

The Effect of Medicaid Expansion on Smoking Behavior

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Abstract

In 2014, multiple states within the U.S. have decided to expand Medicaid coverage to low income individuals. As a positive shock of healthcare access, I hypothesize that Medicaid expansion may have influenced its beneficiaries to be more conscious of their health-related behaviors and decrease the amount of tobacco consumption. Using a difference-in-differences methodology, I find that Medicaid expansion had a relatively significant effect in decreasing the proportion of current smokers in the \$15K-\$25K income level by 1.004 percentage points. Additionally, I find that the relative treatment effects of Medicaid expansion significantly decreased the proportion of everyday smokers in the less than \$15K, \$15K-\$25K, and \$25-\$35K income levels.

I. Introduction

In 2012, the Supreme Court declared national Medicaid expansion to be unconstitutional, but allowed individual states to pursue expansion if they desired to do so. The expansion program would be instated in 2014 and offer Medicaid coverage to low income individuals below 133-138% of the federal poverty level (FPL). As cigarette smoking and tobacco use is more prevalent among the low-income class, it may be possible that expanding Medicaid would influence new coverage recipients to be more aware of their health and decrease their consumption of such products.

In this paper, I compare cigarette and tobacco usage in states that have expanded Medicaid to usage in states that did not expand Medicaid in order to estimate the effects of Medicaid expansion on health-related behaviors of various income levels. Controlling for the average cost of pack of cigarettes as well as state tobacco tax across time, I use the BRFSS (Behavioral Risk Factor Surveillance System) survey data from 2011-2017 to estimate the effect of Medicaid expansion on the prevalence of current smokers. I use a difference-in-differences methodology to find that Medicaid expansion did not have a significant impact on the proportion of current smokers overall, but do report a relative 1.004 percentage point decrease for the \$15K-25K income group. When estimating the changes to the proportion of everyday or “someday” smokers, I find that the proportion of everyday smokers significantly decreased for the less than \$15K, \$15K-\$25K, and \$25K-\$35K income group, and the proportion of “someday” smokers significantly increased for the less than \$15K and \$25K-\$35K income group, which suggests that Medicaid expansion has caused low income individuals to decrease, but not quit tobacco consumption.

The following sections of the paper are organized as described. Section 2 reviews the literature on the effects of Medicaid expansion on general aspects of healthcare as well as health-related behaviors. Sections 3 and 4 identifies data sources and describes the empirical

methodology, respectively. Section 5 details the major findings as well as their implications, and section 6 concludes.

II. Literature Review

General Effects of Medicaid Expansion

Medicaid expansion has been reported to have significantly decreased the uninsured rate and mortality rate and increased self-reports of good health in low-income adults (Sommers et al., 2016; Sommers, Baicker, and Epstein, 2012). The results suggest that Medicaid expansion is causally associated to positive outcomes for low-income individuals. Compared to those in states that did not expand Medicaid, low-income individuals in states that underwent Medicaid expansion reported significantly increased access to primary care (Sommers, Gunja, and Finegold, 2015; Wherry and Miller, 2016), and diagnosis rates of diabetes (Kaufman et al., 2015) and high cholesterol (Wherry and Miller, 2016), indicating that individuals newly covered by Medicaid were taking initiative in improving their health. My research questions whether Medicaid coverage also influences individuals to change their health-related behaviors, specifically that of smoking tobacco.

Effects of Medicaid Expansion on Health-Related Behaviors

Simon, Soni, and Cawley (2017) questioned how expanding Medicaid coverage would affect risky health behaviors. Using the BRFSS data from 2010 to 2015, the study reports that there were no significant effects of expansion on drinking, BMI, obesity, or smoking. However, childless adults reported a significant 1.9% decrease in smoking. Simon, Soni, and Cawley (2017) stated that individuals with income levels between 100-138% of the federal poverty level (FPL) were excluded because they received a different insurance expansion in 2014. Having confirmed that expansion does significantly increase Medicaid coverage of individuals below 138% of the FPL (Sommers et al., 2016; Wherry & Miller, 2016), I will improve upon this study by including individuals below 138% of the FPL in my

analysis. It could also be rationalized that individuals between 100-138% of the FPL are more likely to be consuming cigarettes, as they are more financially flexible than those below 100% of the FPL. Thus, including them in analysis would capture a more accurate effect of Medicaid expansion on health-related behaviors. Additionally, those below 100% of the FPL who consume cigarettes may be less willing to give up smoking if they have been consuming regardless of their lack of financial resources.

Courtemanche et al. (2017) builds upon Simon, Soni, and Cawley (2017) by including individuals up to 138% below the FPL and narrowing the analysis to 2011-2015, eliminating potentially confounding differences prior to the ACA implementation in 2010. The study reports that Medicaid expansion did not have any statistically significant impacts on smoking and other health-related behaviors. However, instead of identifying the varying effects of expansion on different income levels, the methodology controls for income levels and only analyzes the effect on individuals above/below median income level. My research will improve upon this study by analyzing the specific effects of Medicaid expansion on individuals of different income levels, instead of generalizing the effect to a wider category.

Relative to the studies mentioned above, I aim to capture a more accurate and specific analysis of the effects of Medicaid expansion on the health-related behaviors of individuals in varying income levels.

III. Data

The identification of states with expanded Medicaid coverage is available on HealthInsurance.org. States that have undergone Medicaid expansion have done so in 2014 with the exception of three states (Alaska, Louisiana, Pennsylvania) which expanded Medicaid in 2015. Nine states (California, Connecticut, Delaware, District of Columbia, Massachusetts, Minnesota, New York, Vermont, Wisconsin) have been dropped from

analysis for only partially expanding Medicaid or having already existing insurance coverage similar to the one offered by Medicaid expansion.

