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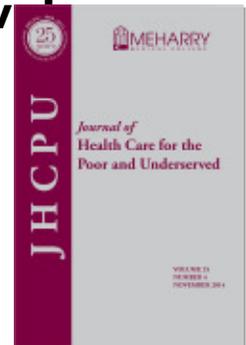
Making the Case for Medicaid Funding of Smoking Cessation Treatment Programs: An Application to State-Level Health Care Savings

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Making the Case for Medicaid Funding of Smoking Cessation Treatment Programs: An Application to State-Level Health Care Savings

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Abstract: Background. In spite of cost-saving tobacco-dependence treatments, many state Medicaid programs offer only limited coverage for these treatments. This report builds a case for state-level financial benefits from funding smoking cessation treatment for Medicaid-eligible populations. **Methods.** Applying published cost estimates to state-specific data, we assessed potential health care savings from tobacco-dependence treatments for pregnant women, mothers exposing young children to secondhand smoke, and other adult Medicaid beneficiaries. **Results.** Across all three populations there was evidence for short-term positive returns on investment. Including counseling and nicotine replacement therapy, estimated net savings were \$157,000 annually for pregnant women and their newborns, \$33,000 annually within four years for children exposed to smoke at home, and \$5 million annually within two years for the general adult Medicaid population in Alabama. **Conclusions.** Findings suggest that making tobacco-dependence treatment freely available to low-income smokers can produce net savings for state governments within a short period of time.

Key words: Smoking cessation, Medicaid, cost-benefit analysis, tobacco, prevention and control.

Fifty years after the 1964 publication of the landmark Surgeon General's report on the detrimental health effects of tobacco, smoking rates among adults have declined by more than half, from 43% in 1965 to 18% in 2012.¹⁻³ The pace of this decline has slowed in recent years, however, and prevalence of smoking is quite variable across demographic subgroups.^{1,2,4-6} Smoking among Medicaid recipients is considerably higher (33.5%)⁶ than smoking among the general adult population, and thus is especially costly to federal and state governments. Between 2006 and 2010, smoking-related illnesses cost Medicaid programs over \$40 billion—approximately 15% of all Medicaid expenditures.⁷ In the face of these costs, a large body of research provides evidence

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that tobacco-dependence treatment is highly cost-effective, and even cost-saving,⁴ and recent studies have shown that medical cost savings from treatment can be seen within 18 months.^{8,9} Nevertheless, a majority of state Medicaid programs continue to offer only limited tobacco-dependence treatment to their enrollees.¹⁰

The current study was undertaken to contribute data-driven information to the discussion in the state of Alabama concerning public funding and policy issues related to tobacco-dependence programs, focusing on the Medicaid-eligible population. We offer it now as an example that could be followed in any state or other geographic entity for using local-level data to build a funding case. Although ample scientific evidence exists to support an economic argument for the cost-effectiveness of smoking cessation treatment, local policymakers are often more interested in local data and summaries that allow them to anticipate costs and benefits accruing directly within their realm of responsibility. For this reason, we focused on the medical cost savings that could be expected within a relatively short-term one-to-six-year period from reductions in smoking rates related to three Medicaid eligible groups: pregnant women who smoke; young children exposed to secondhand smoke at home; and the general population of adult smokers.

Smoking risks. Cigarette smoking drastically increases the risk of disease and is associated with numerous medical conditions that cause death, including cancer, cardiovascular disease, and respiratory disease.¹ In the United States, between 2005 and 2009, smoking accounted for approximately 480,000 deaths each year among adults 35 years of age and older.¹ Smoking cessation can lead not only to long-term reductions in health care costs through prevention of cancers and lung diseases, but to more immediate savings through prevention of heart attacks and strokes. For example, a study in Wisconsin of smokers making primary health care visits found significantly lower costs within 18 months for smokers who quit compared with those who continued smoking.⁸ After two and a half years of offering comprehensive coverage for pharmacotherapy and counseling, in the Massachusetts Medicaid program (MassHealth) smoking rates dropped from 38% to 28%;¹¹ this reduction was accompanied by a 46% reduction in inpatient hospital claims for acute heart attacks, a 49% reduction in coronary heart disease,¹² annual savings of \$571 per program participant, and medical savings to the Medicaid program of \$3.12 for every \$1.00 spent (a return on investment of \$2.12).⁹

Smoking cessation is especially important for pregnant women and children for whom short-term benefits are most critical and likely to accrue. Substantial evidence links maternal smoking to negative maternal and infant health outcomes and increased health care costs.^{1,4} When mothers quit smoking early in their pregnancy, delivery outcomes as well as weight and body measurements of infants improve and become comparable to those of non-smokers.^{13,14} While approximately half of pregnant smokers quit during their pregnancy, continued smoking during pregnancy is highest among women who are younger, who have less education, and who receive Medicaid.¹⁵

