



# The effect of the US Child Tax Credit advance payments in 2021 on adolescent mental health: Changes in depression symptoms and suicidality

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## ABSTRACT

**Objective:** Child poverty is associated with poor adolescent mental health. Changes to the Child Tax Credit (CTC) in 2021 in the U.S. were historic and introduced a new model of distributing the credit in advance of tax filing, providing families with stable, supplemental monthly income. This policy shift offers a unique opportunity to examine the mental health effects for adolescents.

**Methods:** We use electronic health record data from a large pediatric primary care network in Columbus, Ohio, which collected adolescent depression screening scores in real time as the CTC advance payments were introduced. We utilized differences in age of eligibility for the CTC to examine the changes in the probability of depression screening outcomes (positive depression screen, any depression symptom, any suicidal ideation), for adolescents eligible for the credit (turned 18 first quarter of 2022), relative to those not eligible (turned 18 last quarter of 2021) ( $n = 1,423$ ).

**Results:** We did not observe a significant association between the policy change and study outcomes in the overall sample. However, the percentage of adolescents with a positive depression screen significantly declined for Non-Hispanic Black (13.4 percentage point reduction,  $p = 0.01$ ) and publicly insured (9.7 percentage point reduction,  $p = 0.04$ ) adolescents.

**Conclusions:** Our findings suggest reductions in depression symptoms for subgroups of adolescents who were age-eligible for the CTC compared to their counterparts who were not eligible. The CTC advance payments were a brief experiment in universal basic income and may offer a policy solution for addressing both poverty and a growing adolescent mental health crisis.

## 1. Background

Adolescents from socioeconomically disadvantaged families experience heightened risk for suicide, depression, and mental health-related emergency department visits (Hoffmann et al., 2020; Dupere et al., 2009; Angstman et al., 2021). The COVID-19 pandemic further exacerbated pre-existing inequities in social determinants of health (SDOH) and worsened adolescent mental health outcomes (Daly, 2022). In 2021, alarming increases in the rates of emergency department visits for mental health crises or suicide attempts among children and adolescents prompted health organizations to call for a mental health “state of emergency” (American Academy of Pediatrics, 2021). As recognition of

the adolescent mental health crisis continues to grow, a greater understanding of how or whether anti-poverty policies buffer against the deleterious effects of poverty on mental health is needed.

The American Recovery Plan Act passed in March 2021 introduced a major shift in anti-poverty tax policy in the U.S. The changes to the federal 2021 Child Tax Credit (CTC) were historic in size and a lifeline for many families. Importantly, the CTC policy changes allowed families to receive a portion of the tax credits as advance monthly payments, ahead of tax filing, increased the total amount of the credit, made it fully refundable, and allowed families with no or very low income to receive the credit (Parolin et al., 2021). Between July and December 2021, low and middle-income families could receive monthly payments of \$250 for

*Abbreviations:* SDOH, Social Determinants of Health; CTC, Child Tax Credit; HER, Electronic Health Record; DID, Difference in Difference.

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older children (6–17 years), or \$300 for younger children (0–5 years) (Maag, 2021). Families report using these payments for food, housing, and other basic needs (Shafer et al., 2022; Census Bureau, 2021; Karpman et al., 2021), reducing material hardship and financial distress (Shafer et al., 2022; Parolin et al., 2022; The Center for Law and Social Policy, 2021). The CTC changes represented a historic experiment in what it would mean to slash child poverty by nearly 30 % (Parolin et al., 2022).