The BRFSS (Behavioral Risk Factor Surveillance System) survey conducted by the CDC (Centers for Disease Control and Prevention) provides the prevalence (proportion) of current smokers by household income by State. The data spans from 2011-2017. Household income has five categories: <\$15K, \$15K-\$25K, \$25K-\$35K, \$35K-50K, >\$50K. The BRFSS also provides the prevalence of smokers organized by age, race, income, sex, and education levels. However, microdata of individual responses is not available and thus the sampling methodology of the available data prevents us from controlling for those variables.

The average cost of a pack of cigarettes by state and the state tobacco tax per pack of cigarettes by state are obtained from the CDC. The data spans from 1970-2017, but only data from 2011-2017 was used.

IV. Empirical Methodology

The ACA (Affordable Care Act) was signed into law in March, 2010, and provided the initial unexpanded coverage of Medicaid. Therefore, beginning the data set from 2011 would isolate the effect of Medicaid expansion, and not Medicaid itself. I will use a difference-in-differences estimation strategy using a linear regression specification:

$$Smoker_{l,s,t} = \beta_0 + \beta_1[Expansion_s X Adoption_t] + \beta_2[Controls_{s,t}] + \mu_{l,s} + \sigma_t + \epsilon_{l,s,t}$$

The outcome variable, *Smoker*, is the percentage of current smokers by household income by state that varies over time. *Expansion* is an indicator for whether the state expanded Medicaid. *Adoption* is an indicator for whether Medicaid expansion is in practice. *Controls* are state-level time-varying control variables. μ is income-level-by-state fixed effects. σ is time fixed effects.

β_1 is the estimated effect of Medicaid expansion on the prevalence of smokers in states that adopted the policy relative to states that did not adopt the policy when expansion is in practice. The key identifying assumption of the methodology is that in the absence of Medicaid expansion, the prevalence of smokers in states that expanded Medicaid would follow the same path as the prevalence of smokers in states that did not expand Medicaid. This assumption can be tested by comparing pre-trends of prevalence of smokers prior to Medicaid expansion.

AvgPack and *StateTobTax* are control variables that vary by state-year. *AvgPack* is the average price of a pack of cigarette in a given state-year. The price of cigarettes not only influences consumer purchasing behavior, but also controls for the variety of cigarettes available for purchase in the state. However, the prices of cigarettes are determined by both their producers as well as the tax applied on the products. *StateTobTax* is the state tax applied on each pack of cigarettes in a given state-year and controls for such differences.

To estimate the different effects of Medicaid Expansion on varying household income groups, a second specification interacts the *DD* variable (*Expansion*Adoption*) with *Income*, which represents the five household income categories in the BRFSS.

$$Smoker_{l,s,t} = \beta_0 + \beta_1 DD_{s,t} + \sum_{l=1}^4 \beta_{l+1} [DD_{s,t} X Income_l] + \beta_3 [Controls_{s,t}] + \mu_{l,s} + \sigma_t + \epsilon_{l,s,t}$$

In this specification, β_{l+1} estimates the treatment effects on specified household income levels relative to the \$50K+ income level. The \$50K+ income level serves as a good comparison group as they should not be affected by Medicaid expansion due lack of qualification. Coefficient β_1 estimates the treatment effect on the \$50K+ income level.

V. Results

V.I Effects of Medicaid Expansion on Proportion of Current Smokers

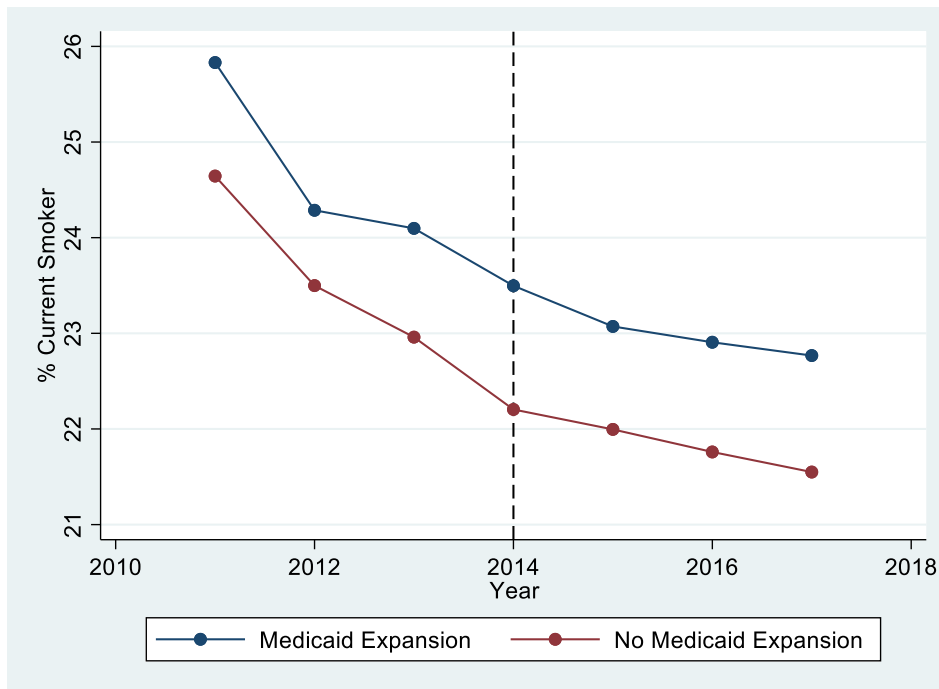


Figure 1. Trends in % Current Smokers between Medicaid Expanded and Non-Expanded States.