Approximately one third of women who stop smoking during pregnancy have returned to smoking within three to four months following birth of their infant.¹⁵ Their infants and other children exposed to secondhand smoke at home are at increased risk for a variety of health problems including sudden infant death syndrome, acute respiratory infections, ear infections, and increased severity of asthma.¹ In two large German

birth cohorts, average annual medical costs (converted to 2014 U.S. dollars) for children ages 9-11 who were exposed to secondhand smoke at home were approximately \$120 (smoking on patio/balcony) to \$200 (smoking indoors) higher than those of children not exposed.¹⁶ Similarly, among U.S. children under five years old, Hill and Liang reported an increased probability and cost (\$147 annually) of emergency department visits and inpatient hospital stays due to respiratory conditions in children exposed to secondhand smoke at home.¹⁷

Smoking cessation treatment. Treatment options for tobacco dependence include medications and counseling from physicians or other professionals. Various forms of nicotine replacement therapy (NRT) have been shown to increase the rate of quitting by 50%–70%.^{4,18}

Brief advice (three to five minutes) from a physician has also been shown to increase long-term abstinence rates from 8% to 10%,⁴ and extended interventions (four or more sessions) with physicians are even more effective. Studies implementing smoking cessation treatments for low-income and limited-education populations have shown that counseling is effective for these groups.^{4,19–21} Physicians, however, may not consistently provide counseling about smoking, particularly to those demographic groups that tend to receive lower levels of treatment overall.^{22–24} Telephone-based cessation services are one of the most universally available interventions for tobacco dependence, with quitlines established worldwide.⁴ Quitline counseling can reach people who tend to be underserved by more traditional programs, and they might be ideal for reaching Medicaid populations.

Extensive research indicates that medication and counseling are each effective when applied independently; however, the combination of medication and counseling is found to be even more effective than either one alone.^{4,25,26} Smith et al. reported six-month quit rates ranging from 17% to 30% for single and combination NRT plus counseling, with the highest rates for the combination therapies.²⁷ When both counseling and medication treatments are covered as benefits, the immediate financial burden on patients is removed, and they have a better chance of successfully quitting.

Medicaid funding of cessation treatment. In spite of the health benefits of smoking cessation and the demonstrated effectiveness of available treatments in both general populations and Medicaid populations, only seven states currently offer full coverage for all recommended counseling and pharmacotherapy for all Medicaid enrollees, and even these seven present some barriers to accessing treatments, such as co-payments, limits, and prior authorization requirements.¹⁰ While all states now offer coverage for at least one form of treatment, they fall far short of the *Healthy People 2020* objective calling for all state Medicaid programs to adopt comprehensive coverage of all evidence-based cessation treatments.^{10,28} Passage of the federal Affordable Care Act (ACA) has improved Medicaid coverage in many states, mandating coverage of tobacco-dependence treatments for pregnant women, requiring coverage of FDA-approved cessation medications, and mandating full coverage for new recipients made eligible under ACA expansion. Furthermore, states can opt to cover comprehensive treatment for all Medicaid recipients and thereby receive a 1% increase in their Federal medical assistance percentage for preventive services.²⁹ Yet, this leaves room for some differences across states and types of Medicaid eligibility, and allows some barriers and limitations

on coverage to remain.³⁰ Thus, expanding availability of treatments and promoting their widespread use continues to be a challenge in many states, including Alabama. In light of the body of research linking comprehensive coverage to reduced smoking rates and healthcare expenditures, public health advocates can make a strong case to policymakers and Medicaid agencies summarizing the expected costs and benefits of cessation programs in their own states to inform their decision making. This was the purpose of the current study.

Methods

We considered three populations of Medicaid beneficiaries: pregnant women, mothers of young children, and the general adult Medicaid population. For each group, we estimated the costs of delivering smoking cessation programs and the potential savings in medical care costs associated with smokers quitting. The *cost of the smoking cessation program* was calculated as follows:

$$\text{Smoking cessation program cost per participant} \times \text{number of smokers} \times \text{proportion treated}$$

The *potential savings* were calculated as:

$$\text{Number of treated smokers who quit} \times \text{cost of care attributable to smoking per affected person}$$

The *net savings* were then calculated as:

$$\text{Potential savings} - \text{program costs}$$

Data for these analyses were gathered from a variety of sources which are listed in Table 1. All costs and potential savings have been adjusted to reflect 2014 dollar amounts using the Consumer Price Index (all items, all urban consumers), thus simplifying comparisons across studies and years. Costs and savings estimates reflect direct medical care only and do not include the value of lives lost or saved, cost of suffering, or indirect costs from lost work and lost productivity.

Based on published research and the experience of the Alabama Quitline, the primary analyses used an estimate of 18% of smokers receiving treatment. A meta-analysis estimated 18.2% utilization when individuals received cessation treatment as a covered benefit;⁴ and other studies have reported utilization rates from 10%-40%, with quit rates of approximately 10%-30%.^{11,27,30-35} For 2013, the Alabama Quitline reported a 30-day point prevalence quit rate on a seven-month follow-up survey of 35% for telephone and 21% for on-line participants, with a combined average of 28%.³⁶ After comparison with the other studies, we selected an estimate of 28% for the success of the smoking cessation treatment, i.e., the proportion of those treated who successfully quit smoking.

