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R STREET POLICY STUDY NO. 124
(Addendum)

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EXPECTED SAVINGS TO MEDICAID FROM SUBSTITUTING ELECTRONIC FOR TOBACCO CIGARETTES (First Ten Years After Switching)

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INTRODUCTION

Present value cost-savings to Medicaid over 25 years from switching to electronic cigarettes has been estimated at \$2.8 billion per 1% of enrollees who switch.¹ These cost-savings are dominated by reductions in future Medicaid expenditures for the treatment of serious, chronic smoking-related diseases, such as cancer, coronary heart disease, chronic obstructive pulmonary disease and emphysema. They are estimated in present value terms because reductions in risk for chronic conditions are not immediately realized, but instead are delayed for years depending on the cessation lag for the relevant disease.

Causal relationships between health effects and smoking are necessary but not sufficient for cost-savings to result from quitting or switching to e-cigarettes. Rather, quitting must reduce future health effects and the medical expenditures otherwise required to treat them. This is because published evidence concerning the time horizon in which

cost-savings from switching would be realized² relies on assumptions about the fraction of aggregate medical expenditures avoided and the rate at which they are realized over a 25-year period. In particular, it is assumed that switching from tobacco to e-cigarettes results in the same reductions in morbidity as quitting smoking; that medical care expenditures by Medicaid decline 5% per year for the first 15 years after switching and remain constant thereafter; and terminate after 25 years when enrollees are assumed to transition to Medicare.³ For convenience in the face of uncertainty, the discount rate applied to future cost-savings is the same as the rate of increase in real per-capita medical care costs for the same conditions, thus allowing nominal cost-savings to be summed over 25 years.⁴

In the December 2017 main report, its appendix and this addendum, near-term cost-savings are not separately estimated because present-value cost-savings are dominated by reductions in serious chronic conditions that are expensive to treat and tend to be realized after many years of smoking. This addendum provides estimated cost-savings for the first ten years after switching occurs.

PRESENT VALUE COST-SAVINGS FOR THE FIRST TEN YEARS AFTER SWITCHING

Table 1 (below) shows estimated cumulative present-value cost-savings to Medicaid from the standardized cohort switching from tobacco to e-cigarettes, disaggregated by state. Results are reported with two significant figures because of known uncertainties in the estimation procedure.⁵ No standard errors are available because uncertainties are not themselves estimated, and thus they cannot be propagated through the model.

For each column labeled “Year 1” to “Year 10,” the estimated value is the sum of cost-savings that accrue for the target year and all preceding years subsequent to switching. Thus, the present value of estimated cost-savings one year after the cohort switches is obtained from the column labeled “Year 1.” Estimated values for other years, such as Year 5 and Year 10, are obtained in the columns labeled “Year 5” and “Year 10,” respectively. Estimated cost-savings are about 15 times greater after Year 5 than Year 1, about four times greater in Year 10 than in Year 5, and about 55 times greater in Year 10 than in Year 1. This reflects the fact that reduced medical expenditures are lagging indicators of the value of health improvements that result from tobacco cessation.

The state-level estimates in Table 1 allow readers and interested parties to focus on state-level effects. In the model, states differ with respect to smoking prevalence, demographic composition and the interaction of these variables; non-aged, non-disabled adult Medicaid enrollment and officially estimated Medicaid expenditures. The analysis does

not attempt to distinguish between the federal and state shares of Medicaid expenditures, which also vary by state and across Medicaid subprograms within each.

Nationwide cost-savings are estimated at \$110 million after Year 5 and \$410 million after Year 10, with the median state saving \$1.3 million and \$5 million, respectively. Cost-savings are highly skewed toward a few states: California, New York and Ohio combined are projected to capture about 36% of the total.

COST-SAVINGS FROM AVOIDED MEDICAL EXPENDITURES

The Surgeon General has stated that, “Quitting smoking has immediate as well as long-term benefits, reducing risks for diseases caused by smoking and improving health in general.”⁶ Thus, it is reasonable to expect that cost-savings would be realized in the early years after switching even if the vast majority of cost-savings consisted of avoided medical care expenditures on serious chronic and often fatal diseases. For example, the Surgeon General deems the exacerbation of asthma in adults to be caused by active smoking,⁷ and expenditures to treat asthma are not delayed as they are for other respiratory ailments, cancer and cardiovascular disease.

