Indiana Smoking Attributable Medicaid Expenditures
Final Report

SVC, Inc.
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I. Executive Summary

Despite a decline in smoking prevalence over the past ten years, smoking remains the leading cause of preventable disease and death in the United States and is responsible for more than one in five deaths annually. Describing the negative health effects of smoking is powerful in the effort to reduce overall smoking prevalence; however, translating these negative effects into economic terms may be more persuasive. The U.S. Centers for Disease Control and Prevention (CDC) estimates the total economic cost of smoking is more than $300 billion annually, including nearly $170 billion in direct medical care for adults.[1] This report provides an estimate of smoking attributable Medicaid expenditures in Indiana. The results of this current analysis are consistent with the prevailing research and indicate that smokers are nearly 17 percentage points more likely to have smoking-attributable health consequences relative to non-smokers (35.8% vs. 19.2%), which likely drives the fact that smokers have 51% higher monthly Medicaid expenditures than non-smokers. This translates to an estimated $540 million in smoking-attributable health care expenditures annually. A complete analysis of the data received is provided in Section VI of this report; however, key findings are highlighted below:

- The self-reported tobacco use and direct tobacco-related expenditures indicate that the prevalence of smoking among Indiana Medicaid members is 23.0%, which is comparable to the national estimate for Medicaid members reported by the CDC (27.8%). We note that self-reported tobacco use may be underreported, due to individual discomfort disclosing smoking habits to a health care provider.

- Indiana Medicaid members who smoke have higher health care costs compared to members who do not smoke. The overall per member per month (PMPM) Medicaid expenditures for smokers ($904.61) is 51.4% ($307.03) higher compared to those for non-smokers ($597.58).

- The annual difference in Medicaid expenditures between smokers ($10,855.29) and non-smokers ($7,171.02) is $3,684.27, which calculates to $539,808,666.55 in smoking-attributable Medicaid costs annually.

- Older Indiana Medicaid members who smoke have higher medical costs compared to younger members who smoke. The PMPM Medicaid expenditures for male smokers age 55-64 ($1,246.37) is 70.3% ($514.29) higher compared to male smokers age 18-34 ($732.08). The PMPM Medicaid expenditures for female smokers age 55-64 ($1,100.38) is 82.3% ($496.69) higher compared to female smokers age 18-34 ($603.69).

- The difference in health care costs between smokers and non-smokers is greater among younger adults. Among males age 35-44, the PMPM expenditures for smokers ($971.87) was $332.01 (51.9%) higher compared to those for non-smokers ($639.86). Among females age 18-34, the PMPM expenditures for smokers ($603.69) was $235.55 (64.0%) higher compared to those for non-smokers ($368.14).

- Male smokers have higher health care costs compared to female smokers. The overall PMPM Medicaid expenditures for male smokers ($1,025.60) is 22.6% ($189.30) higher compared to those for female smokers ($836.30).

- The overall prevalence of smoking-attributable health consequences (listed in Table 1) is 16.6 percentage points higher among smokers (35.8%) compared to non-smokers (19.2%). Among males, the prevalence of smoking-attributable health consequences is 18.6 percentage points higher for smokers (38.6%) compared to non-smokers (20.0%). Among females, the prevalence of smoking-attributable health consequences is 14.6 percentage points higher for smokers (34.3%) compared to non-smokers (18.7%).

- Among individuals with smoking-attributable health consequences, such as lung cancer or stroke, there is minimal variation in PMPM expenditures ($59.92; 4.3%) among smokers ($1,439.38) versus non-smokers ($1,379.46), which suggests that the higher overall health care costs among smokers is driven by the fact that smokers experience a higher number of health consequences compared to non-smokers. Put differently, the cost of smoking-related health problems is approximately the same between smokers and non-smokers; however, since smokers have more smoking-related health problems compared to non-smokers, their overall costs are higher.

II. Purpose of Report

On December 8, 2016, the Richard M. Fairbanks Foundation (the Foundation) contracted with SVC, Inc. (SVC) to develop a report identifying Indiana Medicaid spending attributable to smoking. As part of this analysis, several factors were considered, including but not limited to: existing methodologies used to identify Medicaid spending attributable to smoking, available State data, and potential limiting factors. On March 14, 2017, SVC completed an analysis based on Indiana Medicaid Members ages 35-64, and this report was made available on the Foundation's website. On March 31, 2017, SVC added individuals ages 18-34 to the analysis, thereby providing an estimate of smoking attributable Medicaid expenditures among Indiana Medicaid members age 18-64. This updated report presents our research findings.