Treatment costs can vary widely, depending on the comprehensiveness and format of the program being offered. We used program costs for the Alabama Quitline, the primary vehicle by which Medicaid will fund cessation treatment. In 2013, the Quitline was offering telephone and online counseling sessions and two weeks of NRT. A

Table 1.**DATA SOURCES**

| Population | Input | Source |
|---|---------------|--------------------------------------|
| Pregnant women in Alabama Medicaid | | |
| Number of births | 31,498 | ADPH, 2011 ³⁹ |
| Smoking prevalence during pregnancy (%) | 17.8 | ADPH, 2011 ⁴⁰ |
| Number of maternal smokers | 5,607 | Calculation ^a |
| Number of mothers who quit due to treatment Assuming 18% treated, 28% of treated quit ^c | 283 | Calculation |
| Smoking-attributable expenditures (SAE) per birth to a mother who smokes (\$) | 519 | SAMMEC 2004 ⁴¹ |
| Birth and first year SAE per birth to a mother who smokes (\$) | 351 | Adams et al, 2011 ⁴² |
| Birth and first year SAE per birth to a mother who smokes (\$) | 1273 | Miller et al., 2001 ⁴³ |
| Children in Alabama Medicaid | | |
| Number of births | 31,498 | ADPH 2011 ³⁹ |
| Smoking prevalence after birth (%) | 27.2 | ADPH 2011 ⁴⁰ |
| Number of maternal smokers ^b | 8,567 | Calculation |
| Number of mothers who quit due to treatment Assuming 18% treated, 28% of treated quit ^c | 432 | Calculation |
| Annual smoking-attributable respiratory expenditures per child under 5 years old from smoking household (\$) | 147 | Hill & Liang 2008 ¹⁷ |
| General Alabama Medicaid population | | |
| Number of eligible adult participants | 452,644 | Alabama Medicaid, 2011 ⁴⁴ |
| Smoking prevalence (%) | 33.5 | NHIS, 2011 ⁸ |
| Number of smokers ^d | 151,636 | Calculation |
| Number who quit due to treatment Assuming 18% treated, 28% of treated quit ^e | 7,642 | Calculation |
| Alabama Medicaid payments for adults 21 years+ | 3,324,897,662 | Alabama Medicaid, 2011 ⁴⁴ |
| Smoking-attributable fraction of Medicaid costs | 15.2 | Xu et al., in press ⁷ |
| Annual smoking-related medical costs (\$) ^f | 505,384,445 | Calculation |
| Annual smoking-related medical costs per smoker (\$) ^g - full amount achieved incrementally with \$500 annual increments | 3,333 | Calculation |
| Annual medical cost savings for averted cardiovascular conditions per smoker receiving treatment | 623 | Richard et al., 2012 ⁹ |
| Treatment costs | | |
| Total estimated counseling + NRT program cost (\$) | 809,377 | Alabama Quitline, 2014 ³⁷ |
| Number of individuals starting treatment | 4033 | Alabama Quitline, 2014 ³⁶ |
| Estimated counseling + NRT cost per person ^h | 201 | Calculation |

^aCalculation—indicates a calculation has been made from information in preceding rows.

^bBirths X prevalence

^cMaternal smokers X .18 X .28

^dEligible adults X prevalence

^eSmokers X .18 X .28

^fAlabama Medicaid payments for adults 21 years+ X smoking-attributable fraction of Medicaid costs

^gCosts / number of smokers

^hTotal cessation program costs / number of individuals starting treatment

NRT= Nicotine Replacement Therapy

ADPH=Alabama Department of Public Health

SAMMEC=Smoking-Attributable Mortality, Morbidity, and Economic Costs

NHIS=National Health Interview Survey

complete course of treatment was considered to be four counseling sessions plus NRT. The total program costs for 2013 (adjusted to 2014 dollars) were \$809,377, and 4,033 individuals entered into treatment.³⁷ Thus, the cost per person in treatment was \$201, similar to the per participant costs reported for the MassHealth program.⁹ Lower costs would be estimated if only the direct time for counseling and providing NRT for a single participant were considered.^{35,38} We chose to include all of the annual program costs, similar to the MassHealth evaluation,⁹ to give a more accurate or conservative view of the total costs.

Pregnant women. As listed in Table 1, the number of Medicaid-supported births, reported annually by the ADPH, was 31,498 for 2011.³⁹ Data on smoking prevalence for pregnant women came from Alabama's Pregnancy Risk Assessment Monitoring System (PRAMS), which is based on mail surveys, with telephone follow-up if necessary, conducted several months following the birth of the infant.⁴⁰ In that survey, mothers are asked if they smoked during the last three months of their pregnancy. This smoking rate was 17.8% for 2011, thus there were 5,607 Medicaid maternal smokers.