The most authoritative list of health effects potentially caused by cigarette smoking was compiled in 2014 by the Surgeon General, one of a long series of such reports.⁸ Causal inferences have been made throughout the series and were clarified in the Surgeon General’s 2004 report.⁹ Professional judgment was applied to assign each health effect into one of three categories based on the strength of evidence: (1) inadequate evidence to infer the presence or absence of a causal relationship; (2) suggestive but not sufficient evidence to infer a causal relationship; and (3) sufficient evidence to infer a causal relationship. In this analysis, it is assumed that estimates of medical care expenditures to treat smoking-attributable illness include all health effects the Surgeon General has deemed to be caused by smoking, regardless of the strength of the evidence.¹⁰

Therefore, additional cost-savings are not added to the estimates provided in Table 1 for acute illness or illnesses for which cost-savings are likely to be front-loaded. Estimated expenditures for medical care include all diseases, not just cancer, cardiovascular disease and respiratory ailments other than asthma. Therefore, the model used to estimate cost-savings already accounts for asthma exacerbation, as well as all other conditions deemed by the Surgeon General to be attributable to smoking. Second, the model does not postpone the realization of all cost-savings until some far-away future year. Rather, it assumes that cost-savings begin to accrue in the first year after switching. These early cost-

savings are likely to be dominated by avoided acute illnesses and avoided non-acute illnesses for which costs otherwise would accrue early.

Therefore, no additional cost-savings are reported for the first ten years after the standardized cohort switches to e-cigarettes. Adding cost-savings specific to the avoided treatment of specific conditions, such as asthma exacerbation, is likely to result in double-counting. This point is reinforced by noting which diseases are responsible for the most smoking-attributable mortality (SAM) and lost productivity (Table 2 below) and the highest incidence of smoking-attributable conditions (Table 3 below). These diseases are the major illnesses one expects to dominate the Medicaid expenditure profile. Cost-savings from avoided acute and non-acute but early manifesting conditions are likely to be small.

CONCLUSION

The estimated 25-year present value of cost-savings that would result from the standardized cohort switching from tobacco to e-cigarettes has been previously estimated at about \$2.8 billion. State governments and others may also be interested in what savings they could reasonably expect to capture over shorter time horizons. To inform that consideration, additional estimates of present value savings have been calculated for periods ranging from one to ten years. One year after the standardized cohort switches, cost-savings nationwide are estimated at \$7.4 million, with the median state saving \$91,000. Cumulative cost-savings over five years are about 15 times greater — \$110 million nationwide and \$1.4 million for the median state. After ten years, cost-savings grow to \$410 million and \$5 million for the median state.

These figures apply to the standardized cohort, a group consisting of a demographically representative 1% of non-aged, non-disabled adult smoker Medicaid enrollees. Well-designed public policies could achieve larger switch rates and thus produce proportionally greater cost-savings.