Figure 1 displays the trends in the proportion of current smokers in Medicaid expanded and non-expanded states. Prior to Medicaid expansion occurring at 2014, the proportions of current smokers follow similar trends of changes. Therefore, our identifying assumption holds. However, the proportions of current smokers seem to remain similar after Medicaid expansion as well, and further analysis is needed to determine whether the trends diverge after 2014.

Table 1. Differences between Expanded vs. Non-expanded States from 2011-2013.

| | Mean Non-Expanded | Mean Expanded | Diff | SE | Obs |
|----------------------|----------------------|------------------|-----------|----------|-----|
| % of Current Smokers | 23.70 | 24.74 | -1.037 | (0.697) | 615 |
| Avg. \$ per Pack | 5.219 | 6.016 | -0.797*** | (0.0725) | 615 |
| State Tax per Pack | 0.887 | 1.502 | -0.615*** | (0.0566) | 615 |

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 1 shows the difference in the outcome and control variables between states that did and did not expand Medicaid. The statistical significance found in the difference between both control variables, the average cost of a pack of cigarettes and the state tobacco tax per pack, validate their inclusion in our regression. I do not find a significant difference in the proportion of current smokers. Medicaid expansion failing to have a statistically significant impact on smoking behavior has been previously reported by Courtemanche et al. (2017) and Simon, Soni, and Cawley (2017). To further investigate the effect of Medicaid expansion, I estimate the treatment effect on distinct household income levels.

Table 2. Differences in % of Current Smokers by Income Levels from 2011-2013.

| | Full Sample | < \$15K | \$15K-\$25K | \$25K-\$35K | \$35K-\$50K | > \$50K |
|--------------------------|-------------|---------|-------------|-------------|-------------|---------|
| Mean Non-Expanded States | 23.70 | 34.56 | 28.35 | 23.15 | 19.66 | 12.78 |
| Mean Expanded States | 24.74 | 35.93 | 29.40 | 23.81 | 20.97 | 13.58 |
| Difference | -1.037 | -1.367 | -1.044 | -0.655 | -1.313** | -0.806* |
| SE | (0.697) | (1.085) | (0.848) | (0.695) | (0.603) | (0.474) |
| Observations | 615 | 123 | 123 | 123 | 123 | 123 |

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 2 summarizes the average percentage of current smokers and changes in average percentage of current smokers between states that have and have not expanded Medicaid. The data is presented for the overall sample (Column 1) and by income levels (Columns 2-6). In row 3, we show the differences in average percentage of current smokers between treated and untreated states. Results suggest that the difference in proportion of current smokers across income levels from the 2011-2013 period is only significant for the \$35K-\$50K and \$50K+ income groups. Observing the trends of current smokers for specific income groups, we see

that the trends of smokers between Medicaid expanded and non-expanded states are most similar and stable for the less than \$15K and \$50K+ income groups (Fig. S1, Fig. S5). This may be because the less than \$15K income group has already been covered by Medicaid prior to expansion, and the \$50K+ group does not qualify for coverage even post-expansion. Furthermore, the similarity of trends of smokers for the \$50K+ group strengthen my regression specification of electing the \$50K+ to be the reference to which relative treatment effects are estimated to.

I hypothesize that the \$15K-\$25K income level is the targeted group of Medicaid Expansion. This would make sense as the <\$15K income group should have already been covered by previously-existing Medicaid programs. Unfortunately, due to the lack of information on the number of household members reported in the publicly available BRFSS data, I am unable to verify whether the \$15K-\$25K income group can be strictly characterized as 100%-138% of the FPL. If I assume that all reported households in the \$15K-\$25K income level are of either 1 or 2 household sizes, the \$15K-\$25K group would belong within 100%-138% of the FPL.

Table 3. Relative Effect of Medicaid Expansion on the % of Current Smokers in Each Income Level

| | (1) | (2) | (3) | (4) | (5) |
|-----------------------------|----------------------|----------------------|--------------------|--------------------|--------------------|
| Medicaid Expansion | -1.720*** (0.180) | -0.839*** (0.212) | -0.0654 (0.240) | 0.125 (0.278) | 0.357 (0.417) |
| Avg. Cost of Pack | | -2.293*** (0.317) | -0.360 (0.441) | -0.360 (0.441) | -0.360 (0.441) |
| State Tobacco Tax | | 1.297** (0.524) | 0.00544 (0.590) | 0.00544 (0.590) | 0.00544 (0.590) |
| Rel. Effect on ≤\$15K-\$25K | | | | -0.475 (0.347) | |
| Rel. Effect on <\$15K | | | | | -0.412 (0.538) |
| Rel. Effect on \$15-25K | | | | | -1.004* (0.538) |
| Rel. Effect on \$25-35K | | | | | -0.413 (0.538) |
| Rel. Effect on \$35-50K | | | | | -0.284 (0.538) |
| Fixed Effects | | | ✓ | ✓ | ✓ |
| Observations | 1435 | 1435 | 1435 | 1435 | 1435 |

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. Standard deviations are in parentheses. The dependent variable of all regressions is *Smoker*, the percentage of current smokers. Regressions (2)-(5) include control variables *AvgPack* and *StateTobTax*. Regressions (3)-(5) include Income-by-State and Year fixed effects. *Rel. Effect* variables describe the effect of Medicaid Expansion on the specified household income level relative to the all other income levels. Regression (4) estimates the relative effect of Medicaid expansion on income levels ≤\$15K-\$25K compared to ≥\$25K-\$35K. Regression (5) estimates the relative effect of Medicaid expansion on specified income levels compared to the \$50K+ income level.

