Earned income tax credit policy and unhealthy alcohol use: A difference-in-differences analysis of U.S. states, 2001-2019

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Abstract

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Background: Unhealthy alcohol use is a major contributor to chronic diseases and mortality in the United States. There is variation in generosity of state Earned Income Tax Credit (EITC) which supplements the federal EITC, the largest poverty-alleviation program for low-earning working adults and their families. Prior studies have found income and employment to be associated with risk factors that lead to unhealthy alcohol use. However, none have found significant associations between EITC and unhealthy alcohol use. Our study builds on this body of evidence by controlling for state alcohol policy environment and estimating heavy episodic drinking outcomes.

Methods: We used the Behavioral Risk Factors Surveillance System survey to examine associations between presence and generosity of state refundable EITC and three measures of unhealthy alcohol use: heavy episodic (≥4 and ≥5 drinks per occasion for women and men, respectively), risky (≥7 and ≥14 drinks per week for women and men), and any unhealthy alcohol use (met criteria for either pattern in the past month). We used a generalized difference-in-differences approach to compare exposed states to control states from 2001 to 2019. We used quasi-Poisson regression models with state and year-fixed effects controlling for state-level covariates to obtain survey-weighted prevalence ratios for each alcohol outcome.

Results: From 2001 to 2019, 11 states enacted refundable EITCs. Median state credit as a percentage of federal credit was 10% and as high as 85%. A 10-percentage point increase in state EITC generosity was significantly associated with heavy episodic drinking (PR = 1.01, 95%CI: 1.00 – 1.01) but not for risky (PR = 1.01, 95%CI: 1.00 – 1.01) or any unhealthy alcohol use (PR = 1.01, 95%CI: 1.00 – 1.01). EITC and patterns of unhealthy alcohol use remained weakly associated after restricting analysis to the population with high school (or lower) educational attainment (since this group is more likely to receive EITC), months when credits are typically refunded, and excluding California for its high EITC generosity.

Conclusion: We found weak associations between EITC generosity and three measures of unhealthy alcohol use that were attenuated by adjustment with time-varying confounders. Consistent with previous findings, these results suggest minimal association between EITC and unhealthy alcohol use. Our study is the first to measure the association of EITC and heavy episodic drinking and adjust for state alcohol policy environment. These findings inform understanding of the impacts of EITC and other poverty-alleviation policies on alcohol-related harm and provide impetus for policymakers to examine whether generosity is adequate in current and future policies.

1 Introduction

Higher levels of income, job security, and fair employment are strong predictors of better health outcomes, especially among those living at or below the poverty line.[1,2] In the United States, the Earned Income Tax Credit (EITC) is currently the largest poverty-alleviation program for low-earning working adults and their families. Since its introduction in 1975, federal EITC has led to increased payments for families with more children; additionally, states began to enact their own EITCs as a supplement to the federal refundable credits which allowed households to receive payment from the state if the credits exceeded a household's tax liability. In 1986, Rhode Island enacted the first state EITC. As of 2021, 28 states and the District of Columbia have enacted state EITCs and refundable credits are offered in all but seven states.[3] State EITC expansion has been associated with a cost-effectiveness ratio of around $7,500 per quality-adjusted life years gained, eight times more cost-effective than state Medicaid expansion.[4] Due to the policy's beneficial impacts on single mothers' income and labor force participation, the association of federal and state expansion of EITC and maternal and child health are relatively well-documented with improved outcomes in birth weight, maternal smoking, and abusive head trauma.[5–9]. More recent studies reported statistically significant reductions in frequent mental distress, suicide attempts, and child neglect associated with increasing generosity of state EITC benefits.[10–12]