III. Introduction

While the percentage of U.S. adults who smoke has declined over the past ten years, from 20.9% in 2005 to 15.1% in 2015, smoking remains the leading cause of preventable disease and death in the U.S.[2] In Indiana, the most recently reported prevalence of adults who smoke cigarettes is 20.6%, which is considerably higher than the national average of 15.1%.[2] In Indiana, the average number of annual smoking-attributable deaths is over 11,000 persons.[3]

Despite national declines in smoking prevalence, disparities continue to exist, particularly among Medicaid members.[4] Medicaid is a means-tested program that provides health care coverage to over 70 million low-income Americans, many of whom would otherwise be uninsured.[5] The program is jointly financed between federal and state governments, with Indiana Medicaid totaling over $9 billion annually.[6]

A recent national analysis of Medicaid members conducted by the CDC found that 27.8% of adults on Medicaid currently smoke, a rate that is nearly twice the national average.[2] For further comparison, 11.1% of adults with private insurance and 8.9% of those on Medicare currently smoke.[4] While the increased risk of smoking among Medicaid members is generally understood, the associated Medicaid expenditures are less clear.

IV. Research Methods

Though researchers have spent decades estimating both national and state-level smoking-attributable expenditures, few studies provide definitive guidance on the most appropriate research methods, particularly as it relates to estimates of Medicaid expenditures.[7] However, in 2011, the World Health Organization (WHO) published a toolkit describing various techniques to estimate both direct and indirect smoking-attributable expenditures.[8] Four specific methods were addressed in this toolkit, including: estimation technique, time period, population of interest, and smoking-related conditions; each is summarized below.

The four approaches to estimation technique include: (1) medical cost approach; (2) utilization approach; (3) disease incidence approach, and (4) mortality approach. The medical cost approach requires data on disease-specific annual healthcare *treatment* costs per person, stratified by smoking status.[9] This is the preferred approach, as it directly compares the average

per person medical costs for treating a particular disease between smokers and individuals who have never smoked (i.e., "never smokers").[10]

The utilization approach requires data on disease-specific annual healthcare *utilization* per person, stratified by smoking status.[11] This approach allows for a comparison of average per person healthcare utilization between smokers and never smokers for treating a particular disease; however, a comparison of average healthcare cost must be derived by the product of average per person healthcare utilization and unit cost per utilization.[12]

The disease incidence approach requires disease incidence rates for smokers and never smokers.[13] This approach allows for a comparison of the disease incidence rates between smokers and never smokers; however, a comparison of average healthcare cost must be derived as the product of disease incidence rate, the average healthcare utilization per ill person with that disease, and the unit cost per utilization.[14] Further, this approach may yield biased estimates compared with the first two approaches, as it fails to consider differential access to health insurance, and behavioral risk factors between smokers and never smokers.[15]

Finally, the mortality approach requires data on separate population death rates by underlying cause of death for smokers and never smokers.[16] This approach does not allow for differential estimates by type of healthcare services and is the least preferable.[17]

Regarding the options for identifying the most appropriate time period for analysis, the costs of smoking can be identified over the course of a discrete time, typically one year, or over the course of an individual's lifetime. The former, an "annual cost approach," sums the excess costs of smoking-related diseases and deaths incurred by all persons in a single year.[18] The majority of published cost-of-smoking studies have been conducted using this annual cost approach.[19] Alternatively, the "lifetime cost approach" estimates the predicted excess costs of smoking-related illness in a group of smokers over the course of their lifetimes compared to non-smokers.[20] The lifetime cost approach of smoking are estimated by using longitudinal data on healthcare costs for smokers and non-smokers over their lifetimes and, as a result, is rarely used due to the difficulty in acquiring the data necessary to track costs over a substantial period of time.[21]

