The Hilltop Institute

Estimating the Costs to Mississippi Medicaid Attributable to Tobacco

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UMBC

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Estimating the Costs to Mississippi Medicaid Attributable to Tobacco

Introduction

The Center for Mississippi Health Policy—an independent, nonpartisan organization that provides objective information to inform health policy decisions—sought to analyze Medicaid eligibility and claims data to estimate the costs to Mississippi Medicaid that can be attributed to tobacco use. According to the Centers for Disease Control and Prevention (CDC) (2018), an estimated 22.7 percent of adults in Mississippi used tobacco in 2016. According to the Centers for Medicare & Medicaid Services (CMS) (2017), up to 34 percent of the adult Medicaid population in Mississippi smoke. The Hilltop Institute at the University of Maryland, Baltimore County (UMBC) proposed to build on the best evidence from available research literature to identify a) conditions associated with tobacco use (e.g., cancer, cardiovascular disease, and respiratory disease) and the associated International Classification of Disease, Tenth Edition (ICD-10) diagnosis codes; b) tested methodologies for determining the portion of the costs for each diagnosis code that can reasonably be attributed to tobacco use; and c) tested methodologies for estimating total costs of tobacco-related illness in a defined population. By using administrative data obtained from the Mississippi Division of Medicaid, Hilltop generated a cost estimate accounting for the unique characteristics of Mississippi compared with national estimates of Medicaid costs or those in other states. Mississippi's particular prevalence rates of tobacco-related diseases, its rate of smoking among the Medicaid population, and its provider payment policies all influence how to estimate costs of care for tobacco users in this particular state.

This report presents to the Center for Mississippi Health Policy the results of a model for estimating tobacco-related costs for Mississippi Medicaid participants using administrative claims data for calendar years (CYs) 2016 and 2017. Tobacco-related costs were estimated to be $388 million in 2016 and $396 million in 2017. This report describes the various methods that were used to develop these cost estimates.

Overview of Report and Study Approach

Literature Review

The literature on the health and cost effects of tobacco is vast. To provide a timely and useful report, Hilltop staff built on findings of the U.S. Surgeon General's 2014 Report, *The Health Consequences of Smoking – 50 Years of Progress* (U.S. DHHS, 2014), which included a comprehensive review of scientific literature since initial studies indicated that smoking tobacco had adverse health effects. Using online search tools, including Google Scholar and PubMed, Hilltop staff also sought out literature that was published after the 2014 report. The literature review was important for identifying which illnesses have strong evidence of being tobacco-related, and for extracting quantitative data on the additional risks of smokers acquiring the

disease compared to non-smokers. This report discusses the findings from the literature and the choices of quantitative risk factors for each tobacco-related condition.

Data Analysis

These estimates from the literature informed the analysis of data provided by the Mississippi Division of Medicaid, which was a limited data set (LDS) of all Medicaid and Children's Health Insurance Program (CHIP) enrollees and claims for CYs 2016 and 2017. (References to Medicaid in this report also include the population covered by CHIP). The literature review identified diagnosis codes from the ICD-10 to select claims for Medicaid services that indicated a tobacco-related illness. The majority of the ICD-10 diagnosis codes were obtained from the Surgeon General's Report, although certain additional diagnosis codes were identified in more recent literature.

A limitation of the Mississippi Division of Medicaid data set was that there was only one valid diagnosis code listed as the primary diagnosis on claims from hospitals, nursing homes, and other institutional providers. Claims for professional services—such as those provided by physicians—had up to four diagnosis codes, allowing identification of tobacco-related illness as a secondary condition to a professional service. Comparing the expenditure totals when the additional diagnoses were included did not substantially affect the estimated total expenditure on tobacco. For consistency between the two sources of data, Hilltop assigned the total expenditures for each claim to the single primary diagnosis if the diagnosis was tobacco-related. Hilltop undertook additional analysis of Mississippi Medicaid claims to compensate for the possible undercount of tobacco-related illness because of this limitation to primary diagnoses. For example, the ICD-10 diagnoses for the birth-related conditions that the Surgeon General's Report listed seemed underrepresented when claims with such primary diagnoses were tabulated. In this instance, Hilltop identified claims that had revenue codes indicating that a neo-natal intensive care unit had been used, and then applied estimates from the literature of how much of that use could be attributed to a mother's smoking during pregnancy. Similar additions to the findings from claims diagnoses included adding adjustments for pharmaceuticals used in the treatment of certain diagnoses. The vast majority of pharmacy claims in the Mississippi Division of Medicaid data do not have diagnosis codes. Hilltop identified drugs used to treat most common tobacco-related conditions by their National Drug Code (NDC), which is a numerical coding of all drugs maintained by the federal Food and Drug Administration (FDA). These estimates include tobacco-related costs of prescribed drugs for particular tobacco-related illnesses as a separate line-item in summing the estimated expenditures for all such illnesses.

An additional constraint on measuring costs to Mississippi payers is that persons who are eligible for both Medicare and Medicaid have most of their health costs paid by the federally funded Medicare program. The Mississippi Division of Medicaid data include so-called "crossover" claims in which Mississippi Medicaid pays the cost-sharing required for dual-eligible individuals. Hilltop included these crossover claims for dual-eligible individuals along with claims for nursing facility (NF) services, which are paid primarily by Mississippi Medicaid.

Although each crossover claim is a relatively small share of total payments for services, nearly 760,000 and 723,000 crossover claims were processed in 2016 and 2017, respectively. These crossover claims may comprise a large number of tobacco-related illnesses, as persons who acquired tobacco-related conditions may only begin receiving treatment when they have attained eligibility for Medicare.

The majority of NF claims have primary diagnoses based on symptoms such as hypertension or muscle weakness; only a fraction indicate a tobacco-related illness as primary. So, most acute care costs for elderly and disabled dual-eligible individuals are not paid by Mississippi Medicaid, and NF costs paid primarily by Medicaid may not be captured by the primary diagnosis because secondary diagnoses are not listed. We account for this issue in the section entitled "Additional Sources of Expenditures" on page 28.

To distinguish between costs where Hilltop estimated a specific dollar amount for a disease or a type of health service, we label those costs as "tobacco-attributable." For discussions of the problems and costs of tobacco use in general, we use the term "tobacco-related."

Calculating Tobacco-Attributable Costs

To separate the costs of a disease that are attributable to smoking from other potential causes of that disease (e.g., hereditary factors, occupational exposures, other sources), Hilltop used a method for calculating a smoking-attributable fraction (SAF) that is commonly used in epidemiology. The calculation depends on two factors. A relative risk (RR) for smokers compared with non-smokers was derived from the literature review for that disease. That RR component measures the extra or excess occurrences of the disease due to smoking expressed as a ratio relative to the incidence of the outcome experienced by non-smokers. For example, a risk that is 50 percent higher for smokers than for non-smokers is expressed as an RR of 1.5. The higher rate of disease occurrences are then multiplied by the percentage of the population who are smokers to attribute the extra occurrences to the population that had been exposed to tobacco. That percentage is divided by reciprocal of the excess risk of smoking to the total utilization of the entire population (those who smoke and those who do not).

The formula for the SAF is as follows:

$$\frac{\text{Smoking Rate} * (\text{RR} - 1)}{\text{Smoking Rate} * (\text{RR} - 1) + 1}$$

Therefore, Hilltop's estimates of tobacco-attributable costs in Mississippi depend on multiplying the sum of claims payments made by the Medicaid program for each tobacco-related illness by the calculated SAF, which is in turn based on Mississippi's rate of smoking and research literature estimates of relative risks for that illness. The identification of a valid and reliable

smoking rate is important because it is constant across all of the calculations, whereas the RR changes with each disease.

However, smoking rates cannot be directly measured and rely primarily on survey data, which can be subject to errors from misreporting. Furthermore, by the nature of survey sampling, any survey estimates have a range of possible values. As stated earlier, there are differing estimates of smoking rates in Mississippi's Medicaid population. The average smoking rate across the entire Mississippi population that has been estimated from the CDC's national Behavioral Risk Factor Surveillance Survey (BRFSS)—23 percent—is likely to underestimate the SAF calculation because studies have found that Medicaid recipients are more likely to be smokers. Other sources that calculated smoking rates in Mississippi used the BRFSS estimates but projected them to estimate a statewide smoking rate of 31.7 percent in 2015, assuming the absence of tobacco control activities (Barefield, 2017). The estimate of smokers in Mississippi made by CMS (33.8 percent) is based on a different national survey focused on Medicaid members, so it may be more valid in this context (CMS, 2017).

The CMS estimate of the percentage of smokers in Mississippi Medicaid compares with those in other states in the survey and ranges from 14.5 percent to 49.1 percent. For this study, Hilltop used the CMS estimate of 33.8 percent as the smoking rate factor in calculating the SAF.