Alcohol consumption—particularly unhealthy alcohol use ranging from drinking above recommended limits to meeting diagnostic criteria for alcohol use disorder—is a major contributor to chronic diseases and mortality.[13] Heavy episodic drinking and risky drinking, two patterns of unhealthy alcohol use are linked to increased risk of health consequences. Unhealthy alcohol use is a leading cause of premature mortality in the U.S. with 95,000 deaths and 2.8 million years of potential life lost each year.[14] Heavy episodic drinking, typically defined as ≥4 and ≥5 drinks per occasion for women and men, respectively, causes high levels of blood alcohol concentration which can impair motor functions and decisions regarding risk-taking. Acute deaths such as unintentional injuries and suicide, are largely attributed to heavy episodic drinking and responsible for over half of alcohol-related deaths in the U.S. Heavy episodic drinking also causes social and economic harm, making up 77% of alcohol-related economic loss from health expenditures, criminal justice expenditures, and loss of workplace productivity.[15] Risky drinking is characterized by the number of drinks consumed above the weekly recommended intake. Risky drinking and increasing volume of consumption in general has been associated with over 65 medical conditions including more than five-fold increased risk of oral and pharyngeal cancer, two-fold risk of liver cancer, and moderately greater risk of hypertension and stroke.[16–18]

Different dimensions of socio-economic status (SES) – income, education, and occupation, contribute to the risk of unhealthy alcohol use patterns. For instance, studies show that lower income, lack of employment, and low-paid occupations predict heavy episodic drinking.[19,20] Moreover, adverse health impacts of unhealthy alcohol use disproportionately affects lower SES groups and this differential effect was largely attributed to a higher prevalence of heavy episodic drinking.[21] Pathways have been proposed in which increased income and employment through EITC reduces stress, mental health problems, and parental cognitive load,[9] which may in turn

contribute to prevention and reduction of coping mechanisms, such as unhealthy alcohol use.[22] Alcohol policies, particularly ones that control pricing, regulation, and availability, have been shown to reduce unhealthy drinking patterns and prevent alcohol-related harm. One study found that the presence of state policies affecting alcohol taxes and availability was associated with lower odds of risky drinking and alcohol-related consequences.[23]

Three studies have examined the impact of state EITC policies on alcohol use, but their design and alcohol-related outcome definitions are different.[24–26] The most recent study employed a difference-in-differences (DiD) design to examine the impact of state EITC programs on any drinking and risky drinking by using state EITC eligible individuals as the unit of analysis from the Panel Study of Income Dynamics (PSID), a national longitudinal biennial survey from 1995 to 2015.[24] The other two studies also used PSID but differed in research aim. They aimed to isolate the effects of refundable tax credit transfer from that of seasonal trends of alcohol use by comparing outcomes of EITC-eligible individuals interviewed between February and April, when refund receipt was most likely to occur, with individuals interviewed during other months. None of those studies found a statistically significant association between EITC and absolute alcohol consumption in the last 3 days or risky drinking.

Our study builds on this body of evidence by further controlling for state-level, time-varying covariates using an indicator state composite score for restrictive alcohol policy environments that may influence drinking behaviors.[27] Using data from the Behavioral Risk Factors Surveillance System (BRFSS), we obtained annual estimates of heavy episodic drinking outcomes in addition to risky drinking at the individual level, which could not be captured in prior studies using the biennially administered PSID surveys. These patterns of unhealthy alcohol use are major contributors to alcohol-related harm and have been shown to be associated with a higher risk of developing an alcohol use disorder.[28–31]

By using ecologic-level data to determine exposure to EITC in our study, we make the assumption that eligible study participants living in an EITC state have received the refundable tax credit. Evidence has shown that parental education is highly correlated with household income.[32] This suggests that people with lower educational achievement may be more likely to earn less and therefore more likely to qualify for EITC. Analysis of outcomes collected during February to April when tax refunds are usually received may be of interest, considering mixed evidence on the short term impacts of income supplementation on drinking and alcohol spending behaviors.[26,33,34]

In this study, we sought to leverage state variation in refundable EITC policy using repeated cross-sectional state-representative data and individual-level measures of alcohol consumption. Building on previous literature, we included the novel use of state variation in alcohol policy environment in our analysis, included heavy episodic drinking as an outcome, and used recent data that accounted for recent changes in state refundable EITC expansions. Findings of this study will further our understanding of the health impacts of economic policies on alcohol-related harm and inform future policymaking decisions affecting low-income families.

2 Methods

2.1 Study design

We used publicly available state-level survey data and employed a DiD analysis to estimate the change in the prevalence of unhealthy drinking patterns in states before and after refundable EITC policy enactment (first difference) compared to states with no policy enactment (second difference). We used two-way fixed effects regression model to estimate the association of policy exposure enacted in multiple states at multiple time points with drinking outcomes.