While people of all ages are affected by smoking, different groups are affected in different ways. For example, adult smokers suffer the health and productivity-related impact of exposure to the ingredients of active tobacco smoke, while unborn children are exposed in utero to their mother's smoking behavior while pregnant.[22] Though not directly exposed to the ingredients of active tobacco smoke, nonsmoking spouses and children of smokers may be exposed to secondhand smoke (SHS) at home, and employed people may be exposed to co-workers' smoke in the workplace.[23] Men and women usually are studied separately, because the health impacts have been found to differ by gender.[24] While SHS exposure has been shown to cause a number of illnesses, very few studies have estimated the costs associated with this exposure, given the challenges in measuring population exposure rates.[25]

Finally, regarding health consequences of interest, the Surgeon General's 2014 report, "The Health Consequences of Smoking—50 Years of Progress," serves as the most

comprehensive review of literature assessing the relationship between smoking and health conditions to date.[26] Using a four-level hierarchy to classify the strength of causal inferences from available evidence (i.e., evidence is sufficient to infer a causal relationship, evidence is suggestive but not sufficient, evidence is inadequate, and evidence is suggestive of no causal relationship), the report identifies a series of health consequences as causally linked to smoking, all of which are identified in Appendix A.[27]

V. Data Request

The Indiana Family and Social Services Administration (FSSA) maintains a robust data warehouse to inform key program design and policy decisions. This data includes but is not limited to, member-level information such as billing information, clinical diagnoses, and demographic characteristics. In addition, some members self-report various individual behaviors (e.g., smoking status) on an initial "Health Needs Assessment" (HNA), conducted by Indiana Medicaid Managed Care Entities (MCEs). Given the scope of available data and the research methods noted in Section IV, a data request was developed and submitted to FSSA on January 30, 2017.

To ensure member privacy and the security of protected health information (PHI), the data request sought aggregated (i.e., "rolled-up") fee-for-service and managed care data (rather than member-level data) for the Medicaid population enrolled in State Fiscal Year (SFY) 2016 (July 2015 – June 2016). Specific "rolled-up" categories included: (1) data stratified by member gender; (2) data stratified by age (i.e., 18-34, 35-44, 45-55, 55-64, and 65+); (3) data stratified by Medicaid program (i.e., HIP, HCC, and "other"); (4) self-reported tobacco use; and (5) health consequence (i.e., member had at least one claim during SFY16 with the diagnosis codes for each health consequence in Table 1).

Table 1: Smoking-Attributable Health Consequences and Diagnosis Codes

HEALTH CONSEQUENCE	ICD-9 (2011)	ICD-10 (2017)
Cancers		
Malignant neoplasm of oropharynx	14600 - 14690	C10000 - C10900
Malignant neoplasm of larynx	16100 - 16190	C32000 - C32900
Malignant neoplasm of esophagus	15000 - 15090	C15000 - C15900
Malignant neoplasm of trachea, bronchus, and lung	16200 - 16290	C33000 - C34920
Acute myeloid leukemia	20500 - 20502	C92000 - C92020
Malignant neoplasm of stomach	15100 - 15190	C16000 - C16900
Malignant neoplasm of liver	15500 - 15520 (Exclude 15510)	C92000 - C92920
Malignant neoplasm of pancreas	15700 - 15790	C25000 - C25900
Malignant neoplasm of kidney and ureter	18900 - 18920	C64000 - C66900
Malignant neoplasm of cervix uteri	18000 - 18090	C53000 - C53900
Malignant neoplasm of bladder	18800 - 18890	C67000 - C67900
Malignant neoplasm of colon and rectum	15300 - 15390, 15410	C18000 - C18900, C20000