Overview of Mississippi Medicaid

One of the characteristics of Mississippi Medicaid that affects how much it spends on tobacco-related disease is that its members are predominantly younger women and children, along with a cohort of predominantly elderly females who receive most of their acute health care through Medicare. Mississippi did not elect to expand Medicaid to childless adults as was permitted in the federal Affordable Care Act of 2010. Parents are covered by Mississippi Medicaid up to 27 percent of the Federal Poverty Level (FPL) (Kaiser Family Foundation, 2018). Table 1 shows the distribution by age and gender for enrollees whose data were included in this analysis.[1]

Children aged 18 and younger make up 53 percent of the enrollees included in this analysis and are covered by regular Medicaid or CHIP, depending on parental income. Smoking is assumed to be non-existent among younger children, and under-age children who smoke probably only recently acquired the habit. Tobacco-related illnesses among this group are likely those that may have been caused by secondhand smoke from parents or other adults in the household. Tobacco-related illness directly caused by smoking may take decades to manifest symptoms, so it is not

[1] Enrollment totals include any persons enrolled at any time during 2016 and 2017 and do not reflect the enrollment rate at any one point in time.

likely for heart disease, lung disease, and related cancer to be found among this segment of enrollees.

Similarly, 19-34-year-olds are unlikely to have manifested symptoms from tobacco-related illness, even if this may be an age group in which smoking is commonly found. In fact, the Surgeon General's Report only tabulates the RR and counts of tobacco-related illness for ages 35 and older. Because tobacco-related illnesses that manifest at older ages are intrinsically captured by the claims data incurred for older Medicaid participants, using the age-restricted RRs is assumed to be appropriate.

One might expect the cohort of individuals aged 65 and older to have a high rate of manifested symptoms and treatment. However, as previously mentioned, the vast majority of this age cohort receives most acute health care services from Medicare rather than Medicaid.

Table 1. Age and Gender Distribution of Mississippi Medicaid Enrollees, from Mississippi Division of Medicaid Files, 2016-2017

Age Group	Female	Percentage of Total Enrollment	Male	Percentage of Total Enrollment	Ratio of Females to Males
0-18	263,698	26%	271,788	27%	0.97
19-34	135,656	14%	41,223	4%	3.29
35-44	43,472	4%	16,038	2%	2.71
45-54	28,994	3%	20,063	2%	1.45
55-64	38,473	4%	31,569	3%	1.22
65-older	72,908	7%	35,749	4%	2.04
Total	**583,201**	**58%**	**416,430**	**42%**	**1.40**

Gender differences come into play as well because smoking is more common among men than among women (U.S. DHHS, 2014). Thus, the likelihood of finding tobacco-related illness would also decline among the predominantly female enrollment of Mississippi Medicaid. However, studies that generate RRs for particular diseases vary in whether RRs are reported separately for different genders. Choices among these differing RR estimates are discussed with each description of the disease-specific cost estimates.

Literature Review

Estimates of the effects of smoking on particular diseases depend on decades of studies that have found higher disease and mortality rates among smokers. However, the findings of individual studies may vary because of how the research was conducted. That is, was smoking identified in a population survey or a questionnaire for a specific study? Did the study compare smokers with a matched group of non-smokers? Did it count the current prevalence of smokers in an ongoing

study? Did the study include both women and men, and, if so, were the findings combined or separated by gender? Whether the disease was measured as a cause for entry into treatment or a cause of death may also affect the measurement of risk. Statistical factors that come into play include the sizes of the smoking sample and control group, the amount of variability in the measured outcomes, and the relative occurrence rate of a disease. Scientific studies typically describe a range of possible outcomes based on their analysis of the data, along with the outcome considered most likely according to statistical standards. This "confidence interval" (CI) by convention covers the range of values into which the measure of interest is calculated to fall 95 percent of the time.

Because these issues of scientific measurement are so diverse across the range of diseases attributable to smoking, Hilltop relied on the findings of the U.S. Surgeon General's 2014 Report, *The Health Consequences of Smoking – 50 Years of Progress* (U.S. DHHS, 2014), to summarize this literature, identify the most valid studies, and identify diseases that have tobacco as a significant cause.

The initial list of diseases and their associated ICD-10 diagnosis codes was derived from Table 12.1 in the Surgeon General's Report. The table lists Malignant Neoplasms (cancers) according to the body parts affected and provides both the ICD-10 code and an estimate of RR to use in the calculation of the SAF. Cardiovascular and respiratory diseases are likewise included in this table, with specific manifestations of these diseases identified and provided with an ICD-10 code.

The Surgeon General's Report includes other conditions that have been more recently identified as related to tobacco, but with less detail. Diabetes, tuberculosis, Alzheimer's disease, and conditions occurring in childbirth are among these. Where the Surgeon General's Report did not provide enough information to determine an RR to use in calculating the SAF for Mississippi, Hilltop staff searched the scientific literature for studies that included calculations of an RR, favoring ones that had been published during or after the time the Surgeon General's Report was being prepared. These additional sources are included in the list of references.

To detail the calculations of each tobacco-related condition cost for Mississippi, this section of the report summarizes the literature identified for each condition, the quantities that were determined to contribute to the calculation of the SAF, and the calculation of costs for that condition. Later sections will sum these calculations, discuss the total cost of tobacco-attributable illness for Mississippi, and compare Hilltop's estimates with other estimates of the amount and percentages of health care costs paid by Medicaid.

Cancer

Cancer varies in its manifestations and how smoking affects those occurrences of cancer compared with other causes. The sections below discuss individual types of cancer and calculations of the tobacco-attributable costs.

Acute Myeloid Leukemia

In acute myeloid leukemia (AML), bone marrow makes abnormal blood cells. It is the most common type of acute leukemia in adults, representing about 80 percent of cases (Fircanis, Merriam, Khan, & Castillo, 2014; National Cancer Institute, 2018). Smoking is among the causes, along with having had chemotherapy, childhood leukemia, radiation or exposure to benzene, or history of other blood disorders. For children, exposure to cigarette smoke before birth is among the risk factors, which also include family history, having certain genetic disorders, and exposure to radon or chemicals (National Cancer Institute, 2018). A 2014 study by Fircanis and colleagues summarized the results of previous studies conducted between 1993 and 2013; Combining the estimated risks across all of the studies, the authors found an RR of 1.4 among current smokers. This RR was used in the calculation of the SAF for AML. With this relatively small additional risk, approximately $133,000 spent on AML was attributable to tobacco in 2017, down from $168,000 in 2016.

Table 2. Acute Myeloid Leukemia Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	1,906	$1,113,228	1.4	12%	$132,583
2016	1,909	$1,409,952	1.4	12%	$167,922

Breast Cancer

The effects of smoking on breast cancer are weaker than among other tobacco-related cancers (Secretan et al., 2009), and the Surgeon General's Report found that "the evidence is suggestive but not sufficient to infer a causal relationship between active smoking and breast cancer" (U.S. DHHS, 2014). One factor affecting this low level of evidence is that studies have found that alcohol consumption is correlated with smoking along with the incidence of breast cancer, so attributing the incidence of disease to just one of these causes is difficult (Gaudet et al., 2013). Despite these difficulties, Gaudet and colleagues identified a higher RR of 1.24 for current smokers in a study that followed a cohort of women over the course of 14 years. Using this RR, tobacco-related expenditures for breast cancer were about $605,000 in 2016 and about $616,000 in 2017.

Table 3. Breast Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	27,374	$8,208,882	1.2	8%	$615,939
2016	25,944	$8,062,932	1.2	8%	$604,988

Cervical and Uterine Cancer

Cancers of the cervix and uterus are grouped together by the Surgeon General. Though cervical cancer is understood to be related to infections with human papilloma virus (HPV), smoking enhances the risk of that infection, resulting in active cancer (U.S. DHHS, 2014). The Surgeon General's Report estimated a 1.6 RR for current smokers, which Hilltop incorporated into the estimated SAF for these cancers. As Table 4 shows, in 2017, approximately $207,000 in care for cervical and uterine cancers were attributable to tobacco, compared to about $180,000 in 2016.

Table 4. Cervical and Uterine Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	3,190	$1,246,326	1.6	17%	$207,219
2016	3,306	$1,082,574	1.6	17%	$179,993

Colorectal Cancer

Tobacco's effect on colorectal cancer occurrence is well-supported but also relatively small. A 2014 study in Norway analyzed the RRs for women and men separately but found them to be about the same—1.4—for long-term heavy smokers (Parajuli et al., 2014). For Mississippi Medicaid, this RR resulted in an estimated $710,000 in tobacco-attributable expenditures in 2017 and $624,000 in 2016.

Table 5. Colorectal Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	16,910	$6,711,173	1.4	11%	$709,945
2016	16,030	$5,900,667	1.4	11%	$624,205

Esophageal Cancer

In contrast to the cancer types mentioned earlier, tobacco use substantially increases the risk of esophageal cancer. The Surgeon General's Report cited an RR of 6.8 among men and 7.8 among women. Considering that women enrollees outnumber men in Mississippi Medicaid, Hilltop used the higher RR to estimate spending. The total Medicaid expenditure for this disease in Mississippi was about $618,000 in 2017, down from almost $765,000 in 2016.