2.2 Study Population / Data Source

The Behavioral Risk Factor Surveillance System (BRFSS) has been conducted annually since 1984 focusing on health risk behaviors, chronic conditions, and use of services with over 400,000 U.S. adults completing the telephone survey each year. BRFSS collects national data from non-institutionalized U.S. residents 18 years or older from 50 states, the District of Columbia, Guam, and Puerto Rico. Starting in 2011, BRFSS collected aggregate combined landline and cell phone data and began employing a weighting methodology to adjust for disproportionate selection, non-response, and population characteristics to account for complex survey design. One of the advantages of BRFSS national survey is that its yearly data collection allows more granular monitoring of trends compared to other national surveys that are less frequent and individual-level measures are useful for multi-level analysis with state-level policy exposures. Participants can be interviewed in either English or Spanish language.

The use of publicly available and de-identified BRFSS data for research does not involve human subjects as defined by federal regulations and guidance and therefore does not require Institutional Review Board (IRB) review, as determined by the University of Washington Human Subjects Division (HSD).

We utilized state variation in the existence of state EITC and compared repeated cross-sections from BRFSS surveys to assess individual-level alcohol use outcomes annually from 2001 to 2019. Individual level outcomes and characteristics were derived from BRFSS data. Since our study question compares changes in states before and after EITC enactment with non-EITC states, we excluded 9 states and the District of Columbia that enacted EITC before 2001. We also excluded 3 states that changed its EITC exposure status during the study period. For example, Oklahoma state enacted refundable EITC in 2002 but it has since been changed to a non-refundable tax credit during a budget shortfall in 2016. After this exclusion, we analyzed data from 11 states that enacted refundable EITC and 27 control states that did not.

2.3 Policy Exposure

Individuals living in states that enacted a state refundable EITC policy during the study period 2001 to 2019 were considered exposed to the policy. We used a measure of state EITC generosity as a percentage of federal EITC benefits to estimate changes in prevalence of the outcomes for every 10-percentage point increase in EITC generosity. The control group were individuals living states that did not enact a state EITC policy at all. Individuals living in states that enacted a non-refundable policy were also considered part of the control group because low-income workers tend not to have a tax liability and would benefit little from non-refundable EITCs. There is evidence that non-refundable EITCs are not associated with health outcomes compared to refundable EITCs.[9] We excluded states that already had a refundable EITC policy in place before our study period. Because our aim was to investigate the association between the implementation of refundable credits and patterns of alcohol use, states that already had refundable credits in place did not represent a suitable counterfactual for our exposure. Data on state EITC status during the study period were obtained from the National Bureau of Economic Research.

2.4 Outcomes

Consistent with prior studies[35,36], three measures of unhealthy alcohol ue were derived based on responses to alcohol use questions from the annual BRFSS core surveys. We assessed the frequency of alcohol use based on report of at least one drink in the past 30 days from the following question: “During the past 30 days, how many days per week or per month did you have at least one drink of any alcoholic beverage such as beer, wine, a malt beverage or liquor?" *Risky drinking* was defined based on report of exceeding weekly recommended limits of more than 14 drinks per week for men and 7 drinks per week for women in the past 30 days. *Heavy episodic drinking* was defined based on report of more than 5 drinks for men and 4 drinks for women on a single occasion in the past 30 days. These definitions are provided by the National Institutes of Alcohol Abuse and Alcoholism (NIAAA) and are in the 2015-2020 USDA dietary guidelines.[37,38] We also created a summary measure of *any unhealthy alcohol use* defined as any respondent meeting the criteria for either risky drinking or heavy episodic drinking in the past 30 days.[13]

2.5 Covariates

State-level demographic, policy, and economic covariates that conceivably affect timing or likelihood of state EITC enactment and drinking patterns were chosen *a priori* based on literature review of existing studies. One key characteristic of potential confounders in a DiD analysis is that its distribution changes differentially over time between comparison groups.[39] States are more likely to expand EITC during periods of strong economy and labor market.[8] Economic productivity and job wages are also likely to affect employment and income on the causal pathway between EITC and drinking patterns. Analyses controlled for time-varying state GDP and minimum wage.[23,24,40,41] State GDP and minimum wage were obtained from the University of Kentucky Center for Poverty Research (UKCPR) database.