Estimates of smoking-attributable medical expenditures (SAE) for pregnant smokers vary based on time frame and scope of costs considered (Table 1). We chose three estimates from among those available: (1) \$519 per pregnant smoker in the Alabama Medicaid population for neonatal costs associated with smoking as estimated by the CDC Maternal and Child Health Smoking-Attributable Mortality, Morbidity, and Economic Costs (MCH SAMMEC) system;⁴¹ (2) \$315 per pregnant smoker based on neonatal intensive care unit (NICU) admissions and length of hospital stay;⁴² and (3) \$1,273 per pregnant smoker, which combines smoking-attributable delivery costs for mother and infant costs from birth through the first year of life.⁴³

Children. To estimate the number of children exposed to secondhand smoke because they were born to mothers who smoke (see Table 1), we used the PRAMS surveillance reports for Alabama.⁴⁰ Mothers who were smoking at the time of their participation in the survey (two to four months following the birth of their child) were counted as exposing at least one child to secondhand smoke. When this rate (27.2%) is applied to the number of Medicaid eligible births in a year, we find 8,567 mothers smoking shortly after the birth of their baby. This includes women who smoked throughout their pregnancy, as well as those who abstained during pregnancy, but either returned to smoking or took up smoking following the delivery of their infant.

Because the most direct, short-term link between children's health and exposure to smoke in the home is in the area of respiratory conditions,¹ this was our primary focus of analysis. Hill and Liang estimated additional annual respiratory expenditures per child under five years old living in a household with smokers to be \$147 per year.¹⁷

General adult population. The number of adults in the Medicaid population in Alabama (452,644) was obtained from the Alabama Medicaid Agency annual report,⁴⁴ and smoking prevalence for the Medicaid population (33.5%) was a nationwide estimate (Table 1).⁸ Overall medical costs for the Alabama adult Medicaid population were obtained from the Alabama Medicaid Agency annual report for 2011,⁴⁴ and the smoking attributable fraction (SAF) of medical costs for Medicaid from the 2014 Surgeon General's report on tobacco.⁷ The smoking-attributable expenditures (\$505 million) were divided by the number of estimated Medicaid smokers to determine

average annual smoking-caused medical costs per smoker of \$3,333. As this level of medical savings is not likely to occur immediately in the year following a successful quit, a gradual accumulation of benefits from not smoking was assumed. We followed the method described by O'Donnell and Roizen⁴⁵ which assumed it would take five years for a former smoker without chronic conditions (e.g., back pain) to achieve the full annual savings (with increasing increments of \$666 per year for five years), and 10 years for a former smoker with chronic conditions to achieve the same level of annual savings (with increasing increments of \$333 per year for 10 years). A similar incremental approach has been used in other studies.⁴⁶ We further assumed that approximately half the participants would have a chronic condition. Averaging across participants with and without chronic conditions, we assumed savings of \$500 per successful quit in the first year following the quit, a savings of \$1,000 per successful quit in the second year, a savings of \$1,500 per successful quit in the third year, and so on through the 5th year when, on average, the full annual savings would be realized for those without chronic conditions, and through the 10th year for those with a chronic condition. A second estimate of cost savings for this group was computed based on findings from the MassHealth program, which analyzed the rate of reductions for Medicaid enrollees in hospital admissions due to cardiovascular conditions, and the number who participated in cessation treatment.⁹ They did not have information on smoking status of individuals; thus the quit rate is not a factor in these calculations. The results estimated an overall savings within one year of \$623 per participant in the treatment program.

Sensitivity analysis. To allow for variations in the assumptions, we considered different estimates for percent of the population treated (9%-36%), percent of the population treated who quit smoking (18%-38%), and smoking-associated health care costs for neonates and adults.

Results

Pregnant women. Based on \$201 per participant treatment costs experienced by the Alabama Quitline, the total estimated cost of providing the treatment to Alabama Medicaid pregnant smokers, *via* quitline counseling (assuming 18% are treated), would be approximately \$202,800 (Table 2). Using the three estimates of medical savings from prior studies, the total estimated annual medical savings from this reduction in pregnant smokers ranges from \$99,333 to \$360,259, depending on the source and whether only neonatal costs are included or costs to both mother and infant from delivery through the first year of life are considered. When only neonatal costs are considered, the treatment cost exceeds the medical savings, leading to estimated net losses of \$55,932 and \$103,476. However, when costs through the first year of life are included, net annual savings are projected to be \$157,450. Because the use of NRT may not be recommended during pregnancy, we also conducted analyses without the \$27 cost of two weeks of NRT in the program cost per person. In this scenario, the total cost for treating the pregnant Medicaid women would be \$175,566, there are net losses of \$28,689 and \$76,233 when considering neonatal costs alone, and net savings are \$184,693 when the full first year of life is considered.

Children. According to Alabama PRAMS Surveillance Reports, approximately 27%

Table 2.
COSTS AND POTENTIAL SAVINGS FOR IMPLEMENTING
COUNSELING AND NRT TREATMENT FOR PREGNANT
SMOKERS^{a,b}

| | Estimates based on cost data from: | | |
|--|--|---|--|
| | SAMMEC– 2004 ^{41,c} Neonatal only | Adams et al. (2011) ⁴² Neonatal only | Miller et al., 2001 ⁴³ Mother + Neonatal through first year |
| Number of maternal smokers | 5,607 | 5,607 | 5,607 |
| Number of maternal smokers who receive treatment ^d | 1,009 | 1,009 | 1,009 |
| Number of maternal smokers who quit ^e | 283 | 283 | 283 |
| Total estimated counseling + NRT program cost ^f | \$202,809 | \$202,809 | \$202,809 |
| Program cost with NRT subtracted ^g | \$175,566 | \$175,566 | \$175,566 |
| SAE per maternal smoker | \$519 | \$351 | \$1,273 |
| Total annual medical cost savings ^h | \$146,877 | \$99,333 | \$360,259 |
| Net annual savings (including NRT costs) ⁱ | \$(55,932) | \$(103,476) | \$157,450 |
| Net annual savings (excluding NRT costs) ⁱ | \$(28,689) | \$(76,233) | \$184,693 |