Table 6. Esophageal Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	2,687	$888,959	7.8	70%	$618,059
2016	2,482	$1,099,623	7.8	70%	$764,525

Kidney and Renal Pelvis Cancer

The Surgeon General's Report cited the RR for kidney and renal pelvis cancer as 2.7 for males and 1.29 for females. However, a synthesis of previous studies estimated that the difference was closer for men (1.5) and women (1.22) (Hunt, van der Hel, McMillan, Boffetta, & Brennan, 2005). More recently, a study of cancer survivors found an RR of 1.57 for the initial incidence of kidney cancer and an RR of 5.3 among those who had cancer recurrence. Considering this difference in RR estimates, Hilltop approximated the RR across the population at 2.0. Tobacco-related expenditures were about $255,000 in 2016 and $307,000 in 2017.

Table 7. Kidney and Renal Pelvis Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	3,125	$1,213,511	2	25%	$306,552
2016	3,243	$1,009,067	2	25%	$254,906

Laryngeal Cancer

Cancer of the larynx has a strong relationship with smoking because the mouth and throat come into direct contact with tobacco smoke. However, one study found that it occurs predominantly among men, with an estimated ratio of male to female cases of 5:1 (Markou et al., 2013). The Surgeon General's Report cites an RR of 14.6 for men and 13.0 for women. A study done in Korea in 2014 found a lower RR, but risk was reversed between men (4.65) and women (9.1) (Park, Jee, & Shin, 2014). Because Korean men smoke at a comparatively high rate, measuring their risk ratios may have been affected by having fewer non-smoking men to compare in the study. A study in Greece (Vassileiou et al., 2012) found an even higher RR of 19.5 for the entire population. Considering laryngeal cancer's lower prevalence among women, Hilltop used an RR estimate of 14.0 as an approximate average of these studies to account for the higher ratio of females in Mississippi Medicaid. Even though that RR led to a calculated SAF of about 80 percent of expenditures, the estimated payments for tobacco-attributable laryngeal cancer was about $969,000 in 2016 and $1.2 million in 2017. The relatively low spending may be the result of laryngeal cancer manifesting at ages outside of those covered by Medicaid.

Table 8. Laryngeal Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	4,251	$1,496,222	14	81%	$1,218,836
2016	4,131	$1,189,428	14	81%	$968,918

Lip, Oral Cavity, and Pharynx Neoplasms

The risk of lip, oral cavity, and pharynx cancer increases greatly with tobacco use. A review of studies found mixed results for differences between the genders and the specific cancer sites, but increases in alcohol consumption had synergistic effects with smoking to raise RR disproportionately for men and women using both (Lubin et al., 2011). The Surgeon General's Report cited a smoker's RR of 11 for male tobacco users and an RR of 5 for females. Lubin and colleagues found considerably greater incidence of this group of cancers among men than among women. Hilltop found that about two-thirds of Mississippi Medicaid members with these diagnoses were men, and costs for men were proportionately the same. Considering this disparity, greater alcohol use among men, and the relatively low total spending on this group of cancers, Hilltop calculated an SAF of 77 percent using an RR of 11. This led to an estimate of about $1.5 million in Medicaid spending in 2016 and $1.6 million in 2017.

Table 9. Lip, Oral Cavity, and Pharynx Neoplasm Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	6,298	$2,097,254	11	77%	$1,618,429
2016	5,282	$1,991,030	11	77%	$1,536,457

Liver Cancer

In contrast to other types of cancer, liver cancer has been increasing in the United States. As was true with lip, oral cavity, and pharynx cancer, men have greater incidence of liver cancer than women, incurring the disease at about twice the rate (Ryerson et al., 2016). While much of this increase is attributable to the growing prevalence of the Hepatitis C virus, smoking has been identified as a causal factor in liver cancer by the Surgeon General (U.S. DHHS, 2014). Combining RR estimates from numerous studies cited by the Surgeon General's Report, Hilltop selected an RR of 1.5 to reflect risks of smoking in the SAF for liver cancer. This is also consistent with a study summarizing the findings in multiple studies conducted across different nations, which estimated an RR of 1.51 for current smokers (Lee et al., 2009). This results in an estimated $151,000 in tobacco-related expenditures for liver cancer in 2016 and about $207,000 in 2017.

Table 10. Liver Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	2,621	$1,429,515	1.5	14%	$206,662
2016	2,423	$1,043,391	1.5	14%	$150,841

Pancreatic Cancer

Smoking was found to have an RR of about 1.5 in deaths from pancreatic cancer among persons having long-term experience with smoking (Yuan et al., 2017). In the Surgeon General's Report, the RR of mortality from pancreatic cancer was 2.31 for men and 2.25 for women. Averaging the Surgeon General's estimates, Hilltop applied an RR of 2.3 for estimating the SAF in Mississippi. About $345,000 was spent on pancreatic cancer due to smoking in 2016; about $434,000 was spent in 2017.

Table 11. Pancreas Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	3,090	$1,422,032	2.3	31%	$434,098
2016	2,881	$1,124,783	2.3	31%	$345,189

Prostate Cancer

The Surgeon General's Report found that, while cigarette smoking does not increase the risk of prostate cancer, it does increase the risk of mortality from this usually treatable cancer (U.S. DHHS, 2014). However, one study cited by the Surgeon General pooled the results from several studies of the incidence of prostate cancer and found that heavier smokers have increased incidence rates, with an RR of about 1.11 (Huncharek, Haddock, Reid, & Kuperlnick, 2010). Hilltop used an RR of 1.1 to attribute about $102,000 in tobacco-related spending on prostate cancer in 2017 and about $93,000 in 2016.

Table 12. Prostate Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	12,870	$3,104,598	1.1	3%	$101,505
2016	11,171	$2,848,115	1.1	3%	$93,119

Stomach Cancer

Hilltop assigned stomach cancer an RR of 1.96 based on the Surgeon General's Report (U.S. DHHS, 2014). It was not a common diagnosis in this population, so estimated tobacco-related expenditures amounted to about $140,000 in 2017 and $187,000 in 2016.

Table 13. Stomach Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	1,542	$572,110	2.0	24%	$140,159
2016	1,482	$763,897	2.0	24%	$187,145

Tracheal, Lung, and Bronchial Cancer

Cancers of the trachea, lung, and bronchus have one of the highest attributable fractions to tobacco as these are among the parts of the body that come into direct contact with tobacco smoke. The Surgeon General's Report delineates RR by age group and gender for smokers and former smokers, and found RRs that could range as high as 28:1 (U.S. DHHS, 2014). More recently, a research article synthesizing the results of multiple studies found an RR for smoking and incidence of lung cancer of 13.1 (Ordóñez-Mena et al., 2016). For a balance among these multiple estimates, and in consideration of the proportion of younger persons among Mississippi Medicaid enrollees, Hilltop used an RR of 14. Tobacco-attributable expenditures for these cancers were about $7.1 million in 2017 and $6.7 million in 2016.

Table 14. Tracheal, Lung, and Bronchial Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	26,482	$8,808,819	14	81%	$7,175,741
2016	24,805	$8,203,874	14	81%	$6,682,948

Urinary and Bladder Cancer

Smoking creates an appreciable risk of urinary and bladder cancer. A study based on the National Health Interview Survey combined data from 2006 through 2012 to estimate an RR of 3.01 for men and 2.47 for women who were current smokers (Rostron, Chang, & Pechacek, 2014). Hilltop selected an RR of 2.5 to represent the risk in Mississippi's predominantly female Medicaid population. This resulted in estimated tobacco-attributable expenditures of almost $224,000 in 2016 and just over $284,000 in 2017.

Table 15. Urinary and Bladder Cancer Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	2,727	$844,462	2.5	34%	$284,102
2016	2,281	$667,424	2.5	34%	$224,541

Cardiac and Vascular Diseases

Aortic Aneurysm

The Surgeon General's Report indicated the RR for aortic aneurysm as 6.21 for men and 7.07 for women. Using an RR of 7.0, Hilltop estimated that aortic aneurysms attributable to tobacco cost Mississippi Medicaid about $935,000 in 2016 and $1 million in 2017.

Table 16. Aortic Aneurysm Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	4,425	$1,539,241	7.0	67%	$1,030,905
2016	4,046	$1,396,803	7.0	67%	$935,507

Atherosclerosis

Atherosclerosis—or hardening of the arteries—is a risk factor for illness and death in itself and a cause of other vascular-related disease. Based on the Surgeon General's estimated RR of 2.44 for men and 1.83 for women, Hilltop applied an RR estimate of 2.0 to the Medicaid spending on services with an atherosclerosis diagnosis. The tobacco-attributable spending was about $2.1 million in both 2016 and 2017.

Table 17. Atherosclerosis Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	18,062	$7,631,129	2.0	28%	$2,149,047
2016	18,183	$7,544,379	2.0	28%	$2,124,617

Cerebrovascular Disease

Cerebrovascular disease—or stroke—is among the largest costs to Mississippi Medicaid. The Surgeon General's Report attributed an RR of 3.27 to male smokers aged 35 to 64 and 4.0 to women smokers aged 35 to 64. Hilltop estimated the RR at 3.5 for the entire Mississippi Medicaid population. This resulted in about $57 million in tobacco-attributable expenditures in 2016 and nearly $58 million in 2017.