State alcohol policies has been shown to affect overall alcohol consumption and heavy episodic drinking over time.[23,41,42] One indicator of state alcohol policy environment is the alcohol policy scale (APS) score which is an aggregate measure of policy efficacy ratings and implementation indices of 29 U.S. alcohol policies that determine the strength of the policies in terms of applicability and enforceability. We controlled for state alcohol policy environment using an indicator of time-varying state differences in APS scores. The scale was developed using the Alcohol Policy Information System and state-specific scores for years 2001 to 2018 were obtained from Timothy Naimi and Jason Blanchette at Boston University. More details are described elsewhere.[27,43,44]

Another time-varying policy covariate considered was Medicaid expansion which may confound alcohol use estimates if expansion coincide with changes in state EITC.[7] State adoption of Medicaid expansion was adapted from data provided by the Henry J. Kaiser Foundation. We also controlled for year-fixed and state-fixed effects in the regression model to account for unmeasured confounders such as those that affect all states equally and time invariant factors within states.

We stratified the study population by educational attainment obtained from self-reported questions about the respondent's highest education level completed. Educational attainment was categorized into no more than a high school education or GED equivalent or less and at least some postsecondary education.

2.6 Statistical Analysis

We used survey-weighted Poisson regression to estimate the prevalence ratios comparing heavy episodic, risky, and any unhealthy drinking prevalence between non-EITC state and EITC states before and after enactment of state EITCs. We repeated analyses restricting the study population to those with no more than a High School education and to survey responses collected from February to April. We also repeated analyses excluding responses from California. California is unique in its state EITC structure due to its phase-out threshold. California's maximum credit corresponds roughly to the income threshold equal to 50% of the federal poverty line. As a result, the policy targets the lowest income families rather than a fixed percentage of federal EITC in most other states.

We fit beta estimates to the following adjusted model:

$$\log(Y_{igt}) = \alpha + \beta_1 EITC_{gt} + \beta_2 g + \beta_3 t + \beta_4 X_{gt} + \epsilon_{gt}$$

The fully adjusted model included time-varying state level covariates and state- and year-fixed effects where *i* denotes individuals, *g* states, *t* years. Y_{igt} denotes one of three alcohol outcome measures. $EITC_{gt}$ denotes a continuous variable, for which each one-unit increase represents a 10-percentage point increase in state EITC generosity (as a percentage of federal EITC). g and t are state and year fixed effects, respectively, and

$X_{ngt}$is a vector of state-level covariates. ϵ_{gt} denotes state-clustered robust standard errors generated from survey weighted analyses to account for stratification, clustering, and weighting of BRFSS' complex survey design. The unadjusted model included state EITC variable as well as state and year fixed effects.

A core assumption in a DiD policy analysis is that in the absence of the policy treatment, trends in the outcome between comparison groups would not have differed significantly over time. The parallel trends assumption must be plausible to reduce bias in estimates of the policy's causal effect. Since this counterfactual cannot be observed after implementation, it is conventional to observe parallel trends between comparison groups prior to policy implementation. We estimated a similar model using a treatment indicator for future EITC status and performed a statistical test for equality of trends on the interaction between the linear time trend and the treatment indicator.

3 Results

From 2001 to 2019, 27 states did not have a refundable EITC and 11 states enacted a refundable EITC or transitioned from a nonrefundable to a refundable credit. Analyses included 5,263,590 individual observations from 722 state-years. Median state EITC maximum credit for a family with 2 dependents was $5036. Median state refundable credit as a percentage of federal EITC was 10%, ranging from 3.5% in Louisiana to 85% in California. At baseline, State GDP and minimum wage was higher in EITC states compared to non-EITC states (Table 1). EITC states also had a higher alcohol policy scale score and a higher proportion of Medicaid expansion. The baseline prevalence of heavy episodic drinking and risky drinking in EITC states was 13.5% and 5.6%, respectively, compared to 12.4% and 5.1% in non-EITC states.