^aParentheses indicate a net loss

^b2014 dollars

^cSource: MCH SAMMEC cost estimates based on smoking prevalence and medical costs from 2003–2004

^dMaternal smokers × .18

^eMaternal smokers who receive treatment × .28

^f\$201 X maternal smokers who receive treatment

^gTotal program cost – (\$27 × number who receive treatment)

^hSAE per maternal smoker × number who quit

ⁱTotal medical cost savings – program costs

NRT=Nicotine Replacement Therapy

SAMMEC=Smoking-Attributable Mortality, Morbidity, and Economic Costs

SAE=smoking-attributable medical expenditures

of all new Medicaid mothers in Alabama were smoking at the time they completed the survey, two to four months following the birth of their child.⁴⁰ In Table 3, these Alabama figures for new Medicaid mothers are combined with the dollar figure from the Hill and Liang¹⁷ study (\$147 per child under five years of age) to calculate the savings that could accrue if these mothers were not smoking. The table shows that applying this amount to just one child per household in a one-year period, Medicaid-eligible infants

Table 3.**COSTS AND POTENTIAL SAVINGS IN RESPIRATORY-RELATED EXPENDITURES FOR REDUCING CHILDREN'S EXPOSURE TO SECONDHAND SMOKE AT HOME^{a,b}**

| Variable | Average number of children in the home | | |
|--|--|----------------------------|--------------------------|
| | 1 child per household | 1.5 children per household | 2 children per household |
| Number of mothers who smoke ^{c,d} | 8,567 | 8,567 | 8,567 |
| Mothers receiving treatment ^e | 1,542 | 1,542 | 1,542 |
| Mothers who quit ^f | 432 | 432 | 432 |
| Annual smoking-attributable respiratory expenditures per child of mother who smokes ^g | \$147 | \$221 | \$294 |
| Total annual additional respiratory expenditures ^h | \$1,259,349 | \$1,893,397 | \$2,518,698 |
| Total estimated counseling + NRT program cost ⁱ | \$309,942 | \$309,942 | \$309,942 |
| Total annual respiratory expenditure savings ^j | \$63,504 | \$95,256 | \$127,008 |
| Net respiratory savings in Year 1 ^k | \$(246,438) | \$(214,686) | \$(182,934) |
| Net respiratory savings in Year 2 | \$(189,253) | \$(128,501) | \$(68,568) |
| Net respiratory savings in Year 3 ^l | \$(134,424) | \$(46,068) | \$41,094 |
| Net respiratory savings in Year 4 | \$(81,798) | \$33,050 | \$146,346 |
| Net respiratory savings in Year 5 | \$(31,230) | \$109,074 | \$247,482 |
| Net respiratory savings in Year 6 | \$17,280 | \$182,004 | \$344,502 |
| Net respiratory savings in Year 7 ^m | \$63,879 | \$252,061 | \$437,700 |

^aParentheses indicate a net loss

^b2014 dollars

^cSource: Alabama Department of Public Health 2011³⁹

^dSource: Alabama Department of Public Health 2011⁴⁰

^eMothers who smoke X .18

^fMothers who receive treatment X .28

^gHill and Liang 2008¹⁷

^hMothers who smoke X expenditures

ⁱ\$201 X mothers receiving treatment

^jAnnual additional expenditures per child X mothers who quit

^kAnnual savings – program costs

^lNet savings in year 1 + annual savings in year 2+3

^mNet savings in year 1 + annual savings in years 2+3+4+5+6+7

NRT= Nicotine Replacement Therapy

and children from homes with a smoker account for approximately \$1.26 million in additional respiratory expenditures in Alabama alone.

Applying the treatment cost estimates and the 18% treatment utilization and 28% treatment success targets, and assuming there is only one child in the household, within six years a single cohort of children would accumulate net savings based on respiratory expenditures alone. In the first year after providing treatment, estimated Medicaid respiratory care expenditures of approximately \$63,500 would be averted, but considering the cost of the smoking cessation program, there would be an estimated net loss of \$246,438. Assuming the same annual health care savings per child and no additional treatment costs for the mother in following years, and allowing for a 10% relapse rate from the first to the second year,⁴⁷ and relapse rates of 4% for additional years,⁴⁸ net savings would begin to appear by the sixth year after the successful treatment, totaling \$17,280 for the program overall in that year. Because the assumption of only one child per household is very conservative, we also estimated net savings for two additional scenarios: an average of 1.5 children per household and an average of 2 children per household. With 1.5 children per mother who smokes, net savings become positive in the fourth year, totaling \$33,050 for the program; and with 2.0 children per household, net savings are positive by the third year, at \$41,090 for the program as a whole.