A growing body of evidence points to the potential positive benefits of cash transfer programs or tax credits on child health, including mental health outcomes (Holdroyd et al., 2023; Pilkauskas, 2023; Marcil and Beck, 2020). Expansions of the Canadian Child Benefit were associated with improvements in child social and emotional wellbeing (Milligan and Stabile, 2011; Milligan and Stabile, 2009), offering support for the idea that stable monthly benefits could improve the household environment and improve child mental health. In the U.S., a previous study of changes in the CTC on child outcomes, found lower risk for child injuries and reduced behavioral problems, but only when the CTC was refundable (Rostad et al., 2019). Other prior studies of the Earned Income Tax Credit (EITC) found evidence for improved child test scores (Chetty et al., 2011) and reductions in rates of child maltreatment and injuries (Kovski et al., 2021; Klevens et al., 2017). Importantly, these prior studies found significant effects on outcomes for differences in tax credit amounts of a similar or smaller magnitude to that of the per-child 2021 CTC benefit (Rostad et al., 2019; Chetty et al., 2011; Kovski et al., 2021; Klevens et al., 2017). However, fewer studies have specifically focused on adolescents or used adolescent-reported measures of mental health (Costello et al., 2010; Morris et al., 2017).

There are two primary pathways through which adolescent depression symptoms could be impacted by an immediate increase in household income through the CTC advance payments. First, through an “investment pathway,” as described by the National Academies (National Academies of Sciences, Engineering, and Medicine, 2019), increased income could reduce material hardship and enable access to other health enhancing resources (e.g., school supplies, enrichment activities, or parental time with children), resulting in improved health. Indeed, an association between food insecurity and child mental health, including increased depressive symptoms and suicidality, has been established previously (Cain et al., 2022). Second, consistent with a “stress pathway” (National Academies of Sciences, Engineering, and Medicine, 2019), the increased temporary income of the CTC could result in immediate reduced stress among caregivers that spilled over to their adolescents. Financial distress is associated with increased adolescent and caregiver conflict, which in turn is associated with increased depressive symptoms (Argabright et al., 2022). Thus, the CTC payments may have had a temporary effect on reducing risk factors and enhancing protective factors that could improve adolescent mental health. Moreover, the unique design of the 2021 CTC allows for the disentangling of work requirements from income, which was not possible in prior studies of the effects of working tax credits on child health (Holdroyd et al., 2023; Braga et al., 2020; Batra and Hamad, 2021).

The present study builds on this prior work by using a difference-in-difference design to evaluate the effects of the 2021 CTC policy change on the prevalence of adolescent depression screening outcomes among adolescents attending primary care well-check appointments in a large pediatric primary care network. Specifically, we evaluated the effects of the CTC policy change in 2021 that introduced advanced monthly payments to families from July to December 2021 on the prevalence of positive depression screens, depression symptoms, and suicidal ideation. We examine the effect of an incremental “dose” of the CTC payments on families with an adolescent who was age-eligible, relative to families whose adolescent had just aged out (e.g., turned age 18) before the end of the tax year. We also explore the heterogeneity of these effects by evaluating effects among subgroups of adolescents based on health care insurance status (commercially or publicly insured) and race/ethnicity

(Non-Hispanic White, Non-Hispanic Black or Hispanic).

## 2. Methods

**Study Setting and Data Source.** The study included electronic health record (EHR) data from adolescent primary care patients at Nationwide Children’s Hospital in Columbus, Ohio. Demographic characteristics included patient age, language spoken, race/ethnicity, sex, health insurance type (publicly insured, commercial insurance, self-pay or unknown). To be included in the study, patients had to be within two age groups based on date of birth (turn age 18 first quarter of 2022 and turn age 18 last quarter of 2021). In addition, adolescents had to have completed a depression screen during a primary care well-check between January 2021 and August 2022 at a Nationwide Children’s Hospital primary care clinic (n = 13). The primary care network provides more than 200,000 patient visits per year in the Columbus metropolitan and surrounding area. The study was reviewed by the human subjects review board at Nationwide Children’s Hospital and received a waiver of informed consent.