In the overall DiD model, a 10-percentage point increase in EITC generosity was significantly associated with a 1% increase in the prevalence of heavy episodic drinking (95%CI: 1.00 – 1.01, p = 0.048) after adjusting for APS, Medicaid expansion, state GDP, and minimum wage (Table 2). EITC generosity was not significantly associated with risky drinking (PR = 1.01, 95%CI: 1.00 – 1.01, p = 0.26) or the summary measure of any unhealthy drinking (PR = 1.01, 95%CI: 1.00 – 1.01, p = 0.07).

In the analyses restricting to populations with a high school education or less, we found that EITC generosity slightly increased risk of heavy episodic drinking, risky drinking, and any unhealthy drinking. A 10-percentage point increase in EITC benefits was significantly associated with a 1% increase in heavy episodic drinking prevalence (95%CI: 1.00 – 1.02, p = 0.03), a 2% increase in risky drinking prevalence (95%CI: 1.00 – 1.04, p = 0.04), and a 1% increase in any unhealthy alcohol use (95%CI: 1.00 – 1.02, p = 0.02). Further restricting to survey responses collected from February to April, these estimates remained in the positive direction but only the summary measure of unhealthy alcohol use was significantly associated (PR = 1.02, 95%CI: 1.00 – 1.05, p = 0.04).

We tested the sensitivity of the results to excluding California because of its unusually high EITC generosity (Figure 1) and found that EITC generosity slightly decreased risk across all drinking outcomes. In the state restricted model, EITC generosity was significantly associated with a 2% decrease in prevalence heavy episodic drinking (95%CI: 0.97 – 0.99, p = 0.007) and any unhealthy drinking (95%CI: 0.97- 0.99, p = 0.0003). Risk reduction was attenuated for risky drinking but remained in the negative direction (95%CI: 0.96 – 1.01, p = 0.13). These estimates were no longer statistically significant after restricting analysis by educational attainment and tax season months.

When testing parallel trends assumptions in the years prior to implementation of a state refundable EITC, we found no interaction between future EITC status and calendar year on heavy episodic drinking (p-value = 0.15) and risky drinking (p-value = 0.12). This suggests that pre-policy trends in drinking outcomes did not differ between EITC and non-EITC states.

4 Discussion

We used state-level data to assess the association between EITC generosity and multiple measures of unhealthy alcohol use and identified very small associations that were attenuated with adjustment and stratification. These findings suggest minimal influence of EITC on unhealthy alcohol use. To our knowledge, this is the first state-representative quasi-experimental study to control for time-variant characteristics of a state's alcohol policy environment in assessing the impact of EITC on the risk of unhealthy alcohol use. It is also the first such study to assess the impact of EITC on the risk of heavy episodic drinking.

Findings from the present study are generally consistent with prior studies assessing fewer outcomes with less robust adjustment. Our point estimates, while statistically significant, are small and build upon existing literature suggesting no significant associations between state EITC generosity and measures of any alcohol consumption and risky drinking.[24,26,45] Among a national population with a high school educational attainment or less, which we expected would be more likely to receive EITC, our study suggests that individuals living in states with more generous credits had slight increase in risk of HED and risky drinking. However, when excluding responses made in California, an outlier state in terms of generosity and policy structure, EITC generosity slightly decreased risk of HED and risky drinking. Although we expected responses during tax return months to yield stronger effects of EITC, we observed even fewer significant differences in alcohol outcomes. Overall, the magnitudes of our prevalence ratios were as small as 1% and impact on population or clinical outcomes are likely unobservable, if not null.

Our large sample size (over 5 million observations and 722 unique state-years) and ability to estimate annual trends in drinking behaviors from BRFSS survey data provide more statistical power to detect smaller differences in the long-term impact of EITC on unhealthy drinking patterns. Another way to frame the evidence of null findings is that no adverse effects of EITC on unhealthy alcohol use have been identified. This finding is different from results of studies suggesting associations of larger and less frequent imbursement of welfare benefits with higher alcohol spending and unhealthy alcohol use.[33]

Our study accounted for more recent changes to state refundable EITC policies by using data up to 2019. Our study has the advantage of using individual-level alcohol outcomes data for analysis as opposed to aggregate state-level rates.[46] Valid and reliable individual measures of alcohol consumption in a nationally representative sample with state representative data are important for multi-level analysis in which individual-level inferences on outcomes are made from state-level exposure to EITC. We found no significant difference in pre-EITC trends in alcohol use outcomes between EITC and non-EITC states. This lends plausibility to the parallel trends assumption for unhealthy alcohol use that may otherwise preclude reliable interpretation of regression results.