HEALTH CONSEQUENCE	ICD-9 (2011)	ICD-10 (2017)
Chronic Diseases		
Stroke	43300 - 43600	I61000 - I61900, I63000 - I64000
Eye diseases (i.e., cataracts and age-related macular degeneration)	36600 - 36619, 36690, 36250 - 36257	H25000 - H25900, H35200 - H35389
Periodontitis	52330 - 52350	K05200 - K05329
Aortic aneurysm, early abdominal aortic atherosclerosis in young adults	44000 - 44190	I71000 - I71900, I70000
Coronary heart disease	41000 - 41490	I20000 - I25900
Pneumonia	480000 - 486000	J12000 - J18900
Atherosclerotic peripheral vascular disease	44020 - 44029	I70200 - I70299
Chronic obstructive pulmonary disease, tuberculosis, asthma, chronic bronchitis, emphysema, and chronic airways obstruction	49000 - 49280, 49400 - 49410, 49600, 01000 - 01896, 49300 - 49392, 49100 - 49190	J40000 - J47900, A15000 - A19900
Diabetes	25000 - 25093	E10000 - E13900
Hip fractures	82000 - 82139	S72000 - S72900
Ectopic pregnancy	63300 - 63391	O00000 - O00910
Male sexual function—erectile dysfunction	30272, 60784	N52000 - N52030, N52800 - N52900
Rheumatoid arthritis	71400 - 71490	M05000 - M06900
Direct Tobacco-Related Expenditures		
Nicotine dependence/tobacco disorder, tobacco use disorder complicating pregnancy, childbirth, or the puerperium	305100, 649000 - 649040	F17000 - F17299, O99330 - O99335
Toxic effect of tobacco and nicotine	989840	T65200 - T65294S
Tobacco abuse counseling	N/A[i]	Z71600
Pharmacotherapy for Substance Abuse Treatment, Nicotine Replacement		HZ90ZZZ

Of note, the health consequences in Table 1 differ slightly from those listed in the Surgeon General's 2014 report for several reasons. First, while it has been demonstrated that smoking suppresses the immune system and increases the chances of certain chronic or malignant diseases, there is no associated diagnosis code that allows for identification as an individual health consequence. Second, smoking-attributable expenditures for reproductive effects cannot be identified without member-level data linking the mother and child's records, and member-level data was not requested in order to preserve PHI. Finally, diagnosis codes for several direct tobacco-related expenditures were included.

For each combination of gender, age, program, and tobacco use, the data request also sought a series of summarized results to differentiate between members with none, one, or

[i] The ICD-9 classification system broadly categorizes these expenditures as substance abuse; therefore, inclusion would overstate the impact of tobacco.

multiple health consequences across several broad categories. Finally, the data request sought a total number of member months (i.e., number of Medicaid-enrolled members each month) during SFY16 for the applicable aggregate groupings, as well as the total annual expenditures (medical and pharmacy) incurred during SFY16 (July, 2015 – June, 2016).

VI. Analysis

Population

The population included all Indiana Medicaid members, age 18-64, who were enrolled between July, 2015, and June, 2016 (7,311,616 member months).

Smoking Prevalence

Data were analyzed to determine the prevalence of smoking among Indiana Medicaid members using the following criteria: (a) self-reported tobacco use, and (b) direct tobacco-related expenditures.

Self-reported Tobacco Use

Indiana Medicaid members are served by three MCEs—Anthem, MDwise, and Managed Health Services (MHS), which are responsible for overseeing member health care needs and utilization. Members enrolled in the Healthy Indiana Plan (HIP 2.0), Hoosier Health Wise (HHW), and the Hoosier Care Connect (HCC) programs, totaling nearly 78% (1,094,189) of all Indiana Medicaid members, are served by the MCEs.[28] Indiana Medicaid members receive health needs assessments (HNAs) from MCEs upon enrolling. These HNAs are intended to gather health information, such as a member's smoking status, to assist the MCE in managing member health needs. Members who affirmed smoking (i.e., answered "yes") on the HNA were coded as "smokers."

Direct Tobacco-related Expenditures

Direct tobacco-related expenditures (e.g., smoking cessation medications, tobacco abuse counseling, etc.) are indicative of smoking. Members with direct tobacco-related expenditures were coded as "smokers."

An analysis of the self-reported tobacco use and direct tobacco-related expenditures found that the prevalence of smoking among Indiana Medicaid members is approximately 23.0%.

VII. Results

Medicaid Expenditures among Smokers and Non-Smokers

Given the research methods noted in Section IV, a medical cost approach was used to identify the difference in Medicaid expenditures between smokers and non-smokers. Medical

costs were generated using standard per-member per-month (PMPM) calculations and are presented in Table 2.

Table 2. Per Member Per Month (PMPM) and Annual Estimates of Medicaid Expenditures among Indiana Medicaid Members, FY 2016.