**Exposure.** The main exposure of interest was age-eligibility for the 2021 CTC. Advance payments for the CTC were automatically sent to families over a period of 6 months around the 15th of each month, July to December 2021. Adolescents would age-out of eligibility for the CTC if they turned age 18 before the end of the calendar year (December 31st, 2021), and families would not have been sent payments for these dependents based on IRS records. Therefore, we examine two age groups for whom we expect changes in outcomes would be similar over time, but for their exposure to the additional CTC monthly payment amounts: 1) adolescents who turn age 18 the last quarter of 2021 (not age eligible), and 2) adolescent who turn age 18 the first quarter of 2022 (age eligible). These narrow age ranges were selected to minimize potential differences between the two groups and so that the two age groups would both be age 17 at the time that the advance tax credit payments and the academic school year started, which may limit the possibility that these youth were living independently, and thus unexposed to the CTC. We also assume that the number of siblings between these two groups of similarly aged adolescents would not differ, and as a result, families with an age-eligible adolescent would receive an additional per-child payment amount. Consistent with prior studies of the effects of tax credits on health outcomes, including mental health, this study uses the approach of “intent-to-treat,” and we assume that age-eligible children were “exposed” the CTC (Batra and Hamad, 2021; Muennig et al., 2020).

**Outcome Measures.** The primary outcome was a binary indicator for a positive depression screen, based on the PHQ-9A screening result documented in the EHR. Scores on the PHQ-9A range from 0 to 27 points and scores of 10 or higher were considered positive screen for depression for this study. Within the care setting, these scores receive clinical follow-up and/or referrals as indicated (Kemper et al., 2021). At primary care clinics, patients are prompted to complete the PHQ-9A annually during primary care well-check appointments through self-administered surveys on tablets. Results are documented in the patient’s EHR. A secondary outcome was “any depression symptom,” defined as any positive response to any of the individual PHQ-9A items (2/3 points on questions 1–8) or any suicidal ideation on the last item (1 + point) (Kemper et al., 2021). Finally, any suicidal ideation was also evaluated (item 9 on the PHQ-9A). Outcomes were based on patients’ first depression screen when more than one screen was available.

**Policy Period.** We evaluated the probability of each outcome across three time periods (Appendix 1), which included a “pre-policy period” (before CTC advance payments), a “policy period” (when CTC advance payments were distributed), and a “post-policy period” (after CTC advance payments ended). Outcomes were assigned to the period during which the screen was completed. These policy periods were chosen to allow for evaluation of the effects of introducing the policy, as well as evaluating whether the policy resulted in meaningful differences in

outcome that were sustained beyond the period of the advance payments (e.g., post-policy).

**Covariates.** The study included a repeated cross-sectional sample of patients completing depression screening over time. To account for possible changes in the sample composition over time that could act as potential confounders if imbalanced across time periods, we adjusted for the following demographic characteristics: sex, race/ethnicity, and primary insurance type (public, commercial, self-pay/unknown).

**Analysis.** Descriptive analyses were used to compare patient characteristics between the two age groups. We used a difference-in-difference (DID) approach using multivariable linear regression analysis. The DID approach enabled our analyses to control for secular changes that affected changes in probability of our outcomes. The DID approach is frequently used as a quasi-experimental design to strengthen causal inference and is a common analytic tool for policy evaluation. We also examined monthly trends in the outcomes of interest during June 2020–May 2021 to verify the parallel trends assumption required for DID analyses. We visually compare the differences in probabilities of our outcomes for each month and present these graphically using an event study analysis overall and by subgroup (see Fig. 1; Appendix 2–3). Our DID regression model was specified as follows:

$$Outcome_{it} = \alpha_0 + \beta_1 Age\_Cohort_i \times POLICY\_PERIOD_t + \beta_2 Age\_Cohort_i \times POST\_PERIOD_t + \beta_3 Age\_Cohort_i + \beta_4 POLICY\_PERIOD_t + \beta_5 POST\_PERIOD_t + D_{it} + e_{it}$$

For adolescent  $i$  in time period  $t$ , *Outcome* is probability of positive depression screen (or any depression symptom, or any suicidal ideation). *Age\_Cohort<sub>i</sub>* is a time-invariant indicator for the adolescent’s birth cohort group (e.g., not eligible or age-eligible). *POLICY\_PERIOD<sub>t</sub>* is a binary indicator for the policy period (1/1/2021–7/14/2021). *POST\_PERIOD<sub>t</sub>* is a binary indicator for the post-policy period (1/1/2022–8/31/2022). *D<sub>it</sub>* is a vector of individual adolescent-level covariates, which account for any changes in the study sample composition over the three time periods of interest and further reduce error variance. The key difference-in-difference parameters are  $\beta_1$  and  $\beta_2$ , which are respectively the effects of the expanded CTC policy on the outcomes of interest during and after the policy period. Consistent with assumptions for a difference-in-difference model, we use the age-out group as a comparison because we expect that, but for differences in the CTC policy changes