Our study has several limitations. First, measurements of alcohol use in BRFSS were self-reported which may be subject to under-reporting and differential non-response. The prevalence of heavy episodic drinking is consistently lower in BRFSS than in the National Survey on Drug Use and Health (NSDUH), which is conducted in-person rather than through telephone.[47] Improving self-reported alcohol survey data validity would help ensure quality of unhealthy alcohol use measures for future DiD analyses where variation over time is considered. Adjustments to improve validity is explored elsewhere.[47]

We measured drinking behavior risk factors but not the downstream effects of unhealthy drinking. Alcohol-related consequences (i.e., physical abuse and accidents) and alcohol use disorder may be more sensitive to long term impacts of EITC but these outcomes could not be measured using BRFSS. An example of this was a study of EITC and injury prevention that found that EITC generosity was not associated with changes in suicidal ideation or planning but was significantly associated with fatal and non-fatal suicide attempts.[11] Future studies of the long-term impacts of state EITC may consider including downstream outcomes of unhealthy alcohol use. For instance, Subbaraman et al. used survey data from US National Alcohol Surveys (NAS) to study the association of state alcohol policies with risky drinking, alcohol-related consequences, and alcohol use disorder.[23]

Estimating individual-level EITC eligibility in states without EITC would likely be a more comparable counterfactual group to EITC-eligible individuals living in EITC states. We used an ecologic measure of policy exposure equivalent to an intent-to-treat analysis which may be a less precise measure of comparison. Educational attainment was one way we approximated eligibility for refundable credits. However, BRFSS survey data were collected from any adult respondents in a surveyed household and does not account for the possibility that another adult in the household was college educated. Compared with estimates based on individual eligibility, our ecologic approach may attenuate results due to measurement bias, but it may also avoid overestimating significant results if healthier or more educated individuals were more likely to actually receive credits.[26] Additionally, the average national participation rate of EITC has historically been about 80%.[48]

Residual confounding from unobserved differences between EITC and non-EITC states may cause adjusted estimates to be closer to crude estimates than expected. States that enacted a refundable EITC policy may also be more likely to have a policy environment more

beneficial to low-income households that other states do not. However, this only poses a threat to internal validity if the confounding policies occurred at the same time and have an effect in the same direction as EITC.[49] It is unlikely that state-specific events met both criteria given the political and budgetary efforts to enact significant statewide welfare legislation.

Prior to 2005, heavy episodic drinking in the BRFSS core survey was defined as 5 standard drinks on one occasion for both men and women. Starting in 2005, this outcome was defined differently for men and women. This change in definition of outcome may affect the validity of this outcome compared to other alcohol survey data in which variation over time is considered. Misclassification of the outcome may change the prevalence of the outcome following the 2005 change in definition.

State EITC on average offer significantly fewer credits compared to federal EITC so changes in outcomes may be harder to detect. Between 1995 and 2015, the average state EITC credits was $265 compared to $1912 in federal credits. Our results support conclusions from prior studies that the generosity of state EITC may be inadequate to affect significant changes on health behaviors including drinking patterns.[24]

Policymakers would benefit from considering this body of evidence when deciding on the expansion of EITC and renewing focus on health in all policies. These results also provide impetus to examine the health impacts of other relief policies amid the COVID-19 pandemic and future policies such as the expansion of the monthly Child Tax Credit. In a state-level analysis accounting for economic conditions, Medicaid expansion, and alcohol policy environment, we found minimal influence of EITC generosity on patterns of unhealthy alcohol use.