General adult population. Estimated annual smoking-related medical costs for the Alabama Medicaid population in 2011 were \$505 million (calculated in Table 1). With a national Medicaid smoking rate of approximately 33.5% and an Alabama adult Medicaid population of approximately 453,000, annual costs per smoker were calculated to be approximately \$3,333 (Table 1). Using the estimate based on Alabama Quitline expenditures for the cost of delivering counseling and NRT treatment (\$201 per participant),⁴⁵ and assuming 18% of smokers are treated, the program costs for one year are estimated to be approximately \$5.5 million. We assumed the medical savings would accrue incrementally at the average rate of \$500 per year, resulting in a net loss for the first year of \$1,665,000 (Table 4). Tracking this cohort through another year, allowing for 10% relapse, and increasing the medical savings by \$500 (for a total of \$1,000 per successful quit), the net savings become positive at \$5,212,900. Using findings from Richard *et al.*⁹ who estimated a one-year medical savings of \$623 per program participant, due to averted hospitalizations for cardiovascular conditions, *versus* a program cost of \$200 per participant, net savings within one year would be \$11.5 million.

Sensitivity analysis. We considered the impact of treating half as many smokers (9%) or twice as many (36%), and we considered the impact of achieving four other levels of successful quits ranging from 10 percentage points lower (18%) to 10 percentage points higher (38%) than the initial target success rate. These ranges are wide enough to encompass most of the findings from the research in these three populations. For ease of presentation, we selected a single estimate of smoking-attributable medical cost savings for each of the populations (see Table 5, footnotes 2–4).

The results for pregnant women when including neonatal and costs for the first year of the infant's life, show there is a net savings at all levels within the ranges of treatment utilization and treatment success considered. For children exposed to secondhand smoke at home, assuming an average of 1.5 children in the home, the net savings becomes positive in the fourth year at the 28% quit rate, and in the third year with a higher 33%

Table 4.

**COSTS AND POTENTIAL MEDICAL SAVINGS FOR
IMPLEMENTING COUNSELING AND NRT FOR ALABAMA'S
ADULT (21 YEARS +) MEDICAID POPULATION^a**

| | All Medicaid health costs | Cardiovascular conditions, Richard et al., 2012 |
|---|--|--|
| Number of smokers ^b | 151,636 | 151,636 |
| Number of smokers receiving treatment ^c | 27,294 | 27,294 |
| Number of smokers who quit ^d | 7,642 | 7,642 |
| Total smoking-related medical costs ^e | \$505,384,445 | |
| Total estimated counseling + NRT program cost ^f | \$5,486,094 | \$5,486,094 |
| Annual smoking-related medical costs per smoker (\$) | Total: \$3,333 ^g | \$623 (annual) |
| Full amount of savings achieved by former smokers incrementally; beginning with \$500, increasing in \$500 increments | Yr 1: \$500 Yr 2: \$1000 ... | |
| Medical expenditure savings | Yr 1: \$3,821,000 ^h Yr 2: \$6,878,000 | \$17,004,162 ⁱ |
| Net medical cost savings ^j | Yr 1 (\$1,665,094) Yr 2: \$5,212,906 ^k | \$11,518,068 |

^a2014 dollars.

^bSource: Table 1

^cNumber of smokers X .18

^dNumber receiving treatment X .28

^eSource: Table 1

^f\$201 X number receiving treatment

^gTotal smoking-related costs / number of smokers

^hNumber who quit X annual smoking-related medical costs per smoker

ⁱNumber receiving treatment X smoking-related medical costs per smoker

^jMedical savings – program cost

^kMedical savings in year 1 + annual savings in year 2

NRT= Nicotine Replacement Therapy

success rate. By the sixth year, there are positive net savings for all levels of treatment utilization and success rate. Results for the general adult population show net losses at all levels for the first year, but positive savings at all levels for the second year.

Discussion

Across all three Alabama Medicaid populations reviewed—pregnant women, children exposed to secondhand smoke at home, and the general population—there is strong evidence that it is possible for Medicaid to achieve savings within one to six years by