Table 18. Cerebrovascular Disease Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	180,260	$126,347,689	3.5	46%	$57,866,557
2016	160,986	$123,832,950	3.5	46%	$56,714,820

Coronary Heart Disease

Coronary heart disease was also a high-cost condition for Mississippi Medicaid. The Surgeon General again itemized the risk for male and female smokers by age. Male smokers aged 35 to 64 had an RR of 2.80, and female smokers had an RR of 3.08. Hilltop selected an RR estimate of 3.0 to account for the somewhat lower risks and costs for older populations in nursing facilities. Estimated tobacco-attributable spending was about $16.8 million in 2017 and approximately $16.2 million in 2016.

Table 19. Coronary Heart Disease Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	109,479	$41,822,692	3.0	40%	$16,868,818
2016	97,464	$40,359,570	3.0	40%	$16,278,681

Other Arterial Diseases

Other arterial diseases—which include aneurysms other than aortic; embolisms; and peripheral vascular diseases—have been estimated in the Surgeon General's Report as having an RR of about 2.0 for both men and women. Using that estimate, Hilltop calculated that about $2.1 million was spent on other arterial diseases attributable to smoking in 2017. The estimated total tobacco-related spending was $1.9 million in 2016.

Table 20. Other Arterial Disease Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	36,059	$8,338,632	2.0	25%	$2,106,471
2016	30,744	$7,665,844	2.0	25%	$1,936,514

Other Heart Diseases

Other heart diseases for which smoking is a known cause include rheumatic disease, pulmonary heart disease, cardiomyopathy, cardiac arrest, and heart failure. The Surgeon General's Report estimated an RR of 1.78 for male smokers and 1.49 for female smokers. Assuming an RR of 1.6, Hilltop found that Mississippi Medicaid spent $14 million in tobacco-related expenditures in 2016 and $13 million in 2017.

Table 21. Other Heart Disease Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	264,773	$77,422,747	1.6	17%	$13,053,985
2016	258,092	$84,881,327	1.6	17%	$14,311,551

Respiratory Diseases

As cigarette smoke is inhaled, the respiratory system is most effected. The classifications of respiratory diseases have changed over time, with diseases such as bronchitis, emphysema, and chronic airway obstruction grouped together as chronic obstructive pulmonary disease (COPD). The term COPD itself is relatively recent (Forey, Thornton, & Lee, 2011). Because the Surgeon General's Report identifies RR by the individual diseases listed here, Hilltop classified smoking-attributable costs the same way.

Asthma

Asthma is common among both children and adults, and smoking worsens the symptoms. Adult asthmatics who smoke were found to have worse control of their symptoms (Stapleton, Howard-Thompson, George, Hoover, & Self, 2011). When assessing incidence of new asthma cases among adults, smoking increased the risk 1.36 to 1.43 times (Coogan et al., 2014). Studies that focus on the effects of secondhand smoke on children with asthma found parental smoking

associated with worse health outcomes for the children. Smoking by both parents was found to increase the odds of children being hospitalized for asthma by 54 percent in a study in Japan (Tabuchi et al., 2015). A separate study in the United States found 37 percent higher odds of emergency visits and 2.18 times the odds for hospitalization (Jin, Seiber, & Ferketich, 2013). In addition, children beginning to smoke may bring asthma on themselves; asthma incidence increased by 3.9 times among adolescents who had smoked 300 cigarettes (about 15 packs) in the previous year (Gilliland et al., 2006).

Across these varying estimates, it is difficult to assign an RR for this illness. Considering that hospital costs in the Mississippi Division of Medicaid data represent the bulk of spending, it may be reasonable to attribute a higher weight to more recent studies of hospital utilization. Hilltop selected an RR of 2.0 for asthma, which is within the CI for most of the studies cited.

Hilltop also identified a list of asthma medication NDCs from the Healthcare Effectiveness Data and Information Set (HEDIS) annual measures and then calculated these costs as a separate line item for asthma. These measures are a nationwide standard for evaluating health plan performance. Table 22 shows the results of both the asthma services with a diagnosis code and the asthma medications. In these estimates, about $11 million of what Mississippi spent in 2017 for asthma and asthma medication was tobacco-attributable; in 2016, this amount was nearly $15 million.

Table 22. Asthma and Asthma Medication Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Condition	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	SAF	Estimated Expenditures Attributable to Smoking
2017	Asthma	113,523	$17,761,029	2.0	28%	$5,001,787
	Asthma Medications	272,021	$23,502,033	2.0	28%	$6,618,545
	Total	**385,544**	**$41,263,062**			**$11,620,332**
2016	Asthma	119,599	$18,113,394	2.0	28%	$5,101,019
	Asthma Medications	317,071	$34,810,178	2.0	28%	$9,803,098
	Total	**436,670**	**$52,923,572**			**$14,904,117**

Bronchitis and Emphysema

Bronchitis and emphysema are considered to be chronic lower respiratory diseases. As cigarette smoke comes into direct contact with the separate air pathways in the lungs, increasing tobacco exposure over time, these diseases may manifest more frequently among older age groups.

The Surgeon General's Report indicates a wide range of RR for bronchitis, emphysema, and related conditions, depending on gender and age. As an approximation across the Medicaid population, Hilltop used an RR of 14.6. This lead to a calculation of almost $3.8 million in smoking-attributable costs in 2017 and $3.7 million in 2016.

Table 23. Bronchitis and Emphysema Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	46,703	$4,611,460	14.6	82%	$3,785,019
2016	44,940	$4,529,109	14.6	82%	$3,717,426

Chronic Airway Obstruction and COPD

Chronic airway obstruction was reported to have an RR of 10.58 and 13.08 among male and female smokers, respectively. Taking an approximation of RR to be 12.0, just over $45 million was spent on chronic airway obstruction in 2017, and over $41 million in 2016.

Table 24. Chronic Airway Obstruction Disease Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	224,584	$57,126,491	12.0	79%	$45,018,290
2016	217,958	$52,079,852	12.0	79%	$41,041,308

Influenza and Pneumonia

The Surgeon General's Report found an RR for influenza and pneumonia of around 1.75 for men and 2.17 for women smokers. Another study focusing on pneumonia only identified the RR for smokers at 2.6 (Almirall, Blanquer, & Bello, 2014), while a different study found an RR of 3.0 to 4.4, depending on age (Shea et al., 2014). Using an estimated RR of 2.0, Hilltop found that nearly $6 million spent on influenza and pneumonia in 2016 and just over $7 million spent in 2017 could be attributed to tobacco.

Table 25. Influenza and Pneumonia Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	140,461	$28,440,682	2.0	25%	$7,184,567
2016	102,369	$23,517,175	2.0	25%	$5,940,811

Tuberculosis

Tuberculosis is uncommon in the United States, and the occurrence is low. Studies of the RR of smoking cited in the Surgeon General's Report often come from countries where the risk of infection is high. Hilltop elected to use an RR of 2.4 to indicate the higher risk of smokers incurring tuberculosis, but the low level of total spending in Mississippi on tuberculosis reflects its low prevalence. This resulted in an estimated tobacco-related expenditure of under $100,000 for 2016 and 2017 combined.

Table 26. Tuberculosis Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	461	$158,697	2.4	32%	$50,974
2016	452	$84,832	2.4	32%	$27,249

Other Diseases

Alzheimer's Disease

For a long time, whether smoking contributes to the development of Alzheimer's disease (AD) was controversial, as different studies produced conflicting results. Because many smokers die before reaching an age when AD typically manifests, studies of patients with AD may have been biased by the relatively higher mortality rates of smokers. The Surgeon General's Report itself discusses AD only briefly. However, a 2014 paper by Durazzo, Mattsson, and Weine reviewing the previous literature indicates that many of the studies finding a negative relationship between smoking and AD were sponsored by tobacco companies. Summarizing later studies, Durazzo et al. (2014) concluded that "smoking during lifetime is associated with at least a 1.7 times (70%) greater risk for AD, and the risk markedly increases with greater cumulative cigarette exposure."

Using 1.7 as an estimate of the RR, and the paid amount for Mississippi Medicaid claims with a primary diagnosis of AD, Hilltop estimated spending that could be attributed to tobacco use (see Table 27). Tobacco-attributable expenditures for services to treat AD were $11 million in 2016 and nearly $12 million in 2017.

Table 27. Alzheimer's Disease Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	44,541	$64,424,657	1.7	19%	$12,326,438
2016	39,543	$61,282,462	1.7	19%	$11,725,239

Diabetes Type II

Diabetes was only recently confirmed as a consequence of smoking. The Surgeon General's Report indicates an RR of about 1.5 for diabetes among men and women smokers. A study in Japan identified an RR of 1.38 (Akter, Goto, & Mizoue, 2017). A study of adults in four United States communities found an RR of diabetes among heavy smokers of 1.42 (Yeh, Duncan, Schmidt, Wang, & Brancati, 2010). Using the Surgeon General's RR, Hilltop found that about $11.4 million was spent in tobacco-attributable expenditures for acute care treatment of diabetes in 2017, and about $10.6 million in 2016. Hilltop also identified diabetes medications using the list developed for HEDIS measures, as was done for asthma medications. An additional $5.5 to 5.6 million could be attributed to drug treatment for diabetes because of tobacco use. Total expenditures for 2016 were $16.3 million and nearly $17 million in 2017.