Table 3 estimates the relative effect of Medicaid expansion on specific income groups. The results of the regressions suggest that Medicaid expansion did not have an overarching effect on the prevalence of current smokers. Although regressions (1) and (2) report a statistically significant decrease due to Medicaid expansion, no statistical significance is reported when income-by-state and year fixed effects are incorporated into the regression (Reg. 3, Table 3). Coefficients in fixed-effect regressions fail to report statistical significance except for regression (5). Regression (5) estimates the treatment effect on specific income groups relative to each other, and shows that Medicaid Expansion decreased the percentage of current smokers in the \$15-25K income group by 1.004 percentage points more than that of the \$50K+ income level. As predicted, the \$50K+ income level is not affected by Medicaid

expansion, as shown by the lack of significance on *Medicaid Expansion* (Reg. 5, Table 3).

As discussed above, the \$15K-\$25K income group may be the primary target of Medicaid Expansion.

V.II Effects of Medicaid Expansion on the Proportion of Smokers with Varying Smoking Frequencies.

Recognizing that my analysis of the effect of Medicaid expansion is restricted to smokers who have completely given up smoking, the treatment effects on the frequency of smoking have been estimated below. The BRFSS provides data on the proportion of smokers who self-report their frequency of smoking as “smoking some days” or “everyday”. I will identify smokers who smoke some days as “someday smokers”. Since completely giving up tobacco consumption is extremely difficult, individuals influenced by Medicaid expansion to change their health-related behaviors may resort to decreasing the amount of smoking rather than going cold turkey. Using the same specification as Table 3, I am able to estimate the relative effects of Medicaid expansion on each income level.

Table 4. Relative Effect of Medicaid Expansion on the % of Everyday Smokers in Each Income Level

| | (1) | (2) | (3) | (4) | (5) |
|-----------------------------|----------------------|----------------------|-------------------|---------------------|----------------------|
| Medicaid Expansion | -1.799*** (0.163) | -0.944*** (0.189) | -0.164 (0.216) | 0.115 (0.249) | 0.575 (0.373) |
| Avg. Cost of Pack | | -2.074*** (0.283) | -0.216 (0.396) | -0.216 (0.395) | -0.216 (0.395) |
| State Tobacco Tax | | 0.780* (0.460) | -0.637 (0.530) | -0.637 (0.529) | -0.637 (0.528) |
| Rel. Effect on ≤\$15K-\$25K | | | | -0.696** (0.311) | |
| Rel. Effect on <\$15K | | | | | -0.897* (0.481) |
| Rel. Effect on \$15-25K | | | | | -1.416*** (0.481) |
| Rel. Effect on \$25-35K | | | | | -1.110** (0.481) |
| Rel. Effect on \$35-50K | | | | | -0.271 (0.481) |
| Fixed Effects | | | ✓ | ✓ | ✓ |
| Observations | 1365 | 1365 | 1365 | 1365 | 1365 |

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. Standard deviations are in parentheses. The dependent variable of all regressions is the percentage of everyday smokers. Regressions (2)-(5) include control variables *AvgPack* and *StateTobTax*. Regressions (3)-(5) include Income-by-State and Year fixed effects. *Rel. Effect* variables describe the effect of Medicaid Expansion on the specified household income level relative to the all other income levels. Regression (4) estimates the relative effect of Medicaid expansion on income levels ≤\$15K-\$25K compared to ≥\$25K-\$35K. Regression (5) estimates the relative effect of Medicaid expansion on specified income levels compared to the \$50K+ income level.

Table 5. Relative Effect of Medicaid Expansion on the % of Someday Smokers in Each Income Level

| | (1) | (2) | (3) | (4) | (5) |
|-----------------------------------|-------------------|--------------------|--------------------|--------------------|---------------------|
| Medicaid Expansion | 0.133 (0.0961) | 0.150 (0.111) | 0.148 (0.137) | 0.0741 (0.160) | -0.223 (0.232) |
| Avg. Cost of Pack | | -0.0662 (0.165) | -0.0890 (0.259) | -0.0897 (0.259) | -0.0769 (0.259) |
| State Tobacco Tax | | 0.0900 (0.246) | 0.454 (0.348) | 0.454 (0.348) | 0.450 (0.347) |
| Rel. Effect on \leq \$15K-\$25K | | | | 0.176 (0.198) | |
| Rel. Effect on <\$15K | | | | | 0.534* (0.299) |
| Rel. Effect on \$15-25K | | | | | 0.409 (0.299) |
| Rel. Effect on \$25-35K | | | | | 0.835*** (0.315) |
| Rel. Effect on \$35-50K | | | | | 0.139 (0.306) |
| Fixed Effects | | | ✓ | ✓ | ✓ |
| Observations | 1377 | 1377 | 1377 | 1377 | 1377 |

Notes: * p <0.10, ** p<0.05, *** p<0.01. Standard deviations are in parentheses. The dependent variable of all regressions is the percentage of someday smokers. Regressions (2)-(5) include control variables *AvgPack* and *StateTobTax*. Regressions (3)-(5) include Income-by-State and Year fixed effects. *Rel. Effect* variables describe the effect of Medicaid Expansion on the specified household income level relative to the all other income levels. Regression (4) estimates the relative effect of Medicaid expansion on income levels \leq \$15K-\$25K compared to \geq \$25K-\$35K. Regression (5) estimates the relative effect of Medicaid expansion on specified income levels compared to other income levels.