over this specific period, the changes in prevalence of depression between these two groups would not differ. We also explore the effects of policy changes among a-priori planned subgroups, for whom we anticipated that the effects of the policy change may differ. Analyses were repeated among subgroups separately by race/ethnicity (Non-Hispanic White, non-Hispanic Black, and Hispanic) and insurance status (public or private/commercial insurance). Prior to conducting subgroup analyses we tested the significance of second order interactions in our models that included all patients and the second order interaction for insurance status was not significant ( $p = 0.44$ ), while the second order interaction for race/ethnicity was significant ( $p = 0.04$ ). Analyses were conducted in Stata 16.0. We also conduct a sensitivity analysis where we omitted the post-policy period from our model and evaluate shortened periods leading up to and including the policy change (pre-policy: 3/1/2021–7/14/2021 vs. policy period: 7/15/2021–11/30/2021), to examine whether effects are sensitive to the length of time periods or initial versus delayed effects of the CTC advance payments.

### 3. Results

A total of 1,423 adolescents had a primary care well-check and were screened for depression during the study period and were included in our study sample ( $n = 774$  age-eligible adolescents;  $n = 649$  not age-eligible for 2021 CTC) (Table 1). Overall, 15.9 % screened positive for depression, 40.0 % had any depression symptom, and 8.9 % had any suicidal ideation. There were some demographic differences between the two age groups, with a higher proportion of those who were in the older age group (not CTC eligible) being of Hispanic ethnicity or Spanish speaking compared to the younger age group (CTC eligible) (Table 1). We found no evidence that the assumption of parallel trends for monthly probability of our outcomes, during the three months leading up to the pre-policy period (November to December 2020) and through the pre-policy period (January to June 2021), was violated for the main study outcome (positive depression screen) or secondary outcomes (any depression symptom, any suicidal ideation),  $p$ -value = 0.31,  $p$ -value = 0.45, and  $p$ -value = 0.06, respectively. Descriptive statistics for outcomes across policy periods are presented (Table 2).

In our main difference-in-differences model, we did not observe a significant interaction between age group and policy periods for the

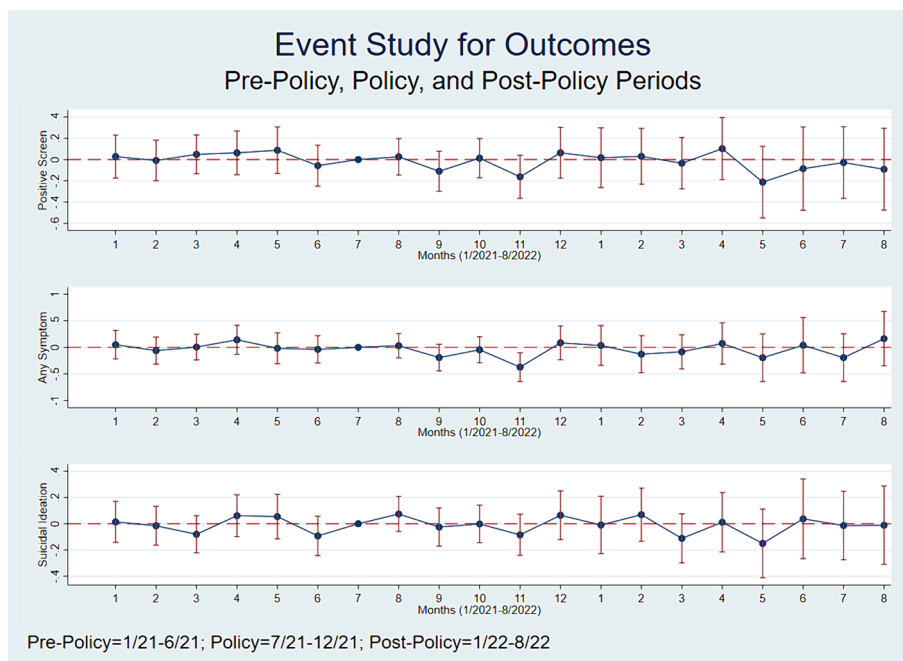


Fig. 1. .Event Study Analysis for Positive Screen, Any Symptom, and Suicidal Ideation.