Table 28. Diabetes Type II Disease Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year		Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	Diabetes Type II	350,271	$78,996,471	1.5	14%	$11,420,362
	Diabetes Medications	101,636	$38,309,567	1.5	14%	$5,538,338
	Total	**451,907**	**$117,306,038**			**$16,958,700**
2016	Diabetes Type II	319,882	$73,605,398	1.5	14%	$10,640,986
	Diabetes Medications	112,636	$39,033,939	1.5	14%	$5,643,059
	Total	**432,518**	**$112,639,337**			**$16,284,045**

Hip Fracture

Smoking as a cause of hip fracture was first identified in the Surgeon General's Report of 2004 (U.S. DHHS, 2004). While the 2014 report does not identify an RR, a recent summary study (Wu, Zhao, Liu, & Yuan, 2016) found that male smokers had an RR of about 1.47. For female smokers, other review articles found an RR of 1.3 (Shen et al., 2015; Ampelas, 2018). Among the population served by Mississippi Medicaid, few claims had a primary diagnosis of hip fracture, leading to tobacco-attributable expenditures of about $400,000 to $470,000.

Table 29. Hip Fracture Disease Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	10,631	$3,715,773	1.4	11%	$403,088
2016	10,889	$4,308,394	1.4	11%	$467,375

Macular Degeneration

Though macular degeneration is a common cause of blindness among the aged, smoking is associated with higher occurrence. A review article found smoking to be the second most consistent risk factor for macular degeneration (Velilla et al., 2013). The Surgeon General's Report examined a number of studies that found RR to be around 3.0. However, cost to

Mississippi Medicaid was low among its covered population, with about $90,000 to $100,000 in tobacco-attributable expenditures.

Table 30. Macular Degeneration Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	4,725	$224,471	3.0	40%	$90,538
2016	4,274	$252,977	3.0	40%	$102,036

Pre- or Perinatal Conditions Resulting in Neonatal Intensive Care Unit (NICU) Services

Medicaid spending for services attributable to pre- or perinatal conditions—as identified by the ICD-10 codes listed in the Surgeon General's Report—seemed implausibly low for a program whose majority of members are mothers and children. This classification is important because damage from secondhand smoking often manifests as low birth weight or other neonatal conditions. To test the validity of these totals, we identified all hospital claims in which a NICU service could be identified with the appropriate hospital revenue code and obtained a much higher total expenditure. One study found that mothers' smoking resulted in an RR of 1.2 for admission to a NICU (Adams et al., 2002). Though the SAF is small, it resulted in a payment of $7.4 million in 2016 and $7.1 million in 2017.

Table 31. Pre- or Perinatal Conditions Resulting in NICU Payments and Estimated Tobacco-Attributable Amounts, 2016-2017

Year	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Smoking
2017	4,769	$112,888,791	1.2	6%	$7,148,073
2016	5,286	$116,656,880	1.2	6%	$7,386,666

Prescription Drug Costs

Because prescriptions lack an indicator of diagnosis, Hilltop could not include prescription drug claims in the analysis based on primary diagnosis. Nevertheless, certain medications could contribute substantial costs as they are used to treat chronic diseases and prevent more expensive health services resulting from flare-ups or worsening of chronic conditions. Hilltop investigated whether certain drug treatments should be added to the direct treatments identified by primary

diagnosis. To identify groups of drugs utilized for particular conditions, Hilltop relied on lists of NDCs that are used to identify disease occurrence and compliance with therapies in HEDIS measures. In this investigation, medications for asthma and diabetes were identified as substantial contributors to tobacco-related costs. The total cost of drugs for asthma and Type II diabetes are included as line items in Tables 32 and 33, which summarize all disease-specific costs. The SAF used for the disease was assumed to be an appropriate factor to allocate these pharmaceutical costs to tobacco use.

Other sets of disease-specific drugs were selected and tabulated but did not contribute substantial costs, so they were not included in tobacco-attributable costs. Expenditures on Alzheimer's disease treatments were among these drugs. As Alzheimer's is much more common among older individuals, the majority of such drugs are likely paid by Medicare Part D drug coverage.

Another set of drugs that are not included in the tobacco-attributable costs because expenditures were relatively small are those used in nicotine replacement therapy (NRT). Most NRT drugs are now available over the counter, but if prescribed to smokers to support quitting, Mississippi Medicaid will pay for a certain quantity of these medications. Hilltop tabulated pharmacy claims for NRT NDCs; Mississippi Medicaid expenditures for NRT were about $60,000 total in 2017 and about $47,000 in 2016. The Mississippi Medicaid state plan document[2] states that pregnant women who smoke are covered for one face-to-face counseling session under Medicaid and then referred to the Mississippi Quitline for telephone counseling. According to personal communication from Mississippi tobacco control officials, 44 callers to the Quitline were pregnant females in state fiscal year 2017, and the total number of Quitline callers enrolled in Medicaid was 450. Expenditures for NRT can be considered an investment in avoiding future higher health care costs. However, such small sums will not significantly affect total accounting for tobacco-related expenditures.

A final class of drug expenditures not included in the estimates of tobacco-attributable costs comprises the fairly recent Electronic Nicotine Delivery Systems (ENDS), which—like other tobacco products—are regulated by the Food and Drug Administration.[3] These can be in the form of so-called e-cigarettes or similar devices for "vaping," by which users inhale nicotine extracts, often with additional additives or flavors, heated to a vapor by an electric device. The Surgeon General's Report cites arguments that e-cigarettes can be a less dangerous substitute for smoking tobacco, and as well counter-arguments that ENDS still have health risks and could encourage nicotine addiction and continued use of smoking tobacco (U.S. DHHS, 2014). The report notes that there is still uncertainty in both sets of arguments as there is a lack of research to definitively resolve these questions.

[2] https://medicaid.ms.gov/wp-content/uploads/2014/01/Attachment_3.1-A.pdf
[3] https://www.federalregister.gov/d/2016-10685/p-55

Tobacco Use

Hilltop investigated whether tobacco use could be identified explicitly by the coding available in ICD-10. The ICD-10 code for tobacco use was rarely included as a primary diagnosis in the Mississippi Division of Medicaid. Nonetheless, Hilltop included 100 percent of the paid amounts on these claims in tabulating the total costs of smoking. (See Tables 32 and 33).

Total Costs of Services for Treating Tobacco-Related Disease for Mississippi Medicaid

This section of the report summarizes the cost estimates for each particular disease, applies total costs from Hilltop's approach to this analysis, and compares Hilltop's findings with other methods of estimating Medicaid costs for tobacco-related disease.

Total Expenditures on Tobacco-Related Diseases in CY 2016 and CY 2017

Summing the individually calculated tobacco-attributable expenditure amounts for each tobacco-related illness, as estimated from the SAF supported by research literature and as discussed in the previous section, Hilltop's estimate of total Mississippi Medicaid spending on payments to health service providers was approximately $210 million in 2016 and slightly higher at $215 million in 2017. The largest contributors to this total are conditions that frequently occurred among the covered population and have a large SAF, including cerebrovascular disease, chronic airway obstruction, coronary heart disease, other heart diseases, and Type II diabetes. Other conditions may have a relatively large SAF—such as chronic bronchitis and emphysema, esophageal and larynx cancer, lung cancer, and cancers of the lip, oral cavity, and pharynx—but are not common occurrences among the Mississippi Medicaid population, who are mostly children and younger women. There are also services—such as perinatal NICU care—that have high total expenditures, but only a small portion could be attributed to smoking (see Tables 32 and 33).

In addition to total provider payments, one should also consider administrative costs, which include payments to Mississippi Medicaid coordinated care organizations (CCOs) under the MississippiCAN[4] program, which covers about 68 percent of Mississippi Medicaid beneficiaries (Mississippi Division of Medicaid, 2018). Hilltop calculated the difference between capitation payments made to CCOs and the total expenditures to health providers across all services and conditions, and estimated that about 15 percent in additional payments to the CCOs accounted for their expenses in managing care for MississippiCAN enrollees. Assuming that these extra costs are generated in making all payments to providers, Hilltop increased the total calculated

[4] https://medicaid.ms.gov/programs/managed-care/

medical expenses by 15 percent. With this adjustment, tobacco-attributable expenditures are preliminarily estimated to be $241 million in 2016 and $247 million in 2017.