Table 4 shows that Medicaid expansion had a significant relative effect in decreasing the proportion of everyday smokers for the less than \$15K, \$15K-\$25K, and \$25K-\$35K income groups compared to the \$50K+ income group, with the \$15K-\$25K group experiencing the largest decrease of 1.416 percentage points. It is worth noting that none of these income groups experienced any significant changes in the proportion of current smokers from Medicaid expansion, except for the \$15K-\$25K reporting a relative 1.004 p.p. decrease at the 10% level (Table. 3). The results suggest that Medicaid expansion has decreased the overall tobacco consumption of individuals from households with incomes less than \$35K, but did not significantly affect the proportion of smokers itself.

Table 5 shows statistical significance on the coefficients of the relative treatment effect on income groups “less than \$15K” and “\$25K-\$35K”. Medicaid expansion relatively increased the proportion of someday smokers by 0.534 p.p. and 0.835 p.p., respective to the \$50K+ income level. As I have shown that the proportion of everyday smokers has significantly decreased for the < \$15K and \$25K-\$35K income groups (Table. 4), the increases in the proportion of someday smokers are indicative of those individuals who are transitioning from an everyday to a someday smoker. This substantiates the claim that Medicaid expansion, a positive shock in access to healthcare, caused affected individuals to be more conscious of their health and health-related behaviors. The \$15K-\$25K income group, which we theorize to be the main beneficiaries of Medicaid expansion, does not experience a significant relative change in the proportion of someday smokers (Table. 5), but does experience a significant relative decrease in the proportion of everyday smokers (Table. 4). This may suggest that as the potential primary target of Medicaid expansion, the \$15K-\$25K income group experienced the biggest positive shock in access to healthcare and were more likely to attempt to quit smoking completely. However, as discussed above, I am unable

to discern which individual households the primary recipients of Medicaid expansion are due to lack of information on the number of household members.

V.III Effects of Medicaid Expansion on the Proportion of Current Smokers by Age, Race, and Gender.

Using the BRFSS data on the proportion of current smokers, I analyzed the effects of Medicaid expansion by various ages, race, and gender. Since the regression on data organized by income cannot be controlled for such variables due to the lack of available microdata, estimating the treatment effects will provide insight to whether Medicaid expansion effected different ages, races, or genders differently.

Table 6. Relative Effect of Medicaid Expansion on the % of Current Smokers by Age Groups.

| | (1) | (2) | (3) | (4) | (5) |
|---------------------------|----------------------|----------------------|--------------------|----------------------|----------------------|
| Treatment | -2.231*** (0.166) | -1.075*** (0.190) | -0.0382 (0.214) | 1.113*** (0.257) | 2.165*** (0.378) |
| AvgPack | | -3.143*** (0.284) | -0.444 (0.393) | -0.444 (0.385) | -0.444 (0.371) |
| StateTobTax | | 2.200*** (0.454) | 0.515 (0.526) | 0.515 (0.515) | 0.515 (0.496) |
| Rel. Effect on <45 y.o. | | | | -2.303*** (0.297) | |
| Rel. Effect on 18-24 y.o. | | | | | -5.382*** (0.495) |
| Rel. Effect on 25-34 y.o. | | | | | -3.818*** (0.495) |
| Rel. Effect on 35-44 y.o. | | | | | -0.863* (0.495) |
| Rel. Effect on 45-54 y.o. | | | | | -2.741*** (0.495) |
| Rel. Effect on 55-64 y.o. | | | | | -0.414 (0.495) |
| Fixed Effects | | | ✓ | ✓ | ✓ |
| Observations | 1722 | 1722 | 1722 | 1722 | 1722 |

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. Standard deviations are in parentheses. The dependent variable of all regressions is *Smoker*, the percentage of current smokers. Regressions (2)-(5) include control variables *AvgPack* and *StateTobTax*. Regressions (3)-(5) include Age-by-State and Year fixed effects. *Rel. Effect* variables describe the effect of Medicaid Expansion on the specified age group relative to the all other age groups. Regression (4) estimates the relative effect of Medicaid expansion on less than 45 y.o. compared to greater than 45 y.o. Regression (5) estimates the relative effect of Medicaid expansion on specified age groups compared to the 65+ y.o.

Table 7. Relative Effect of Medicaid Expansion on the % of Current Smokers by Gender

| | (1) | (2) | (3) | (4) |
|----------------------|----------------------|----------------------|--------------------|-------------------|
| Treatment | -2.296*** (0.179) | -1.129*** (0.190) | -0.0178 (0.175) | 0.0843 (0.214) |
| AvgPack | | -3.168*** (0.284) | -0.334 (0.321) | -0.334 (0.321) |
| StateTobTax | | 2.197*** (0.454) | 0.398 (0.430) | 0.398 (0.430) |
| Rel. Effect on Males | | | | -0.204 (0.248) |
| Fixed Effects | | | ✓ | ✓ |
| Observations | 574 | 574 | 574 | 574 |

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. Standard deviations are in parentheses. The dependent variable of all regressions is *Smoker*, the percentage of current smokers. Regressions (2)-(4) include control variables *AvgPack* and *StateTobTax*. Regressions (3)-(4) include Age-by-State and Year fixed effects. Regression (4) estimates the relative effect of Medicaid expansion on males compared to females.