**Table 1**  
Descriptive Statistics for Adolescent Patients in Primary Care Who Were or Were not Age Eligible for the Child Tax Credit in 2021.

	Not Age Eligible (N=649) n (%)	Age Eligible (N=774) n (%)	Overall (N=1,423) n (%)
<b>Sex</b>			
Female	350 (53.9)	433 (55.9)	783 (55.0)
Male	299 (46.1)	341 (44.1)	640 (45.0)
<b>Race/Ethnicity</b>			
NH White	109 (16.8)	141 (18.2)	250 (17.6)
Hispanic	131 (20.2)	115 (14.9)	246 (17.3)
NH Black	342 (52.7)	428 (55.3)	770 (54.1)
Other	67 (10.3)	90 (11.6)	157 (11.0)
<b>Language Spoken</b>			
English	452 (69.6)	549 (70.9)	1001 (70.3)
Other	45 (6.9)	55 (7.1)	100 (7.0)
Somali	40 (6.2)	75 (9.7)	115 (8.1)
Spanish	112 (17.3)	95 (12.3)	207 (14.5)
<b>Period</b>			
Pre-policy	274 (42.2)	324 (41.9)	598 (42.0)
Policy	266 (41.0)	324 (41.9)	590 (41.5)
Post-policy	109 (16.8)	126 (16.3)	235 (16.5)
<b>Primary Insurance</b>			
Commercial	99 (15.3)	111 (14.3)	210 (14.8)
Other/Unknown	31 (4.8)	33 (4.3)	64 (4.5)
Public	486 (74.9)	606 (78.3)	1092 (76.7)
Self-pay	31 (4.8)	22 (2.8)	53 (3.7)
Missing	2 (0.3)	2 (0.3)	4 (0.3)

**Table 2**  
Descriptive Statistics of Study Outcomes for Adolescent Patients in Primary Care Who Were or Were not Age Eligible for the Child Tax Credit in 2021.

	Not Age Eligible	Age Eligible	Overall
	Mean (SD)	Mean (SD)	Mean (SD)
<b>Positive Depression Screen</b>			
Pre-policy	0.190 (0.393)	0.214 (0.410)	0.203 (0.403)
Policy	0.144 (0.352)	0.105 (0.307)	0.123 (0.329)
Post-policy	0.157 (0.366)	0.129 (0.337)	0.142 (0.350)
<b>Any Depression Symptom</b>			
Pre-policy	0.458 (0.499)	0.467 (0.500)	0.463 (0.499)
Policy	0.403 (0.491)	0.328 (0.470)	0.362 (0.481)
Post-policy	0.352 (0.480)	0.306 (0.463)	0.328 (0.470)
<b>Suicidal Ideation</b>			
Pre-policy	0.117 (0.322)	0.102 (0.303)	0.109 (0.312)
Policy	0.061 (0.240)	0.062 (0.241)	0.061 (0.240)
Post-policy	0.102 (0.304)	0.081 (0.273)	0.091 (0.288)

primary outcome of positive depression screen or secondary outcomes of any depression symptom or any suicidal ideation (Table 3). Results were unchanged in our sensitivity analysis that omitted the post-policy period from the model and included shortened pre-policy and policy periods (Appendix 4).

In subgroup analysis among adolescents with public insurance or commercial insurance, results were largely consistent with the findings in the overall sample with some exceptions (Table 4). Among those who had public insurance, the policy effect of the CTC advance payments was associated with a 9.7 percentage point reduction in the probability of a positive depression screen ( $p = 0.04$ ) and results were similar in sensitivity analyses (12.5 percentage point decrease,  $p = 0.02$ ) (Appendix 5). However, there were no significant differences associated with the

**Table 3**  
Estimated Effects of the Child Tax Credit Advance Payments on Depression and Suicidal Ideation for Adolescent Primary Care Patients.