Table 32. Estimated Tobacco-Attributable Expenditures by Mississippi Medicaid, by Diagnoses of Tobacco-Related Conditions, CY 2016

Condition	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Smoking-Attributable Expenditures
Acute Myeloid Leukemia	1,909	$1,409,952	1.4	12%	$167,922
Aortic Aneurysm	4,046	$1,396,803	7.0	67%	$935,507
Alzheimer's Disease	39,543	$61,282,462	1.7	19%	$11,725,239
Asthma	119,599	$18,113,394	2.0	28%	$5,101,019
Asthma Medications	317,071	$34,810,178	2.0	28%	$9,803,098
Atherosclerosis	18,183	$7,544,379	2.0	28%	$2,124,617
Breast Cancer	25,944	$8,062,932	1.2	8%	$604,988
Bronchitis Emphysema	44,940	$4,529,109	14.6	82%	$3,717,426
Cerebrovascular Disease	160,986	$123,832,950	3.5	46%	$56,714,820
Cervical Uterine Cancer	3,306	$1,082,574	1.6	17%	$179,993
Chronic Airway Obstruction	217,958	$52,079,852	12.0	79%	$41,041,308
Colorectal Cancer	16,030	$5,900,667	1.4	11%	$624,205
Coronary Heart Disease	97,464	$40,359,570	3.0	40%	$16,278,681
Diabetes Type II	319,882	$73,605,398	1.5	14%	$10,640,986
Diabetes Medications	112,636	$39,033,939	1.5	14%	$5,643,059
Esophageal Cancer	2,482	$1,099,623	7.8	70%	$764,525
Hip Fracture	10,889	$4,308,394	1.4	11%	$467,375
Influenza Pneumonia	102,369	$23,517,175	2.0	25%	$5,940,811
Kidney and Renal Pelvis Cancer	3,243	$1,009,067	2.0	25%	$254,906
Larynx Cancer	4,131	$1,189,428	14.0	81%	$968,918
Lip Oral Cavity Pharynx Neoplasms	5,282	$1,991,030	11.0	77%	$1,536,457
Liver Cancer	2,423	$1,043,391	1.5	14%	$150,841
Macular Degeneration	4,274	$252,977	3.0	40%	$102,036
Other Arterial Disease	30,744	$7,665,844	2.0	25%	$1,936,514
Other Heart Disease	258,092	$84,881,327	1.6	17%	$14,311,551
Pancreas Cancer	2,881	$1,124,783	2.3	31%	$345,189
Pre- or Perinatal Conditions	5,286	$116,656,880	1.2	6%	$7,386,666
Prostate Cancer	11,171	$2,848,115	1.1	3%	$93,119

Condition	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Smoking-Attributable Expenditures
Rheumatoid Arthritis	28,009	$11,660,022	1.5	14%	$1,685,666
Stomach Cancer	1,482	$763,897	2.0	24%	$187,145
Tobacco Use	6,302	$1,598,832		100%	$1,598,832
Trachea Lung Bronchus	24,805	$8,203,874	14.0	81%	$6,682,948
Tuberculosis	452	$84,832	2.4	32%	$27,249
Urinary Bladder Cancer	2,281	$667,424	2.5	34%	$224,541
Total Health Services Expenditures		**$743,611,075**			**$209,968,158**
Additional 15 percent to Administration					$31,495,224
Total in Tobacco-Attributable Expenditures					**$241,463,382**

Table 33. Estimated Tobacco-Attributable Expenditures by Mississippi Medicaid, by Diagnoses of Tobacco-Related Conditions, CY 2017

Condition	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Smoking-Attributable Expenditures
Acute Myeloid Leukemia	1,906	$1,113,228	1.4	12%	$132,583
Aortic Aneurysm	4,425	$1,539,241	7.0	67%	$1,030,905
Alzheimer's Disease	44,541	$64,424,657	1.7	19%	$12,326,438
Asthma	113,523	$17,761,029	2.0	28%	$5,001,787
Asthma Medications	272,021	$23,502,033	2.0	28%	$6,618,545
Atherosclerosis	18,062	$7,631,129	2.0	28%	$2,149,047
Breast Cancer	27,374	$8,208,882	1.2	8%	$615,939
Bronchitis Emphysema	46,703	$4,611,460	14.6	82%	$3,785,019
Cerebrovascular Disease	180,260	$126,347,689	3.5	46%	$57,866,557
Cervical Uterine Cancer	3,190	$1,246,326	1.6	17%	$207,219
Chronic Airway Obstruction	224,584	$57,126,491	12.0	79%	$45,018,290
Colorectal Cancer	16,910	$6,711,173	1.4	11%	$709,945
Coronary Heart Disease	109,479	$41,822,692	3.0	40%	$16,868,818
Diabetes Type II	350,271	$78,996,471	1.5	14%	$11,420,362
Diabetes Medications	101,636	$38,309,567	1.5	14%	$5,538,338

Condition	Number of Claims in MS Medicaid with Condition	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Smoking-Attributable Expenditures
Esophageal Cancer	2,687	$888,959	7.8	70%	$618,059
Hip Fracture	10,631	$3,715,773	1.4	11%	$403,088
Influenza Pneumonia	140,461	$28,440,682	2.0	25%	$7,184,567
Kidney and Renal Pelvis Cancer	3,125	$1,213,511	2.0	25%	$306,552
Larynx Cancer	4,251	$1,496,222	14.0	81%	$1,218,836
Lip Oral Cavity Pharynx Neoplasms	6,298	$2,097,254	11.0	77%	$1,618,429
Liver Cancer	2,621	$1,429,515	1.5	14%	$206,662
Macular Degeneration	4,725	$224,471	3.0	40%	$90,538
Other Arterial Disease	36,059	$8,338,632	2.0	25%	$2,106,471
Other Heart Disease	264,773	$77,422,747	1.6	17%	$13,053,985
Pancreas Cancer	3,090	$1,422,032	2.3	31%	$434,098
Pre or Perinatal Conditions	4,769	$112,888,791	1.2	6%	$7,148,073
Prostate Cancer	12,870	$3,104,598	1.1	3%	$101,505
Rheumatoid Arthritis	35,864	$12,046,688	1.5	14%	$1,741,566
Stomach Cancer	1,542	$572,110	2.0	24%	$140,159
Tobacco Use	6,626	$1,576,464		100%	$1,576,464
Trachea Lung Bronchus	26,482	$8,808,819	14.0	81%	$7,175,741
Tuberculosis	461	$158,697	2.4	32%	$50,974
Urinary Bladder Cancer	2,727	$844,462	2.5	34%	$284,102
Total Health Services Expenditures		**$746,042,495**			**$214,749,663**
Additional 15 percent to Administration					$30,950,416
Total in Tobacco-Attributable Expenditures					**$246,962,112**

Additional Sources of Expenditures

The methodology of identifying smoking-attributable disease from the literature on smoking and calculating SAFs from RRs that are supported by literature provides a partial estimate of potential sources of tobacco-related costs for Mississippi Medicaid. Hilltop identified certain other potential sources of cost that might be measureable through the Mississippi Division of Medicaid data: secondhand smoking, nursing facility spending, and expenditures for chemotherapy and radiation therapy for cancer.

Secondhand Smoking Costs

Many of the costs of secondhand smoke are implicitly included in the prior discussion of costs for particular diseases. However, for those disease cost estimates that are based on calculated RRs for smokers to non-smokers, secondhand smoke is not considered a primary contributor to costs. There have been a number of studies that account for the additional cost for persons who did not smoke yet acquired a tobacco-related disease because of extended time periods spent in the company of smokers.

One such cost study of secondhand smoking conducted in Minnesota calculated the SAF for particular diseases that were considered to have a large number of cases resulting from secondhand smoke (Waters, Foldes, Alesci, & Samet, 2009). The SAFs found in this study were used in estimates in other states. In particular, a study performed by the Social Science Research Center at Mississippi State University (MSU) applied the Minnesota SAF and found $36 million in spending on services related to secondhand smoke during state fiscal year 2013 (Mississippi Tobacco Data, 2015).

Hilltop could not update this estimate directly, in part because MSU based its cost estimates on both primary and secondary diagnoses using ICD-9th edition that were available at the time but are no longer available in the 2016-2017 Mississippi Division of Medicaid data. Furthermore, the Hilltop methodology to estimate the extra costs of Medicaid services added by secondhand smoke would be difficult to adapt because the methodology relies on an RR estimate to calculate SAF along with a measure of smoking prevalence. To accurately calculate secondhand smoking effects would require an estimate of the percentage of persons exposed to secondhand smoke who are not also smokers.

Nevertheless, Hilltop applied the studies that calculate secondhand smoke RRs for individual diseases to the smoking prevalence rates to generate an approximate estimate of secondhand smoking costs. Selecting diseases with an estimated RR available for secondhand smoke and calculating an additional SAF based on the tabulated total spending, the resulting tobacco-attributable expenditures are presented in Table 34. Secondhand smoking is estimated to cost Mississippi Medicaid about $19 million in 2016 and $19.5 million in 2017.