Table 8. Relative Effect of Medicaid Expansion on the % of Current Smokers by Race

| | (1) | (2) | (3) | (4) |
|----------------------|----------------------|----------------------|--------------------|--------------------|
| Treatment | -1.947*** (0.284) | -0.863*** (0.320) | 0.270 (0.373) | 0.397 (0.408) |
| AvgPack | | -2.825*** (0.467) | -0.330 (0.653) | -0.325 (0.653) |
| StateTobTax | | 1.695** (0.690) | -0.0842 (0.871) | -0.0717 (0.871) |
| Rel. Effect on Black | | | | -0.448 (0.575) |
| Fixed Effects | | | ✓ | ✓ |
| Observations | 754 | 754 | 754 | 754 |

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. Standard deviations are in parentheses. The dependent variable of all regressions is *Smoker*, the percentage of current smokers. Regressions (2)-(4) include control variables *AvgPack* and *StateTobTax*. Regressions (3)-(4) include Age-by-State and Year fixed effects. Regression (4) estimates the relative effect of Medicaid expansion on blacks compared to whites.

For age, the 65+ group was chosen as the reference group for the relative treatment effect specification (Reg. 5, Table 6). This is because people are less likely to change their behaviors the older they get. Although not empirically proven, it seems unlikely that a 70 year old smoker would suddenly quit smoking due to being covered by Medicaid. Another specification estimates the treatment effect on ages less than 45 relative to ages greater than 45. Medicaid expansion increased the proportion of current smokers greater than 45 year old by 1.113 p.p. and decreased that of smokers less than 45 year old by 2.303 p.p. (Reg. 4, Table 6). Relative to the 65+ group, the proportion of current smokers decreased by 5.382 p.p. for 18-24 year olds, 3.818 p.p. for 25-34 year olds, 0.863 p.p. for 35-44 year old, and 2.741 p.p. for 45-54 year olds (Reg. 5, Table 6). Results suggest that Medicaid expansion did have very different treatment effects for the proportion of current smokers by age group and that age should be controlled for in my income-based analysis. The effects of Medicaid Expansion on proportion of current smokers do not seem to be differentiated by gender (Reg. 4, Table 7) nor by race (Reg. 4, Table 8). Analysis of Medicaid expansion on Hispanics could not be performed due to collinearity issues.

VI. Conclusion

Both Simon, Soni, and Cawley (2017) and Courtemanche et al. (2017) reported a lack of statistically significant effect of Medicaid expansion on smoking behavior. However, neither paper assesses the changes in the proportion of everyday or someday smokers, and solely relies on the proportion of current smokers. As previous literature has done, I have shown that Medicaid expansion does not affect the proportion of current smokers overall. However, I have also shown that the relative effects of Medicaid expansion on varying income groups are significant. Specifically, I report that households belonging to income groups of less than \$15K, \$15K-\$25K, and \$25K-\$35K experience a significant relative decrease in the proportion of everyday smokers, with the \$15K-\$25K group experiencing the greatest relative decrease of 1.416 percentage points. I also show that Medicaid expansion increases the proportion of someday smokers for the less than \$15K and \$25-\$25K income group, which suggests that individuals are transitioning from being everyday smokers to only smoking on some days. Note, I could not control for other demographic variables and instead report that Medicaid expansion had significant effects on different age groups. Future studies should attempt to access the BRFSS microdata and control for demographic variables.

Supplemental Figures

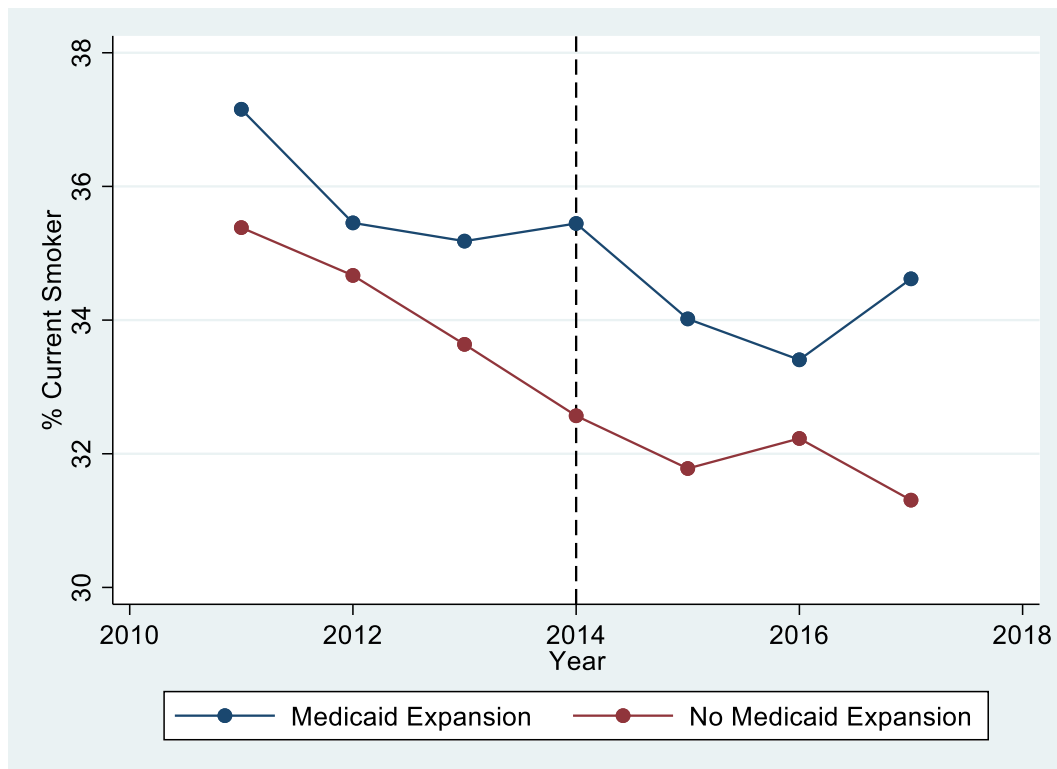


Figure S.1. Trends in % Current Smokers between Medicaid Expanded and Non-Expanded States for the <\$15K Income Group.