Gender	Age	PMPM		Annual Estimate	
		Smoker	Non-Smoker	Smoker	Non-Smoker
Male	18-34	$732.08	$534.13	$8,784.96	$6,409.56
Male	35-44	$971.87	$639.86	$11,662.44	$7,678.32
Male	45-54	$1,174.56	$822.89	$14,094.72	$9,874.68
Male	55-64	$1,246.37	$971.78	$14,956.44	$11,661.36
Subtotal		*$1,025.60*[*]	*$693.50*[·]	*$12,307.20*[*]	*$8,322.00*[*]
Female	18-34	$603.69	$368.14	$7,244.28	$4,417.68
Female	35-44	$859.31	$524.49	$10,311.72	$6,293.88
Female	45-54	$1,077.50	$782.35	$12,930.00	$9,388.20
Female	55-64	$1,100.38	$902.28	$13,204.56	$10,827.36
Subtotal		*$836.30*[*]	*$541.84*[*]	*$10,035.60*[*]	*$6,502.08*[*]
Total		**$904.61**	**$597.58**	**$10,855.29**	**$7,171.02**

Overall Expenditures

The overall PMPM Medicaid expenditures for smokers ($904.61) were 51.4% ($307.03) higher compared to non-smokers ($597.58). This equates to an annual difference of $3,684.27 between smokers ($10,855.29) and non-smokers ($7,171.02). There were 637,031 adults (ages 18-64) enrolled in Medicaid during the final month for timeframe for this analysis (June, 2016). As stated previously, this analysis finds that the smoking rate among Indiana Medicaid members is 23.0%, which yields a total of 146,517 individual smokers. Thus, the annual difference ($3,684.27) between these smokers and non-smoking Indiana Medicaid members calculates to $539,808,666.55 in Medicaid costs.

Expenditures by Age

The PMPM Medicaid expenditures for male smokers ages 55-64 ($1,246.37) were 6.1% ($71.82) higher compared to males ages 45-54 ($1,174.56), were 28.2% ($274.50) higher compared to males age 35-44 ($971.87), and were 70.3% higher ($514.29) compared to males age 18-34 ($732.08).

There was variation in the difference in the PMPM expenditures for male smokers versus non-smokers across age groups. Among males age 55-64, the PMPM expenditures for smokers was $274.60 (28.3%) higher compared to non-smokers; among males age 45-54, the PMPM

[·] Subtotals and totals are averages based on the number of member months within each age category (which vary), and cannot be derived based solely on the data provided within the table.

expenditures for smokers was $351.66 (42.7%) higher compared to non-smokers; among males age 35-44, the PMPM expenditures for smokers was $332.01 (51.9%) higher compared to non-smokers, and among males age 18-34, the PMPM expenditures for smokers was 37.1% ($197.95) higher compared to non-smokers.

The PMPM Medicaid expenditures for female smokers age 55-64 ($1,100.38) were 2.1% ($22.88) higher compared females age 45-54 ($1,077.50), were 28.1% ($241.07) higher compared to females age 35-44 ($859.31), and were 82.3% ($496.69) higher compared to females age 18-34 ($603.69).

There was considerable variation in the difference in the PMPM expenditures for female smokers versus non-smokers across age groups. Among females age 55-64, the PMPM expenditures for smokers was $198.10 (22%) higher compared to non-smokers; among females age 45-54, the PMPM expenditures for smokers was $295.15 (37.7%) higher compared to non-smokers; among females age 35-44, the PMPM expenditures for smokers was $334.82 (63.8%) higher compared to non-smokers, and among females age 18-34, the PMPM expenditures for smokers was 64.0% ($235.55) higher compared to non-smokers.

Expenditures by Sex

The overall PMPM Medicaid expenditures for male smokers ($1,025.60) is 22.7% ($189.30) higher compared to females ($836.30).

Expenditures by Smoking-Attributable Health Consequence

The PMPM Medicaid expenditures among members with at least one smoking-attributable health consequences are presented in Table 3. There is minimal variation in PMPM expenditures for smokers versus non-smokers among individuals with one or more smoking-attributable health consequences.

Table 3. Per Member Per Month (PMPM) and Annual Medicaid Expenditures Among Indiana Medicaid Members with Smoking-Attributable Health Consequences, FY 2016.