Table 34. Estimated Costs of Secondhand Smoking to Selected Disease Conditions

Condition	2016				2017			
	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Secondhand Smoking	Sum of Total Paid Amounts	Relative Risk	Smoking-Attributable Fraction	Estimated Expenditures Attributable to Secondhand Smoking
Asthma	$18,111,423	1.4	13%	$2,344,811	$17,759,331	1.4	13%	$2,299,227
Cervical and Uterine Cancer	$1,082,517	1.4	12%	$131,756	$1,246,326	1.4	12%	$151,694
Chronic Pulmonary Disease	$52,064,491	1.8	22%	$11,406,260	$57,110,376	1.8	22%	$12,511,710
Coronary Heart Disease	$40,346,055	1.1	3%	$1,319,111	$41,812,814	1.1	3%	$1,367,066
Otitis Media	$19,008,239	1.5	14%	$2,747,983	$18,396,878	1.5	14%	$2,659,600
Spontaneous Abortion	$1,849,263	1.16	5%	$94,877	$1,709,795	1.16	5%	$87,722
Trachea Lung and Bronchus Cancer	$8,202,946	1.2	7%	$567,753	$8,808,198	1.2	6%	$557,732
Total				**$18,612,551**				**$19,547,028**

Nursing Facility Spending

Nursing facility (NF) claims were included in the Mississippi Division of Medicaid data set, and the cost of NF claims in which a tobacco-related condition was indicated as a primary diagnosis was included in the tabulations above. However, Mississippi spends between $800 and $900 million annually on NF services (Table 35), of which only about $200 million had a smoking-related illness as a primary diagnosis. Among the NF claims without indicators of tobacco-related illness, primary diagnoses frequently included conditions such as hypertension, muscle weakness, osteoarthritis, and malaise and fatigue. Hilltop considers it to be likely that some proportion of persons living in NFs who were reporting such relatively common conditions actually became residents because of health conditions related to tobacco. The methodology for estimating a share of these other NF expenditures that could be attributed to tobacco-related illness could be based on estimates in the literature for an RR of NF placement. These range from 1.12 (Rist, Nguyen, Whitmer, & Glymour, 2016) to 1.39 (Warner, McCammon, Fries, & Langa, 2013) to 1.56 (Valiyeva, Russell, Miller, & Safford, 2006). However, these estimates of RR are based either on the rates found for specific research cohorts entering NFs or on national survey data. Because claim-specific data were available to Hilltop, and the likelihood of NF placement may vary from state to state because of variations in the supply of NF beds and community-based alternatives to NF placement, Hilltop implemented a different approach to attributing the proportion of NF spending in Mississippi to tobacco-related illness.

Hilltop selected persons whose NF claims did not include a tobacco-related diagnosis, then searched for claims for these NF users from other types of providers that did show a tobacco-related diagnosis. This method assumes that the SAFs calculated for acute and chronic health conditions are a reasonable proxy for the unavailable SAF for the physical, cognitive, and health service needs that lead individuals to use NF services. If the effects of an individual's disease burden from smoking are proportionate to their support services needed, as identified through assignment of persons to levels of care under Mississippi's long-term care scoring algorithm (Mississippi Division of Medicaid, 2007), this assumption is defensible. Table 35 displays the calculation of NF expenditures on tobacco-related illness using this method. Hilltop attributed between 14 and 15 percent of NF spending in Mississippi—approximately $124 to $125 million in additional expenditures per year—to tobacco use for NF claims lacking a tobacco-related primary diagnosis.

Table 35. Total Mississippi Medicaid Nursing Facility Expenditures, Proportion of NF Users with Non-NF Primary Diagnosis Attributed to Smoking, and Percentage of Total, 2016-2017

	2017	2016
Total NF Expenditures	$820,596,574	$871,422,778
Estimated NF Expenditures Attributable to Tobacco Use Based on NF Residents' Other Claims	$123,535,768	$124,892,593
Percentage of Total Nursing Facility Expenditures	15%	14%

Chemotherapy

Not included among the smoking diagnoses are ICD-10 codes for chemotherapy and radiation therapy (Z51.0 and Z51.1). Because these services may be applicable to numerous types of cancer, the SAF estimate for cancer diagnoses as a whole is based on the RR estimate of Ordóñez-Mena et al. (2016) of 1.44 (Table 36).

Table 36. Expenditures for Chemotherapy and Radiation Therapy Attributable to Tobacco, 2016-2017

2016 Sum of Total Paid Amounts for Chemotherapy	2017 Sum of Total Paid Amounts for Chemotherapy	Relative Risk	Smoking-Attributable Fraction	2016 Smoking-Attributable Expenditures for Chemotherapy	2017 Smoking-Attributable Expenditures for Chemotherapy
$36,047,743	$37,595,348	1.4	12%	$4,666,951	$4,867,313

Summary of Estimates

The estimated costs to Mississippi Medicaid of individual tobacco-attributable diseases, diseases resulting from secondhand smoke, use of nursing facilities that may have been avoided if the resident did not smoke, and estimated chemotherapy costs related to tobacco use are summed in Table 37.

Table 37. Summation of Estimates of Direct and Indirect Costs of Tobacco-Attributable Illness to Mississippi Medicaid, 2016-2017

	2016	2017
Direct Costs of Treatment for Tobacco-Attributable Conditions as Primary Diagnoses	$241,134,957	$246,616,165
Costs of Conditions from Secondhand Smoke	$18,612,551	$19,547,028
Nursing Facility Costs Estimated from Other Claims for Tobacco-Attributable Conditions	$123,535,768	$124,892,593
Chemotherapy	$4,666,951	$4,867,313
Total	**$387,952,243**	**$395,925,117**

Comparison to Other Estimation Methods

While Hilltop used detailed claims to identify known tobacco-related diagnoses, other approaches have been used to estimate the cost burden of tobacco-related illness. A study commonly cited to estimate tobacco-attributable expenditures in other states—Xu, Bishop, Kennedy, Simpson, & Pechacek, 2015—combined several years of survey data from the national Medical Expenditure Panel Survey (MEPS) to identify medical costs, as well as the National Health Interview Survey (NHIS) to identify smoking behavior. By measuring the total costs of smokers compared to non-smokers, and adjusting for other factors that influence costs, Xu et al. (2015) calculated that 3.2 percent of national spending was generated by current smokers between 2006 and 2010, with a CI ranging between 2.2 percent and 4.4 percent. Adding the costs incurred by former smokers, the authors estimated that 8.7 percent of national health care spending was due to smoking. Xu and colleagues (2015) then allocated the smoking costs according to estimated sources of spending from another source of data, the National Health Expenditure Accounts (NHEA). The authors estimated that the share of total Medicaid spending was 15.2 percent (with a CI between 6.2 percent and 27.4) (Xu et al., 2015).

The total smoking-attributable costs that Hilltop calculated are compared to total Mississippi Medicaid spending on health services, as tabulated from the Mississippi Division of Medicaid data. Mississippi Medicaid spent approximately $4.4 billion on health services, which accords with total spending reported by the Mississippi Division of Medicaid in its 2018 Annual Report (Mississippi Division of Medicaid, 2018). Hilltop estimates that tobacco-attributable expenses accounted for about 9 percent of Medicaid expenses in 2016 and 2017.

The difference between the estimated share of Medicaid expenditures attributable to smoking between Xu et al. (15.2 percent) and Hilltop (approximately 9 percent) can be explained by a number of factors. Because the estimated rate of current smokers rather than current and former smokers was available, the RR of current smokers was used in the SAF calculations. Xu and colleagues' total cost share included costs of former smokers because they used a different source for a national estimate. As described earlier, there are differing state-level estimates of current smoking rates, and for Hilltop to incorporate a percentage estimate of costs based on former smokers would require additional judgments about appropriate sources and make expenditure calculations more complex. The nationwide survey data used by Xu et al. (2015) to estimate total expenditures and tobacco-attributable costs assumes that individual states have the same demographic and epidemiologic conditions. Finally, Xu and colleagues' method calculated all additional health costs for smokers, regardless of whether the costs were for tobacco-related illness or other illnesses. Hilltop's estimate of 8.8 to 9.2 percent as the share of Medicaid spending for tobacco-attributable illness is within the 95 percent CI of the Xu et al. study (6.2 percent to 27.4 percent).

Table 38. Estimated Smoking-Attributable Expenditures as a Percentage of Mississippi Medicaid Medical Expenditures, 2016 and 2017

	2016	2017
Total Health Expenses	$4,399,338,301	$4,303,793,903
Estimated Smoking-Attributable Amounts	$387,952,243	$395,925,117
Percentage of Total Health Expenses Attributable to Smoking	8.8%	9.2%

Sensitivity Analysis

As noted earlier, the results presented in this report are derived from literature that consolidates potentially wide ranges of RR estimates. They are also based on the assumption of a rate of current smoking among Mississippi Medicaid participants of 33.8 percent. Varying these assumptions helps place the results of the methodology into context. Hilltop recalculated the cost of tobacco-attributable illness as if the percentage of smokers among Mississippi Medicaid recipients were the same as the estimated statewide average of 23 percent. Under this scenario, expenditures were about 27 percent lower: $282 million (or 6.4 percent of Mississippi Medicaid's total expenditures) in 2016, and $288 million (or 6.7 percent of total expenditures) in 2017.

Explicitly testing alternatives to the RR estimates based on published CIs for the base research would not be practical, because Hilltop sometimes used approximations or averages among a number of different RR estimates. Instead, to test the effects of a lower RR, Hilltop reduced any RR estimate of 2.0 or greater used in Tables 31 and 32 by 20 percent. The resulting estimate of total spending was about 12.5 percent less, resulting in tobacco- attributable expenditure estimates of $340 million (or 7.7 percent of total expenditures) in 2016 and $347 million (or 8.1 percent of total expenditures) in 2017. Although the same adjustment could in principle be used to test for greater RRs or smoking rates, Hilltop suggests that these adjustments represent lower-bound estimates for the total cost that may be a more useful consideration for policymakers.