	Coefficients for DID N=1,423		
	$\beta$	(95 % CI)	CI
<b>Positive Depression Screen</b>			
$\beta_1$	-0.063	(-0.145, 0.019)	0.019
$\beta_2$	-0.035	(-0.144, 0.074)	0.074
<b>Any Depression Symptom</b>			
$\beta_1$	-0.083	(-0.192, 0.027)	0.027
$\beta_2$	-0.035	(-0.180, 0.111)	0.111
<b>Suicidal Ideation</b>			
$\beta_1$	0.018	(-0.046, 0.081)	0.081
$\beta_2$	0.002	(-0.083, 0.087)	0.087

Note: Time periods include pre-policy period (1/1/2021–7/14/2021), policy period ( $\beta_1$ , 7/15/2021–12/31/2021) and post-policy period ( $\beta_2$ , 1/1/2022–8/31/2022);  $\beta_1 = \text{Age Cohort} \times \text{Policy Period}$ ,  $\beta_2 = \text{Age Cohort} \times \text{Post Period}$ ; Covariates in all models included sex, race/ethnicity, and insurance type.

**Table 4**  
Estimated Effects of the Child Tax Credit Advance Payments on Depression and Suicidal Ideation for Adolescent Primary Care Patients, by Insurance Status.

	Public Insurance N=1,092		Private Insurance N=210	
	$\beta$	(95 % CI)	$\beta$	(95 % CI)
<b>Positive Depression Screen</b>				
$\beta_1$	-0.097	(-0.188, -0.006)*	0.005	(-0.215, 0.224)
$\beta_2$	-0.043	(-0.165, 0.079)	-0.053	(-0.334, 0.229)
<b>Any Depression Symptom</b>				
$\beta_1$	-0.092	(-0.215, 0.030)	-0.087	(-0.363, 0.189)
$\beta_2$	-0.034	(-0.199, 0.131)	0.031	(-0.322, 0.385)
<b>Any Suicidal Ideation</b>				
$\beta_1$	-0.013	(-0.082, 0.056)	0.123	(-0.056, 0.301)
$\beta_2$	-0.014	(-0.106, 0.079)	0.003	(-0.225, 0.231)

Note: Time periods include pre-policy period (1/1/2021–7/14/2021), policy period ( $\beta_1$ , 7/15/2021–12/31/2021) and post-policy period ( $\beta_2$ , 1/1/2022–8/31/2022);  $\beta_1 = \text{Age Cohort} \times \text{Policy Period}$ ,  $\beta_2 = \text{Age Cohort} \times \text{Post Period}$ ; Covariates in all models included sex and race/ethnicity; \* $p < 0.05$ .

policy change for other secondary outcomes or among those with private insurance.

In analyses stratified by race/ethnicity, among Non-Hispanic Black adolescents, there was a significant reduction in the probability of a positive depression screen associated with the policy change (13.4 % reduction,  $p = 0.01$ ), as well as a significant effect in the post-policy period relative to the pre-policy period (18.5 % reduction,  $p = 0.01$ ) (Table 5). The effect was similar in sensitivity analyses that omitted the post-policy period from the model (13.0 % reduction,  $p = 0.03$ ) (Appendix 5). However, changes in other secondary outcomes for all racial/ethnic subgroups were not significant, and there were no significant changes in the probability of a positive depression screen among Non-Hispanic White or Hispanic adolescents.

#### 4. Discussion

Among older adolescents attending well-check appointments at a large pediatric primary care network in central Ohio, we did not find a significant effect of the CTC policy shift in monthly advance payments on depression screening outcomes in our overall sample. Yet, there was a significant effect of the policy on reduced probability of positive



**Table 5**  
Estimated Effects of the Child Tax Credit Advance Payments on Depression and Suicidal Ideation for Adolescent Primary Care Patients, by Race/Ethnicity.