Table 5.
POTENTIAL NET SAVINGS UNDER VARYING TREATMENT RATES, AND SUCCESS RATES^{a,b}

| Counseling + NRT costs: \$201 | Treatment Success | Treatment Reach Percent of Smokers Who Receive Treatment | | | |
|--|---------------------|---|-------------|-------------|-------------|
| | | Percent of Treated Smokers Who Quit (%) | 9%, \$ | 18%, \$ | 36%, \$ |
| Pregnant women ^c | 18 | | 14,338 | 28,877 | 56,280 |
| | 23 | | 46,163 | 92,527 | 184,853 |
| | 28 | | 77,988 | 157,450 | 313,246 |
| | 33 | | 111,086 | 221,100 | 441,999 |
| | 38 | | 142,911 | 284,750 | 570,572 |
| Children ^d 1.5 children per household | Year 1 | 18 | (124,252) | (248,504) | (497,229) |
| | | 23 | (115,854) | (231,487) | (463,195) |
| | | 28 | (107,235) | (214,470) | (428,940) |
| | | 33 | (988,370) | (197,453) | (394,906) |
| | | 38 | (90,218) | (180,436) | (360,872) |
| | Year 3 ^e | 18 | (70,107) | (140,214) | (280,649) |
| | | 23 | (46,902) | (92,920) | (186,945) |
| | | 28 | (23,255) | (46,068) | (91,915) |
| | | 33 | 392 | 1,005 | 1,789 |
| | | 38 | 24,039 | 47,857 | 96,156 |
| | Year 4 | 18 | (44,692) | (89,384) | (178,768) |
| | | 23 | (14,415) | (27,725) | (56,997) |
| | | 28 | 16,304 | 33,050 | 66,542 |
| | | 33 | 47,023 | 94,267 | 188,313 |
| | | 38 | 77,742 | 155,263 | 310,968 |
| General adult Medicaid ^f | Year 1 | 18 | (1,515,047) | (3,029,594) | (6,059,389) |
| | | 23 | (1,173,547) | (2,347,094) | (4,694,889) |
| | | 28 | (832,547) | (1,665,094) | (3,329,889) |
| | | 33 | (491,047) | (982,594) | (1,965,389) |
| | | 38 | (150,047) | (300,094) | (600,389) |
| | Year 2 ^e | 18 | 694,953 | 1,392,406 | 2,783,611 |
| | | 23 | 1,651,453 | 3,302,906 | 6,605,111 |
| | | 28 | 2,606,453 | 5,212,906 | 10,427,111 |
| | | 33 | 3,562,953 | 7,123,406 | 14,247,611 |
| | | 38 | 4,516,953 | 9,034,906 | 18,069,611 |

^aParentheses indicate a net loss

^b2014 dollars

^c\$1,273 smoking-attributable medical expenditures for delivery and first year of infant's life per maternal smoker who quits

^d\$147 annual smoking-attributable medical expenditures for respiratory illness, 1.5 children per maternal smoker

^eAdjusted for 10% relapse from year 1 to year 2; 4% relapse in subsequent years

^f\$500 first year smoking-attributable medical expenditures per smoker who quit; \$1000 second year smoking-attributable medical expenditures per smoker who quit

NRT= Nicotine Replacement Therapy

investing in comprehensive smoking cessation programs. For pregnant women, the net savings through the first year of the newborn's life could be about \$160,000 annually assuming moderate rates of treatment and quitting reported in the literature and experienced in the population. These savings are realized quickly, within the first year of an infant's life. For young children exposed to secondhand smoke at home, net savings could total about \$30,000 by the fourth year of program coverage if we assume an average of 1.5 children per household, or \$17,000 in the sixth year if only one child per household is assumed. This conservative estimate for children represents reduced respiratory illness expenses only. There would very likely be additional savings related to other conditions and additional children. Finally, for the general adult Medicaid population, the estimates of annual net savings from smoking cessation treatment ranged from \$11.5 million in the first year to \$5.2 million in the second year, depending on the choice of smoking attributable medical costs used.

Level of education and income are related to the likelihood of smoking² and the likelihood of quitting, with smokers from lower socioeconomic status (SES) or more deprived areas being less likely to quit smoking.⁴⁹⁻⁵¹ Thus, lower rates of treatment utilization and success might be observed from the Medicaid population that is the focus here. Studies have shown success, however, in treating tobacco dependence in these populations,^{4,35,52} and the sensitivity analysis further shows that even at lower rates of treatment and success, net savings are predicted within these relatively short time frames, especially for the general adult population and pregnant women when both neonatal and full first-year costs are included. From these analyses it appears that an investment in support of smoking-cessation treatment is wise both medically and fiscally.

While the reported findings are based on data specific to the Alabama Medicaid population, they strongly suggest that making tobacco-dependence treatment available to low-income smokers has the potential to reduce smoking prevalence rates and produce net savings for other states as well. The data came from general sources that would be available to other states for conducting similar analyses based on the smoking and demographic details of their state and Medicaid population. These calculations show that savings can be achieved in the short term, even with moderate quit rates, as seen in the sensitivity analysis. Higher treatment utilization and success rates would yield even larger savings.

In the case of Alabama, these projections provided supportive arguments to publicly fund the treatment of tobacco dependence. The report from this project was provided by ADPH to the Alabama Medicaid Agency and was used by the Medicaid staff in conjunction with other materials for making the case to fund smoking cessation treatments. Shortly thereafter, the Alabama Medicaid Agency made the decision to begin funding smoking cessation counseling through physician referral to the Alabama Quitline as part of routine care for pregnant women, prior to the 2010 ACA federal mandate for such coverage.³⁵ With the referral process, which is available to any healthcare professional, the physician conducts all or part of the Five A's³¹ (or an abbreviated Ask, Advise, Refer, Prescribe protocol) and then refers a patient through a faxed referral form to the Quitline, where the patient receives multiple proactive counseling sessions and NRT. In April 2012, the Alabama Medicaid Agency became the first state to extend this coverage for smoking cessation services to women who are not pregnant but are receiving

family planning services through a Medicaid-waiver program.⁴⁴ Helping a woman stop smoking before she becomes pregnant is an important step forward in protecting the health of the woman and any future children she may have.