Conclusion

The estimates of tobacco- attributable costs to Mississippi Medicaid are based on RRs derived from current literature on the risks of smoking for the occurrence of specific tobacco-related diseases, along with a survey-based estimate of the prevalence of smoking among participants in Mississippi Medicaid. Some of these diseases are still being studied, and the basis for The Hilltop Institute's estimates may change in the future. Efforts to prevent people from starting to smoke and encouraging existing smokers to quit may result in lower future prevalence of smoking as well. Further research will be needed to determine whether the growing use of ENDS will improve or worsen these trends. This report presents an estimate of costs attributable to tobacco based on current levels of spending recorded in Mississippi Medicaid's transactions with health care providers and estimated SAFs generated from the current literature on higher risks of

diseases from smoking. Given trends toward reduced smoking prevalence, these annual costs for Medicaid may lessen over time, but because the effects of smoking may not manifest into illness for decades, there will be health system expenditures on tobacco-related illness for the foreseeable future.

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Appendix A. List of ICD-10 Codes Used to Identify Tobacco-Related Illness

Tobacco-Related Conditions	ICD-10 Codes Identifying Conditions
Respiratory	
Tuberculosis	A15 – A15.9
Influenza, Pneumonia	J10 – J17
Bronchitis, Emphysema	J40 – J43.9
Chronic Airway Obstruction	J44 – J44.9
Asthma	J45 – J45.998
Cancers	
Lip, Oral Cavity, Pharynx	C00 – C14.8
Esophagus	C15 – C15.9
Stomach	C16 – C16.9
Colorectal	C18 – C18.9
Liver	C22 – C22.9
Pancreas	C25 – C25.9
Larynx	C32 – C32.9
Trachea, Lung, Bronchus	C33 – C34.92
Breast	C50 – C50.929
Cervix or Uterus	C53 – C53.9
Prostate	C61
Kidney or Renal Pelvis	C64 – C65.9
Urinary Bladder	C67 – C67.9
Acute Myeloid Leukemia	C92 – C92.02
Endocrine	
Diabetes Type II	E11 – E11.9
Other	
Alzheimer's Disease	G30 – G30.9
Tobacco Use	Z72.0, O99.33
Cardiovascular	
Coronary Heart Disease	I20 – I25.9
Other Heart Disease	I00 – I09.9, I26 – I52
Cerebrovascular Disease	I60 – I69.998
Atherosclerosis	I70 – I70.92
Aortic Aneurysm	I71 – I71.9
Other Arterial Disease	I72 – I72.9
Musculoskeletal	
Rheumatoid Arthritis	M05 – M06.9
Hip Fracture	M80.052A, M80.059A, M80.851A, M80.852A, M80.859A, M84.350A, M84.351A, M84.352A, M84.353A, M84.359A, M84.451A, M84.452A, M84.453A, M84.459A, M84.551A, M84.552A, M84.553A, M84.559A, M84.651A, M84.652A,

Tobacco-Related Conditions	ICD-10 Codes Identifying Conditions
	M84.653A, M84.659A, S32.301A, S32.301B, S32.302A, S32.302B, S32.309A, S32.309B, S32.311A, S32.311B, S32.312A, S32.312B, S32.313A, S32.313B, S32.314A, S32.314B, S32.315A, S32.315B, S32.316A, S32.316B, S32.391A, S32.391B, S32.392A, S32.392B, S32.399A, S32.399B, S32.401A, S32.401B, S32.402A, S32.402B, S32.409A, S32.409B, S32.411A, S32.411B, S32.412A, S32.412B, S32.413A, S32.413B, S32.414A, S32.414B, S32.415A, S32.415B, S32.416A, S32.416B, S32.421A, S32.421B, S32.422A, S32.422B, S32.423A, S32.423B, S32.424A, S32.424B, S32.425A, S32.425B, S32.426A, S32.426B, S32.431A, S32.431B, S32.432A, S32.432B, S32.433A, S32.433B, S32.434A, S32.434B, S32.435A, S32.435B, S32.436A, S32.436B, S32.441A, S32.441B, S32.442A, S32.442B, S32.443A, S32.443B, S32.444A, S32.444B, S32.445A, S32.445B, S32.446A, S32.446B, S32.451A, S32.451B, S32.452A, S32.452B, S32.453A, S32.453B, S32.454A, S32.454B, S32.455A, S32.455B, S32.456A, S32.456B, S32.461A, S32.461B, S32.462A, S32.462B, S32.463A, S32.463B, S32.464A, S32.464B, S32.465A, S32.465B, S32.466A, S32.466B, S32.471A, S32.471B, S32.472A, S32.472B, S32.473A, S32.473B, S32.474A, S32.474B, S32.475A, S32.475B, S32.476A, S32.476B, S32.481A, S32.481B, S32.482A, S32.482B, S32.483A, S32.483B, S32.484A, S32.484B, S32.485A, S32.485B, S32.486A, S32.486B, S32.491A, S32.491B, S32.492A, S32.492B, S32.499A, S32.499B, S32.501A, S32.501B, S32.502A, S32.502B, S32.509A, S32.509B, S32.511A, S32.511B, S32.512A, S32.512B, S32.519A, S32.519B, S32.591A, S32.591B, S32.592A, S32.592B, S32.599A, S32.599B, S32.601A, S32.601B, S32.602A, S32.602B, S32.609A, S32.609B, S32.611A, S32.611B, S32.612A, S32.612B, S32.613A, S32.613B, S32.614A, S32.614B, S32.615A, S32.615B, S32.616A, S32.616B, S32.691A, S32.691B, S32.692A, S32.692B, S32.699A, S32.699B, S32.810A, S32.810B, S32.811A, S32.811B, S32.82XA, S32.82XB, S32.89XA, S32.89XB, S32.9XXA, S32.9XXB, S72.001A, S72.001B, S72.001C, S72.002A, S72.002B, S72.002C, S72.009A, S72.009B, S72.009C, S72.011A, S72.011B, S72.011C, S72.012A, S72.012B, S72.012C, S72.019A, S72.019B, S72.019C, S72.021A, S72.021B, S72.021C, S72.022A, S72.022B, S72.022C, S72.023A, S72.023B, S72.023C, S72.024A, S72.024B, S72.024C, S72.025A, S72.025B, S72.025C, S72.026A, S72.026B, S72.026C, S72.031A, S72.031B, S72.031C, S72.032A, S72.032B, S72.032C, S72.033A, S72.033B, S72.033C, S72.034A, S72.034B, S72.034C, S72.035A, S72.035B, S72.035C, S72.036A, S72.036B, S72.036C, S72.041A, S72.041B, S72.041C, S72.042A, S72.042B, S72.042C, S72.043A, S72.043B, S72.043C, S72.044A, S72.044B, S72.044C,

Tobacco-Related Conditions	ICD-10 Codes Identifying Conditions
	S72.045A, S72.045B, S72.045C, S72.046A, S72.046B, S72.046C, S72.051A, S72.051B, S72.051C, S72.052A, S72.052B, S72.052C, S72.059A, S72.059B, S72.059C, S72.061A, S72.061B, S72.061C, S72.062A, S72.062B, S72.062C, S72.063A, S72.063B, S72.063C, S72.064A, S72.064B, S72.064C, S72.065A, S72.065B, S72.065C, S72.066A, S72.066B, S72.066C, S72.091A, S72.091B, S72.091C, S72.092A, S72.092B, S72.092C, S72.099A, S72.099B, S72.099C, S72.101A, S72.101B, S72.101C, S72.102A, S72.102B, S72.102C, S72.109A, S72.109B, S72.109C, S72.111A, S72.111B, S72.111C, S72.112A, S72.112B, S72.112C, S72.113A, S72.113B, S72.113C, S72.114A, S72.114B, S72.114C, S72.115A, S72.115B, S72.115C, S72.116A, S72.116B, S72.116C, S72.121A, S72.121B, S72.121C, S72.122A, S72.122B, S72.122C, S72.123A, S72.123B, S72.123C, S72.124A, S72.124B, S72.124C, S72.125A, S72.125B, S72.125C, S72.126A, S72.126B, S72.126C, S72.131A, S72.131B, S72.131C, S72.132A, S72.132B, S72.132C, S72.133A, S72.133B, S72.133C, S72.134A, S72.134B, S72.134C, S72.135A, S72.135B, S72.135C, S72.136A, S72.136B, S72.136C, S72.141A, S72.141B, S72.141C, S72.142A, S72.142B, S72.142C, S72.143A, S72.143B, S72.143C, S72.144A, S72.144B, S72.144C, S72.145A, S72.145B, S72.145C, S72.146A, S72.146B, S72.146C, S72.21XA, S72.21XB, S72.21XC, S72.22XA, S72.22XB, S72.22XC, S72.23XA, S72.23XB, S72.23XC, S72.24XA, S72.24XB, S72.24XC, S72.25XA, S72.25XB, S72.25XC, S72.26XA, S72.26XB, S72.26XC, S79.001A, S79.002A, S79.009A, S79.011A, S79.012A, S79.019AS79.091A, S79.092A

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