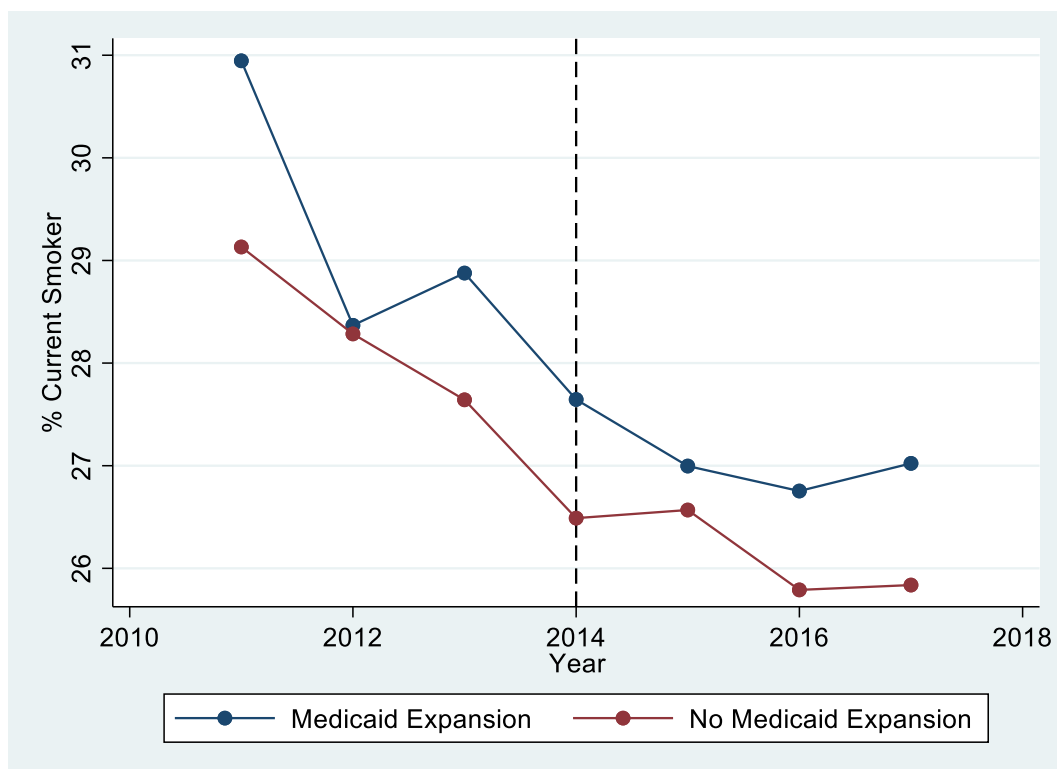


Figure S.2. Trends in % Current Smokers between Medicaid Expanded and Non-Expanded States for the \$15K-\$25K Income Group.

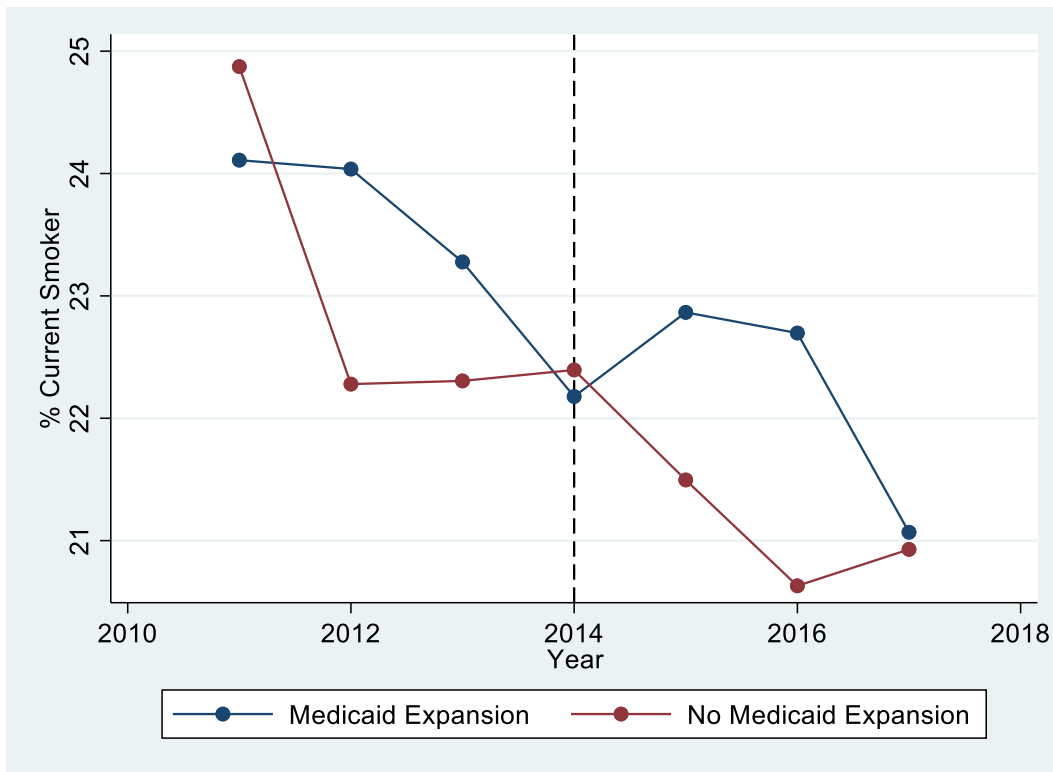


Figure S.3. Trends in % Current Smokers between Medicaid Expanded and Non-Expanded States for the \$25K-\$35K Income Group.