Gender	Age	PMPM		Annual Estimate	
		Smoker	Non-Smoker	Smoker	Non-Smoker
Male	18-34	$1,544.53	$1,733.59	$18,534.30	$20,803.06
Male	35-44	$1,526.53	$1,548.22	$18,318.36	$18,578.64
Male	45-54	$1,656.48	$1,480.55	$19,877.76	$17,766.60
Male	55-64	$1,612.08	$1,570.92	$19,344.96	$18,851.04
Subtotal		*$1,604.24* [·]	*$1,563.98* [*]	*$19,250.88* [*]	*$18,767.79* [*]
Female	18-34	$1,092.32	$1,047.32	$13,107.90	$12,567.79

[·] Subtotals and totals are averages based on the number of member months within each age category (which vary), and cannot be derived based solely on the data provided within the table.

Female	35-44	$1,346.76	$1,241.87	$16,161.12	$14,902.44
Female	45-54	$1,432.71	$1,332.35	$17,192.52	$15,988.20
Female	55-64	$1,378.94	$1,337.83	$16,547.28	$16,053.96
Subtotal		$1,334.72*	$1,264.98*	$16,016.60*	$15,179.80*
Total		**$1,439.38**	**$1,379.46**	**$17,272.52**	**$16,553.53**

The overall PMPM expenditures for individuals with one or more smoking-attributable health consequences is 4.3% ($59.92) higher among smokers ($1,439.38) compared to non-smokers ($1,379.46). This equates to an annual difference of $718.99 between smokers ($17,272.52) and non-smokers ($16,553.53). Among males, the PMPM expenditures for individuals with one or more smoking-attributable health consequences is 2.6% ($40.26) higher for smokers compared to non-smokers. Among females, the PMPM expenditures for individuals with one or more smoking-attributable health consequences is 5.5% ($69.74) higher for smokers compared to non-smokers.

Prevalence of Smoking-Attributable Health Consequences

Smoking attributable consequences are listed in Table 1 (page 6). The prevalence of smoking-attributable health consequences (defined as members with one or more of the conditions listed in Table 1) is presented in Table 4.

Table 4. Prevalence of Smoking-Attributable Health Consequences

Gender	Age	Smoker	Non-Smoker
Male	18-34	15.1%	6.7%
Male	35-44	28.0%	15.8%
Male	45-54	48.7%	31.1%
Male	55-64	62.7%	42.5%
Subtotal		*38.6%*	*20.0%*
Female	18-34	14.7%	7.1%
Female	35-44	31.2%	16.4%
Female	45-54	52.1%	32.4%
Female	55-64	65.0%	46.5%
Subtotal		*34.3%*	*18.7%*
Total		**35.8%**	**19.2%**

The overall prevalence of smoking-attributable health consequences is 16.6 percentage points higher among smokers (35.8%) compared to non-smokers (19.2%). Among males, the prevalence of smoking-attributable health consequences is 18.6 percentage points higher for smokers (38.6%) compared to non-smokers (20.0%). Among females, the prevalence of smoking-attributable health consequences is 14.6 percentage points higher for smokers (34.3%) compared to non-smokers (18.7%).

VIII. Conclusions

The self-reported tobacco use and direct tobacco-related expenditures indicates that the prevalence of smoking among Indiana Medicaid members is 23.0%, which is comparable to the national estimate for Medicaid members (27.8%). The self-report of smoking among Indiana Medicaid members may be underreported, due to the social discomfort of affirming smoking to a health care provider.

Indiana Medicaid members who smoke have higher health care costs compared to members who do not smoke. The overall PMPM expenditures for smokers ($904.61) was 51.4% ($307.03) higher compared to non-smokers ($597.58).

The annual difference in smoking-attributable Medicaid expenditures between smokers ($10,855.29) and non-smokers ($7,171.02) is $3,684.27, which calculates to $539,808,666.55 in smoking-attributable Medicaid costs annually.

Older Indiana Medicaid members who smoke have higher medical costs compared to younger members who smoke. The PMPM Medicaid expenditures for male smokers age 55-64 ($1,246.37) was 70.3% ($514.29) higher compared to males age 18-34 ($732.08). The PMPM Medicaid expenditures for female smokers age 55-64 ($1,100.38) was 82.3% ($496.69) higher compared to females age 18-34 ($603.69).