In January 2014, the Alabama Medicaid Agency entered a two-and-a-half year agreement with the Alabama Department of Public Health to reimburse some of the cost for quitline services, thus tapping in to a 50% federal match for supporting telephone quitline services for Medicaid enrollees.⁵³ With other changes mandated by the Affordable Care Act, Alabama Medicaid is now covering smoking-cessation medications for all enrollees. Efforts are now needed to promote widely knowledge of the availability of effective pharmacotherapies and counseling services as covered benefits.⁵ The Massachusetts Medicaid program achieved a very high utilization rate, but this has not been matched in some other state programs, including Arkansas, New York, and Wisconsin. In Arkansas it was demonstrated that knowledge of Medicaid coverage of cessation treatment was positively associated with usage of treatment.⁵⁴ Thus some of the between-state variations might be largely due to differences in the aggressiveness of promotional campaigns and subsequent awareness of availability and coverage for effective treatments.⁵⁴

Partnerships will be necessary to meet the needs of all smokers.^{1,4,55} For example, an effective telephone and online quitline has been established by the ADPH, but it is serving only a small fraction of smokers. If insurers, including Medicaid and Medicare, provide reimbursement for counseling and medications—as recommended by the CDC⁵⁶—the quitline could serve many more callers, and physicians and other health care providers would be more likely to provide the initial intervention and brief counseling.

Additionally, health providers should implement a tobacco use identification system in every clinic to help facilitate the recognition of tobacco users by clinicians. Adopting pay-for-performance initiatives for clinics and physicians to be more consistent in screening and administering tobacco treatments is also recommended.^{4,56}

Limitations. This project focuses on the potential for direct, short-term medical savings, and, therefore, does not address the many potential long-term and indirect medical benefits of promoting tobacco cessation treatments (such as the accumulated effects of heart disease prevention, or indirect benefits through greater physical exercise made possible by improved respiratory function).¹ There might also be indirect and non-medical effects leading to future savings, through improvement in food security, childhood cognitive development, educational attainment, and prevention of children becoming smokers later in life.⁵⁷⁻⁶² Additional savings not considered in the paradigm include the savings to the smoker and his or her family when tobacco purchases are eliminated, savings from reductions in lost productivity due to illness, and savings associated with transportation to obtain medical care and over-the-counter medications. Thus the cost savings estimated in the current study are quite understated compared with the actual cost savings to the public when a longer timeframe is considered.

Although we have not included in our estimates the effect of people who are treated but who would have quit even without treatment, the adjustments made in the sensitivity analysis allow one to consider that effect. A review of 15 studies involving self-quitters (i.e., untreated smokers who try to quit) found that from 3%–5% of self-quitters are successful in achieving prolonged abstinence,⁶³ and these authors suggest

that interventions producing abstinence rates of greater than 5% among those treated might be considered effective. As seen in Table 5, if the assumed success rate for pregnant women is 28%, but the quit rate of 23% is used to adjust for the 5% who might have quit on their own, there is still a positive annual savings. This is a conservative estimate of savings, of course, as it assumes that all 5% who would quit on their own do, in fact, receive treatment. Actually, only a subset of them would be likely to visit a physician and be offered some assistance, and then use any Medicaid-covered cessation treatment services.

The treatment costs used in our calculations were based on actual costs for the Alabama Quitline in 2013, including costs for two weeks of NRT. This is the primary mechanism by which Alabama Medicaid is most likely to offer coverage for cessation treatment into the future. Treatment costs may be higher if the program offers a more expansive level of intervention such as the 90 days of NRT twice a year and up to 16 counseling sessions covered by the MassHealth program; however, MassHealth reported similar annual costs of \$195 per user, plus \$5 for promotion and outreach.⁹ If the program grows substantially, as expected, economy of scale may keep the per user cost down to a comparable level. These factors are not considered in our estimates.

Many factors other than treatment programs can affect smoking and cessation rates, including increased excise taxes leading to increased tobacco prices, introduction of tobacco-free air ordinances, or coincidental media campaigns on the dangers of smoking and exposure to secondhand smoke. Added demand from these environmental factors would likely increase the costs for treating additional individuals, while also increasing the medical savings if success rates remained the same. These, of course, are not included in our calculations.

Conclusion. The bottom line in treatment, according to the *Public Health Service Clinical Practice Guideline*, is that *all* smokers should be identified, *all* smokers should be encouraged to quit, and *all* smokers should be offered appropriate evidence-based treatments of counseling and medications.⁴ Research has shown that the more resources states commit for sustained, comprehensive tobacco control programs, the more reduction there is in smoking prevalence; and the longer states are able to continue this investment in programs, the greater their impact. To make this happen, creative partnerships among providers, public and private insurers, and other facets of the health care community will be necessary. As this study has shown for the state of Alabama, increasing the availability of evidence-based cessation treatment is not only valuable in improving the health of individuals and communities and providing long-term savings, but can also be financially beneficial to states in providing short-term savings.

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