5 Appendix

5.1 Table 1: SOCIAL AND ECONOMIC CHARACTERISTICS OF US STATES BY FUTURE EITC STATUS AT BASELINE, 2001

	EITC enactment during study period (n = 11)	No EITC during study period (n = 27)
State population, median	5,347,271	4,534,267
State GDP, median $	$158,959	$108,931
State minimum wage, mean $ (SD)	$7.45 (0.97)	$7.14 (0.60)
Alcohol policy scale score, median	41.7	40.4
Expansion of Medicaid in 2014, %	72.7%	37.0%
Heavy episodic drinking prevalence, mean % (SD)	13.5% (1.2)	12.4% (3.4)
Risky drinking prevalence, mean % (SD)	5.6% (0.9)	5.1% (1.5)

5.2 Table 2: EITC GENEROSITY AND SURVEY WEIGHTED PREVALENCE RATIO OF UNHEALTHY ALCOHOL USE

		Heavy episodic drinking			Risky drinking		
		PR	**95% CI**	**p-value**	**PR**	**95% CI**	**p-value**
Overall (n=5,263,590)	**Model 1**	1.00	0.99 – 1.00	0.085	0.99	0.98 – 1.00	0.005*
	Model 2	1.01	1.00 – 1.01	0.048*	1.01	1.00 – 1.01	0.262
High school educational attainment or less (n=2,063,568)	**Model 1**	1.00	0.99 – 1.00	0.265	1.00	0.98 – 1.01	0.474
	Model 2	1.01	1.00 – 1.02	0.034*	1.02	1.00 – 1.04	0.04*
High school educational attainment or less during Feb, Mar, and April (n=526,123)	**Model 1**	1.00	0.99 – 1.02	0.892	1.00	0.98 – 1.03	0.762
	Model 2	1.02	1.00 – 1.05	0.071	1.03	0.99 – 1.07	0.19

Model 1 adjusted for state and year fixed-effects. Model 2 adjusted for state-level covariates: APS score (cont), Medicaid expansion (binary), state GDP adjusted for inflation ($USD, cont), and minimum wage adjusted for inflation ($USD, cont), and state and year fixed-effects.
*Statistically significant associations, p-value < 0.05

		Any Unhealthy Alcohol Use		
		PR	**95% CI**	**p-value**
Overall (n=5,263,590)	**Model 1**	1.00	0.99 – 1.00	0.070
	Model 2	1.01	1.00 – 1.01	0.068
High school educational attainment or less (n=2,063,568)	**Model 1**	1.00	0.99 – 1.00	0.354
	Model 2	1.01	1.00 – 1.02	0.021*
High school educational attainment or less during Feb, Mar, and April (n=526,123)	**Model 1**	1.00	0.99 – 1.02	0.700
	Model 2	1.02	1.00 – 1.05	0.041*