	Non-Hispanic White N=250		Non-Hispanic Black N=770		Hispanic N=246	
	$\beta$	(95 % CI)	$\beta$	(95 % CI)	$\beta$	(95 % CI)
<b>Positive Depression Screen</b>						
$\beta_1$	0.027	(-0.202, 0.256)	-0.134	(-0.240, -0.027)*	0.081	(-0.102, 0.265)
$\beta_2$	0.147	(-0.128, 0.422)	-0.185	(-0.333, -0.037)*	0.004	(-0.237, 0.246)
<b>Any Depression Symptom</b>						
$\beta_1$	-0.043	(-0.322, 0.236)	-0.089	(-0.236, 0.058)	-0.015	(-0.280, 0.251)
$\beta_2$	0.107	(-0.228, 0.442)	-0.122	(-0.327, 0.083)	-0.041	(-0.390, 0.308)
<b>Any Suicidal Ideation</b>						
$\beta_1$	0.090	(-0.095, 0.275)	0.013	(-0.070, 0.096)	-0.005	(-0.143, 0.133)
$\beta_2$	0.191	(-0.031, 0.413)	-0.113	(-0.229, 0.003)	0.069	(-0.113, 0.250)

Note: Time periods include pre-policy period (1/1/2021–7/14/2021), policy period ( $\beta_1$ , 7/15/2021–12/31/2021) and post-policy period ( $\beta_2$ , 1/1/2022–8/31/2022);  $\beta_1 = \text{Age Cohort} \times \text{Policy Period}$ ,  $\beta_2 = \text{Age Cohort} \times \text{Post Period}$ ; Covariates in all models included sex and insurance type; \*p = 0.01.

depression screens for both Non-Hispanic Black adolescents and adolescents enrolled in public insurance. This study is the first, to our knowledge, to evaluate adolescent mental health outcomes of anti-poverty tax policy changes in the United States. Importantly, we evaluated changes in outcomes using adolescent-reported mental health measures that were collected in real time as the policy changes occurred, and we took advantage of age-eligibility for the CTC as a natural experiment to compare changes in outcomes among adolescents who were age eligible relative to those who had aged out of the credit. Contrary to our expectations, we did not observe a significant protective effect of the policy on adolescent depression screening outcomes in the overall sample. However, subgroup analyses indicate that there may be some adolescents who benefited from the policy change, suggesting these subgroups merit further attention.

Although the potential mental health benefits of anti-poverty tax credits have been explored extensively among adults (Boyd-Swan et al., 2016; Batra et al., Jan 2023; Courtin et al., 2022; Collyer et al., 2022); fewer studies have evaluated these outcomes among children or adolescents (Batra and Hamad, Jun 2021). Our results did not find an overall benefit for adolescents in the outcomes we measured, which is in contrast with one prior study of the positive effects of expansions of the CTC on child behavior problems (Rostad et al., 2019). However, this previous study used a longitudinal survey study, did not specifically focus on adolescents, and evaluated parent-reported behavioral health outcomes (Rostad et al., 2019). These methodological differences could explain the differences from our findings. Yet, we cannot rule out the possibility that our failure to observe a significant effect was due to lack of statistical power. It is also possible that the duration of the 2021 CTC advance payments was too short to meaningfully improve household financial stability, and as a result, may not have translated to meaningful reductions in all adolescent depression measures. Moreover, parent perceptions of adolescent mental health and functioning could differ from what adolescents report themselves. Evidence regarding changes in material hardship following the CTC advance payments is somewhat mixed (Parolin et al., 2021; Collyer et al., 2022; Pilkauskas et al., 2022); though there appear to have been effects for reduced food insecurity (Shafer et al., 2022; Kovski, 2022; Parolin et al., 2022). Qualitative research among parents or caregivers regarding their experiences with

these policies could improve our understanding of the effects of changes in anti-poverty tax policies on adolescent mental health.