TABLE I: ESTIMATED CUMULATIVE COST-SAVINGS TO MEDICAID FOR THE FIRST TEN YEARS AFTER SWITCHING

State	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
AK	\$32,000	\$95,000	\$190,000	\$320,000	\$470,000	\$660,000	\$880,000	\$1,100,000	\$1,400,000	\$1,700,000
AL	56,000	170,000	340,000	560,000	840,000	1,200,000	1,600,000	2,000,000	2,500,000	3,100,000
AR	41,000	120,000	240,000	410,000	610,000	860,000	1,100,000	1,500,000	1,800,000	2,200,000
AZ	190,000	580,000	1,200,000	1,900,000	2,900,000	4,100,000	5,400,000	7,000,000	8,700,000	11,000,000
CA	940,000	2,800,000	5,600,000	9,400,000	14,000,000	20,000,000	26,000,000	34,000,000	42,000,000	52,000,000
CO	110,000	330,000	660,000	1,100,000	1,600,000	2,300,000	3,100,000	4,000,000	4,900,000	6,000,000
CT	120,000	350,000	700,000	1,200,000	1,800,000	2,500,000	3,300,000	4,200,000	5,300,000	6,500,000
DC	35,000	100,000	210,000	350,000	520,000	730,000	980,000	1,300,000	1,600,000	1,900,000
DE	45,000	140,000	270,000	450,000	680,000	950,000	1,300,000	1,600,000	2,000,000	2,500,000
FL	250,000	750,000	1,500,000	2,500,000	3,800,000	5,300,000	7,000,000	9,000,000	11,000,000	14,000,000
GA	140,000	420,000	830,000	1,400,000	2,100,000	2,900,000	3,900,000	5,000,000	6,200,000	7,600,000
HI	43,000	130,000	260,000	430,000	640,000	900,000	1,200,000	1,500,000	1,900,000	2,300,000
IA	51,000	150,000	310,000	510,000	760,000	1,100,000	1,400,000	1,800,000	2,300,000	2,800,000
ID	16,000	49,000	98,000	160,000	240,000	340,000	460,000	590,000	730,000	900,000
IL	280,000	830,000	1,700,000	2,800,000	4,200,000	5,800,000	7,800,000	10,000,000	12,000,000	15,000,000
IN	180,000	530,000	1,100,000	1,800,000	2,700,000	3,700,000	4,900,000	6,400,000	8,000,000	9,700,000
KS	33,000	100,000	200,000	330,000	500,000	700,000	930,000	1,200,000	1,500,000	1,800,000
KY	160,000	490,000	970,000	1,600,000	2,400,000	3,400,000	4,500,000	5,800,000	7,300,000	8,900,000
LA	120,000	370,000	740,000	1,200,000	1,900,000	2,600,000	3,500,000	4,500,000	5,600,000	6,800,000
MA	50,000	440,000	880,000	1,500,000	2,200,000	3,100,000	4,100,000	5,300,000	6,600,000	8,100,000
MD	170,000	510,000	1,000,000	1,700,000	2,500,000	3,600,000	4,700,000	6,100,000	7,600,000	9,300,000
ME	31,000	92,000	180,000	310,000	460,000	640,000	860,000	1,100,000	1,400,000	1,700,000
MI	320,000	970,000	1,900,000	3,200,000	4,900,000	6,800,000	9,100,000	12,000,000	15,000,000	18,000,000
MN	140,000	410,000	810,000	1,400,000	2,000,000	2,800,000	3,800,000	4,900,000	6,100,000	7,400,000
MO	77,000	230,000	460,000	770,000	1,100,000	1,600,000	2,100,000	2,800,000	3,400,000	4,200,000
MS	50,000	150,000	300,000	500,000	750,000	1,000,000	1,400,000	1,800,000	2,200,000	2,700,000
MT	54,000	160,000	330,000	540,000	810,000	1,100,000	1,500,000	2,000,000	2,400,000	3,000,000
NC	140,000	430,000	870,000	1,400,000	2,200,000	3,000,000	4,000,000	5,200,000	6,500,000	8,000,000
ND	14,000	43,000	86,000	140,000	220,000	300,000	400,000	520,000	650,000	790,000
NE	21,000	62,000	120,000	210,000	310,000	430,000	570,000	740,000	920,000	1,100,000
NH	21,000	63,000	130,000	210,000	310,000	440,000	580,000	750,000	940,000	1,100,000
NJ	180,000	530,000	1,100,000	1,800,000	2,700,000	3,700,000	5,000,000	6,400,000	8,000,000	9,700,000
NM	74,000	220,000	440,000	740,000	1,100,000	1,500,000	2,100,000	2,600,000	3,300,000	4,000,000
NV	37,000	110,000	220,000	370,000	560,000	790,000	1,000,000	1,300,000	1,700,000	2,100,000
NY	930,000	2,800,000	5,600,000	9,300,000	14,000,000	19,000,000	26,000,000	33,000,000	42,000,000	51,000,000
OH	390,000	1,200,000	2,400,000	3,900,000	5,900,000	8,300,000	11,000,000	14,000,000	18,000,000	22,000,000
OK	55,000	160,000	330,000	550,000	820,000	1,100,000	1,500,000	2,000,000	2,500,000	3,000,000
OR	170,000	500,000	990,000	1,700,000	2,500,000	3,500,000	4,600,000	6,000,000	7,500,000	9,100,000
PA	320,000	950,000	1,900,000	3,200,000	4,700,000	6,600,000	8,800,000	11,000,000	14,000,000	17,000,000
RI	48,000	150,000	290,000	480,000	730,000	1,000,000	1,400,000	1,700,000	2,200,000	2,700,000
SC	79,000	240,000	470,000	790,000	1,200,000	1,700,000	2,200,000	2,800,000	3,500,000	4,300,000
SD	7,900	24,000	47,000	79,000	120,000	170,000	220,000	280,000	350,000	430,000

State	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
TN	250,000	740,000	1,500,000	2,500,000	3,700,000	5,100,000	6,900,000	8,800,000	11,000,000	13,000,000
TX	240,000	730,000	1,500,000	2,400,000	3,700,000	5,100,000	6,800,000	8,800,000	11,000,000	13,000,000
UT	19,000	58,000	120,000	190,000	290,000	400,000	540,000	690,000	870,000	1,100,000
VA	100,000	300,000	610,000	1,000,000	1,500,000	2,100,000	2,800,000	3,700,000	4,600,000	5,600,000
VT	28,000	83,000	170,000	280,000	410,000	580,000	770,000	990,000	1,200,000	1,500,000
WA	300,000	900,000	1,800,000	3,000,000	4,500,000	6,300,000	8,400,000	11,000,000	14,000,000	17,000,000
WI	99,000	300,000	590,000	990,000	1,500,000	2,100,000	2,800,000	3,600,000	4,400,000	5,400,000
WV	55,000	170,000	330,000	550,000	830,000	1,200,000	1,500,000	2,000,000	2,500,000	3,000,000
WY	5,000	15,000	30,000	50,000	76,000	110,000	140,000	180,000	230,000	280,000
Medi-an State	91,000	270,000	550,000	910,000	1,400,000	1,900,000	2,600,000	3,300,000	4,100,000	5,000,000
Total	7,400,000	22,000,000	44,000,000	74,000,000	110,000,000	160,000,000	210,000,000	270,000,000	330,000,000	410,000,000