The difference in health care costs between smokers and non-smokers is higher among younger smokers compared to older smokers. Among males age 35-44, the PMPM expenditures for smokers ($971.87) was $332.01 (51.9%) higher compared to non-smokers ($639.86). Among females age 18-34, the PMPM expenditures for smokers ($603.69) was $233.55 (64.0%) higher compared to non-smokers ($368.14).

Male smokers have higher health care costs compared to female smokers. The overall PMPM Medicaid expenditures for male smokers ($1,025.60) is 22.6% ($189.30)higher compared to females ($836.30).

Smokers are more likely to have one or more smoking-attributable health consequences compared to non-smokers. The overall prevalence of smoking-attributable health consequences is 16.6 percentage points higher among smokers (35.8%) compared to non-smokers (19.2%). Among males, the prevalence of smoking-attributable health consequences is 18.6 percentage points higher for smokers (38.6%) compared to non-smokers (20.0%). Among females, the prevalence of smoking-attributable health consequences is 14.6 percentage points higher for smokers (34.3%) compared to non-smokers (18.7%).

Among individuals with one or more smoking-attributable health consequences, there is minimal variation in PMPM expenditures ($59.92; 4.3%) among smokers ($1,439.38) versus non-smokers ($1,379.46), which suggests that the higher heath care costs among smokers is driven by the fact that smokers experience a higher number of health consequences compared to non-smokers. Put differently, the cost of smoking-related health problems is approximately the same between smokers and non-smokers, however, since smokers have more smoking-related health problems compared to non-smokers, their overall costs are higher.

IX. Study Limitations

Throughout the course of this project, several limitations were encountered, placing certain restrictions on conclusions provided in this final report. The limitations concerned the availability and consistency of State data and data collection tools as described below.

First, aggregate data does not allow for advanced statistical modeling that might otherwise be performed were member-level data available. As such, this analysis does not control for confounding variables, such as risk factors such as diet or physical activity that also may be associated with the various health consequences under consideration. To the extent that smokers are more likely than non-smokers to have these other risk factors, the costs of smokers vs. non-smokers could be overestimated.

Second, as noted in Section V, smoking-attributable expenditures for reproductive effects cannot be identified without utilizing member-level data linking the mother and child's records. Research indicates these reproductive effects are associated with substantial economic and societal costs, with studies reporting upwards of $366 million annually in the U.S.[29] Therefore, the final estimates of overall smoking-attributable expenditures are likely conservative.

Third, the HNA does not distinguish between smokers, former smokers, and never-smokers, and smoking status is self-reported. As smoking-related illnesses may manifest long after an individual has quit smoking, and smoking prevalence based on self-reporting tends to be underestimated, some measure of expenditures associated with the non-smoker group may in fact be smoking-attributable.[30] These factors further support a more conservative final estimate of overall smoking-attributable expenditures.

Finally, while the adverse health and economic consequences of exposure to secondhand smoke have been well documented, these expenditures are outside of the scope of this report.[31] As such, final estimates of overall smoking-attributable expenditures, particularly as they relate to children, are likely conservative.[32]

X. **Appendix A**: Health Consequences Causally Linked to Smoking[33]

Cancers
Oropharynx, larynx, esophagus
Trachea, bronchus, and lung
Acute myeloid leukemia
Stomach
Liver
Pancreas
Kidney and ureter
Cervix
Bladder
Colorectal
Chronic Diseases
Stroke
Blindness, cataracts, and age-related macular degeneration
Periodontitis
Aortic aneurysm, early abdominal aortic atherosclerosis in young adults
Coronary heart disease
Pneumonia
Atherosclerotic peripheral vascular disease
Chronic obstructive pulmonary disease, tuberculosis, asthma, chronic bronchitis, emphysema, and chronic airways obstruction
Diabetes
Hip fractures
Ectopic pregnancy
Male sexual function—erectile dysfunction
Rheumatoid arthritis
Immune function
Reproductive Effects
Congenital defects—maternal smoking: orofacial clefts
Low birth weight
Respiratory distress syndrome—newborn
Other respiratory conditions—newborn
Sudden infant death syndrome

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