5.3 Table 3: EITC GENEROSITY AND SURVEY WEIGHTED PREVALENCE RATIO OF UNHEALTHY ALCOHOL USE EXCLUDING CALIFORNIA

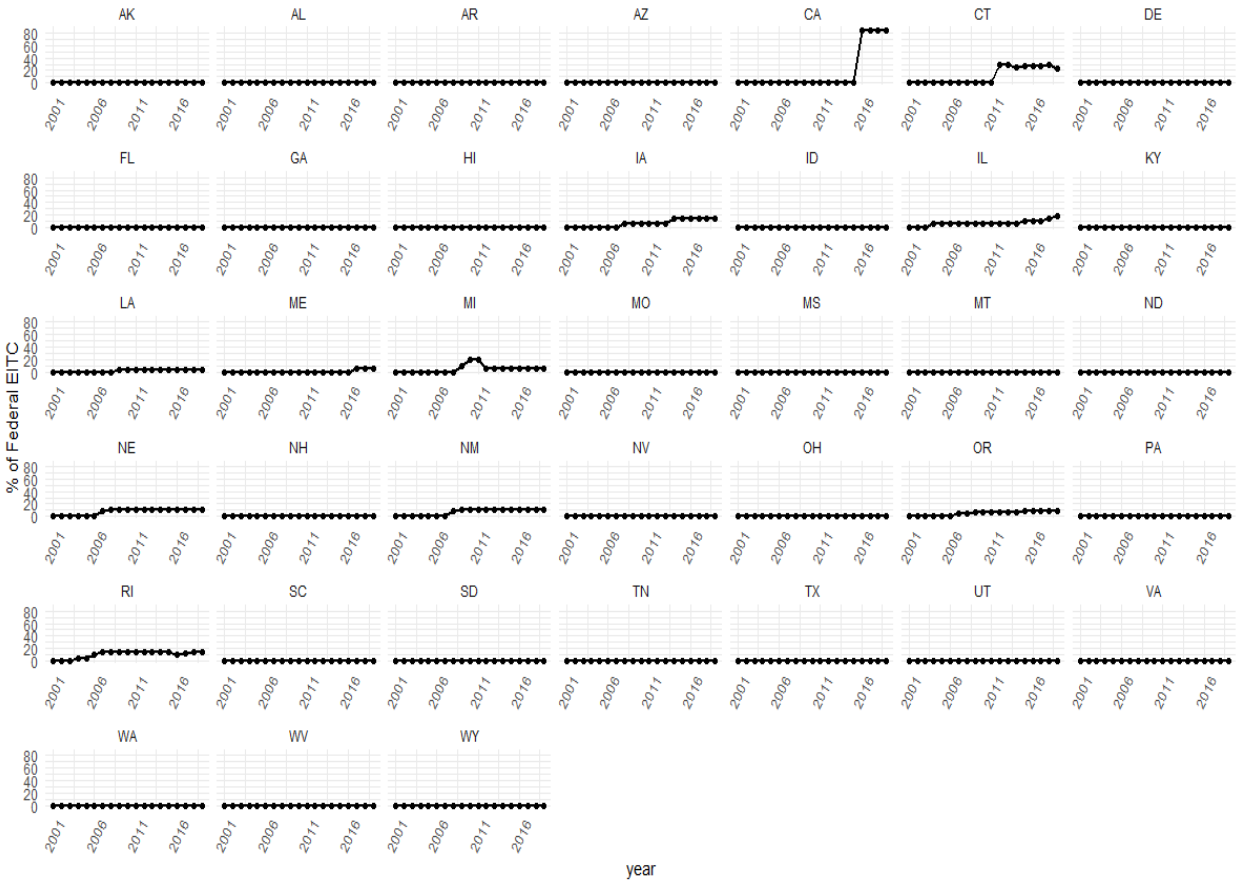
		Heavy episodic drinking			Risky drinking		
		PR	**95% CI**	**p-value**	**PR**	**95% CI**	**p-value**
Overall (n=5,072,144)	**Model 1**	0.99	0.97 – 1.00	0.035*	1.00	0.97 – 1.02	0.683
	Model 2	0.98	0.97 – 0.99	0.007*	0.98	0.96 – 1.01	0.131
High school educational attainment or less (n=2,001,587)	**Model 1**	0.99	0.97 – 1.01	0.364	1.02	0.98 – 1.06	0.290
	Model 2	0.99	0.97 – 1.01	0.452	0.99	0.96 – 1.03	0.766
High school educational attainment or less during Feb, Mar, and April (n=512,581)	**Model 1**	1.02	0.97 – 1.06	0.489	0.99	0.93 – 1.07	0.878
	Model 2	1.02	0.97 – 1.06	0.480	0.96	0.89 – 1.03	0.242

Model 1 adjusted for state and year fixed-effects. Model 2 adjusted for state-level covariates: APS score (cont), Medicaid expansion (binary), state GDP adjusted for inflation ($USD, cont), and minimum wage adjusted for inflation ($USD, cont), and state and year fixed-effects.
*Statistically significant associations, p-value < 0.05

		Any Unhealthy Alcohol Use		
		PR	**95% CI**	**p-value**
Overall (n=5,072,144)	**Model 1**	0.99	0.97 – 1.00	0.021*
	Model 2	0.98	0.97 – 0.99	0.0003*
High school educational attainment or less (n=2,001,587)	**Model 1**	0.99	0.97 – 1.01	0.436
	Model 2	0.99	0.97 – 1.01	0.346
High school educational attainment or less during Feb, Mar, and April (n=512,581)	**Model 1**	1.01	0.97 – 1.06	0.540
	Model 2	1.01	0.97 – 1.05	0.678

5.4 Figure 1: STATE EITC GENEROSITY 2001- 2019

Source: National Bureau of Economic Research's TAXSIM program (www.nberg.org/taxsim)



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