We observed a significant reduction in the probability of a positive depression screen among publicly insured and Non-Hispanic Black adolescents, who were age eligible for the CTC relative to those not age eligible. Differential effects of anti-poverty tax credits like the Earned Income Tax Credit (EITC) by race/ethnicity have been identified previously, with some prior studies finding a greater benefit for birth outcomes among Black infants and improved health behaviors among Black mothers, relative to their White counterparts (Markowitz et al., 2017; Komro et al., 2019). Moreover, although the CTC advance payments were available to both low- and middle- income tax filers with child dependents, the increased monthly income may have provided greater relief to financial distress and improvements in mental health symptoms for low income households, who may have gained more from the income supports of the CTC (Pilkauskas et al., 2022; Andrade et al., 2017). For example, children of color were disproportionately excluded for the CTC prior to 2021, due to long-standing inequities in which Black children are over-represented among families making too little income to qualify for the CTC prior to 2021. Thus, their families may have experienced greater financial relief when the monthly payments were available, which could contribute to the reduction in positive depression screening we observed for Black adolescents. Nevertheless, our study relied on a relatively small sample of adolescents meeting our eligibility criteria who had primary care visits within the study time frame, which may have limited our ability to detect small to moderate effects in other subgroups. Future research could evaluate whether the associations we identified for adolescent depression outcomes among publicly insured or non-Hispanic Black adolescents hold in larger samples.

There are some potential limitations to the present study that merit consideration. First, this analysis used an intent-to-treat approach, and we did not have information on the tax filing status of adolescents' caregivers. Therefore, not all adolescents in our sample may have been eligible for or received a CTC advance payment, and as a result, our estimates of the effects of the policy change are likely to be conservative. There are many reasons a family may not have received the CTC advance payments, such as not having filed taxes in previous years (due to no or very low income) or not having an updated address or bank account for the CTC payments to be delivered either by mail or direct deposits. However, CTC advance payments were dispersed to more than 2.1 million children in Ohio (U.S. Department of Treasury, 2021), and with an estimated statewide population of more than 2.5 million children under 18 in 2021, this would indicate that more than 80 percent of children in Ohio received CTC advance payments. Second, our study population included adolescents who had attended a well-check appointment during the study period, and not all adolescents regularly attend preventive health care visits. Thus, we are not able to determine whether our findings would generalize to community samples or other settings. However, our study findings are relevant for health care systems, particularly those that are increasingly engaged in efforts to address social determinants of health through screening and connecting patients and families to community resources. Finally, our comparison group of similarly aged adolescents who had "aged out" of their family's receiving the per-child CTC, makes some assumptions. We assume that on average the two groups of adolescents did not differ in number of other eligible siblings in the household. Unfortunately, we do not have data to empirically test this assumption, which could attenuate our findings due to measurement error. By selecting adolescents so close in age (<6 months difference in age), we assume that they are otherwise similar to their age-eligible peers, however we cannot rule out the possibility of other unknown differences between these groups that could influence our findings.

The policy changes introduced to the CTC in 2021 were substantial and impacted millions of families and adolescents nationwide. Our analysis took advantage of this policy shift as a natural experiment, and our use of real-world clinical data offers an examination of the potential

implications of this policy shift for adolescent mental health. Although we did not observe changes in outcomes as hypothesized for our overall primary care sample, we did observe that there may be some subgroups for whom this policy change had a greater impact. Future studies should replicate these findings in a larger sample, particularly among the most socioeconomically disadvantaged families, for whom the CTC may have had the greatest benefit.

### CRedit authorship contribution statement

**Laura J. Chavez:** Funding acquisition, Formal analysis, Conceptualization. **Andreas A. Teferra:** Writing – review & editing, Project administration, Formal analysis. **Rose Hardy:** Writing – review & editing, Project administration, Methodology, Conceptualization. **Tansel Yilmazer:** Writing – review & editing, Project administration, Methodology, Conceptualization. **Jennifer Cooper:** .

### Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The authors have no conflicts of interest to report. This work was supported by the Doris Duke Foundation as part of the Innovations in Cash Assistance for Children Initiative, administered through the Urban Institute to Dr. Chavez. The funder had no role in the design and conduct of the study, data collection and management, analysis or interpretation of findings.

### Data availability

The authors do not have permission to share data.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2024.102811>.

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