TABLE 2: ANNUAL DEATHS AND ESTIMATES OF SMOKING-ATTRIBUTABLE MORTALITY (SAM) AND LOST PRODUCTIVITY (2005-09):

Category	Health Effect	Estimated SAM, adults 35+ (2005-09) a	Smoking Attributable % a
Cancer	All	163,700	49%
	Lung	130,659	82%
	Others	36,000	20%
Cardiovascular and metabolic diseases	All	160,600	20%
	Coronary heart disease	99,300	24%
	Cerebrovascular disease	15,300	11%
	Other vascular disease	11,500	38%
	Diabetes mellitus	9,000	13%
Pulmonary diseases	All	113,100	62%
	Pneumonia, influenza, tuberculosis	12,500	22%
	COPD	109,600	79%
Perinatal conditions	All	1,013	8%
	Prenatal conditions	613	6%
	SIDS	400	17%
Residential fires		620	—
Secondhand smoke	All	4,128	7%
	Lung cancer	7,330	5%
	Coronary heart disease	33,950	8%
ALL CAUSES		480,320	—

NOTE: Among adults 35+

SOURCE: U.S. Dept. of Health and Human Services (2014); a Table 12.4; b Table 12.11. <https://www.surgeongeneral.gov/library/reports/50-years-of-progress/index.html>.

TABLE 3: NUMBER AND PERCENTAGE OF CIGARETTE SMOKING-ATTRIBUTABLE CONDITIONS (2000)

Disease	Current Smokers		Former Smokers		Overall Total	
	Number	%	Number	%	Number	%
Chronic bronchitis	2,633,000	49%	1,872,000	26%	4,505,000	35%
Emphysema	1,273,000	24%	1,742,000	24%	3,016,000	24%
Heart attack	719,000	13%	1,755,000	24%	2,474,000	19%
All cancer except lung	358,000	7%	1,154,000	16%	1,512,000	12%
Stroke	384,000	7%	637,000	9%	1,021,000	8%
Lung cancer	46,000	1%	138,000	2%	184,000	1%
Total	5,412,000	100%	7,299,000	100%	12,711,000	100%

NOTE: Among current and former smokers, by condition (U.S.)

SOURCE: U.S. Dept. of Health and Human Services (2014), Table 12.10. <https://www.surgeongeneral.gov/library/reports/50-years-of-progress/index.html>.

ENDNOTES

1. Richard B. Belzer, "Expected Savings to Medicaid from Substituting Electronic for Tobacco Cigarettes," R Street Policy Study No. 124, December 2017. <http://www.rstreet.org/policy-study/expected-savings-to-medicare-from-substituting-electronic-for-tobacco-cigarettes>; See also its Appendix. <http://2o9ub0417chl2lg6m43em6psi2i.wpengine.netdna-cdn.com/wp-content/uploads/2018/01/R-Street-124-Technical-Appendix.pdf>.

2. Ibid.

3. Ibid.

4. Ibid.

5. Ibid.

6. Office of the Surgeon General, "The Health Consequences of Smoking: A Report of the Surgeon General," U.S. Dept. of Health and Human Services, 2004, p. 25. <https://www.ncbi.nlm.nih.gov/pubmed/20669512>.

7. Office of the Surgeon General, "The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General, U.S. Dept. of Health and Human Services, 2014, pp. 374-75. <https://www.surgeongeneral.gov/library/reports/50-years-of-progress/index.html>.

8. Ibid.

9. "The Health Consequences of Smoking," 2004. <https://www.ncbi.nlm.nih.gov/pubmed/20669512>.

10. Causal inferences made prior to 2004 were assumed to remain valid for the 2004 and later Surgeon General Reports, and the method of causal assignment published in 2004 has been retained. The 2004 Report "identifies a substantial number of diseases found to be caused by smoking that were not previously causally associated with smoking" (p. 3) based on revised criteria combined with the notion of a counterfactual state—i.e., "something is a cause of a given outcome if, when the same person is observed with and without a purported cause and without changing any other characteristic, a different outcome would be observed" (p. 19). Like pre-2004 determinations, causal inferences based on these criteria are determined by expert judgment concerning the appropriate balance of Type I and Type II error. Unfortunately, the balance of Type I and Type II errors chosen by the Surgeon General is not disclosed.