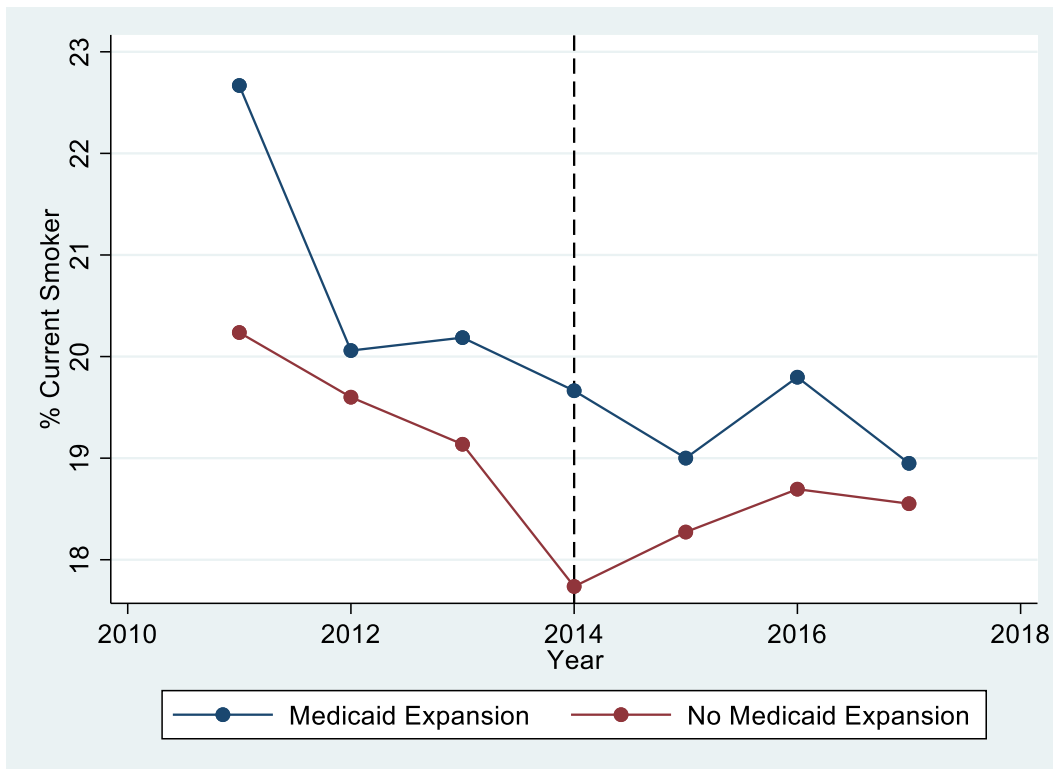


Figure S.4. Trends in % Current Smokers between Medicaid Expanded and Non-Expanded States for the \$35K-\$50K Income Group.

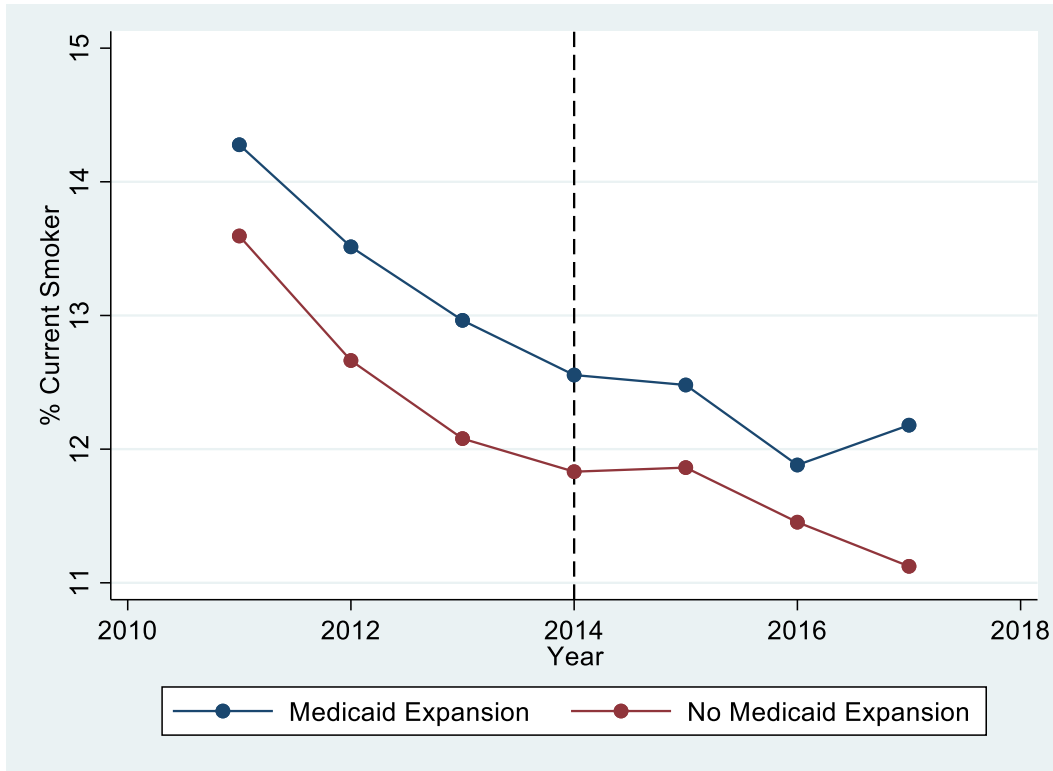


Figure S.5. Trends in % Current Smokers between Medicaid Expanded and Non-Expanded States for the \$50K+ Income Group.

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