

Adverse long-term effects of criminal legal system involvement on mental health in adulthood among a longitudinal cohort of youth in the USA

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► Additional supplemental material is published online only. To view, please visit the journal online (<https://doi.org/10.1136/jech-2026-226202>).

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Received 9 March 2026
Accepted 25 September 2026

ABSTRACT

Background Despite an established association of criminal legal system (CLS) involvement with poor mental health, it has been challenging to estimate a long-term causal effect among youth. This study examined the effects of CLS involvement on mental health outcomes among youth in the USA over 10 years.

Methods We used data from 5611 youth from the National Longitudinal Survey of Youth 1997 (2000–2010). Using the parametric g-formula, we estimated the risks of (1) depressive symptoms (defined by the Mental Health Inventory 5-item version) and (2) self-reported emotional, mental health or psychiatric problems at the end of the study, adjusted for confounding. To quantify the effect of CLS involvement, we calculated differences in the risks under the natural course of CLS involvement vs under two interventions: (1) removing arrests and incarcerations ('no CLS involvement') and (2) removing incarcerations only, with 95% CI derived from 300 bootstrap samples.

Results The end-of-follow-up risk was 9.5% for both depressive symptoms and mental health problems under the natural course of CLS involvement. The 'no CLS involvement' intervention was estimated to lower the risks for depressive symptoms and mental health problems by 0.4 (95% CI –0.8 to –0.04) and 0.6 (95% CI –1.0 to –0.3) percentage points, respectively. The estimates for 'no incarceration' did not provide evidence of an effect.

Conclusion Our findings support the hypothesis that CLS involvement, especially arrests, contributes to poor mental health among youth in adulthood and reaffirms that CLS involvement is a social determinant of mental health in this population.

INTRODUCTION

Juvenile interactions with the criminal legal system (CLS) are common in the USA; at least 1 in 100 people under age 18 was arrested in 2020.¹ CLS contacts, regardless of the nature or severity, are negatively associated with mental health outcomes, with such associations reported among general adult populations and among youth.^{2–12} There are multiple theoretical explanations for these associations. First, CLS encounters may be distressing; for example, police encounters can be violent and traumatic.¹³ Second, individuals with CLS contacts may experience social deprivation through stigmatisation, disrupted family relationships and employment difficulties.^{14–16} Social deprivation may be

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The association between interactions with the criminal legal system (CLS) and poor mental health outcomes is well-established in the USA, but it remains challenging to investigate a long-term causal effect from CLS involvement among youth due to limitations in existing observational studies, many of which are cross-sectional or, if longitudinal, do not account for treatment-confounder feedback (ie, how CLS involvement and mental health affect each other over time).

WHAT THIS STUDY ADDS

⇒ This study is the first application of the parametric g-formula to address bias from treatment-confounder feedback in research on CLS involvement and mental health. We provide causal evidence of modestly increased risks for depressive symptoms and mental health problems in adulthood among youth with CLS involvement over a 10-year period, demonstrating long-term harm to mental health from CLS involvement over the life course.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ CLS involvement is a salient social determinant of mental health in the youth population. Negative, long-term public health consequences must be considered in policymaking that affects the chance of youth and young people having contact with the CLS, especially among those most disproportionately exposed to the CLS.

biologically embodied as poor health over the life course (as suggested by the ecosocial theory)¹⁷; it may also contribute to stress and chronic strains, which can affect mental health (stress process paradigm).¹⁸ Given these potential harms, it is unsurprising that some scholars caution long-lasting health impacts of CLS involvement among young people.¹⁹

Despite a strong theoretical underpinning, it has been challenging to unbiasedly quantify the mental health impact of CLS involvement among youth over the life course and to document a causal relationship. Many studies have used cross-sectional data with an ambiguous temporal relationship



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To cite: Chan PY, Shahn Z, Wyka K, et al. *J Epidemiol Community Health* Epub ahead of print: [please include Day Month Year]. doi:10.1136/jech-2026-226202

between CLS involvement and mental health and were insufficient for inferring causality.^{2 3 5-7} Furthermore, although CLS involvement is often a repeated event over the life course,^{20 21} one-time measurement of CLS involvement dominates the literature,^{2 3 5-7 12} providing limited insights on how accumulation of CLS encounters impacts mental health as youth transition into adulthood.

To date, a few studies have used longitudinal data with repeated measurement of CLS involvement to investigate the CLS involvement-mental health relationship among youth.⁸⁻¹⁰ These longitudinal studies, despite being conducted with methodology that strengthens causal inference, may have biased findings due to neglecting how CLS involvement and mental health histories can affect each other as well as covariates over time, an issue in epidemiology known as treatment-confounder feedback loop.^{22 23} Briefly, this issue arises because earlier CLS encounters may impact subsequent socioeconomic status, mental health and other confounders, which may in turn affect the subsequent likelihood of CLS encounters and later mental health.

Understanding the causal effects of youth CLS involvement on mental health in adulthood has important public health and policy implications, including improving programmes addressing health needs of people with prior CLS involvement, documenting long-term impacts of structural racism—a root cause of CLS involvement—on population health,²⁴ and informing CLS policy reform from a public health perspective. To better understand the effects, we examined a national cohort of youth from the National Longitudinal Survey of Youth 1997 (NLSY97) over a 10-year period. We applied the parametric g-formula,²² a method for addressing treatment-confounder feedback loops, to estimate the risks of select mental health outcomes under specific trajectories of arrest and incarceration. By comparing the estimated risks of these outcomes under the natural course of CLS involvement and under hypothetical interventions of removing CLS encounters, we quantified the effects of CLS involvement on mental health.

METHODS

Data source

We analysed the public use dataset of the NLSY97 in this study. The NLSY97 is an ongoing longitudinal study among 8894 youth born between 1980 and 1984, sampled from 6819 US households. The respondents were first interviewed in 1997 (between 12 and 18 years of age) and were followed annually until 2010 and biennially after. The NLSY97 collects data on various topics, including education, employment, marriage, income, health and CLS involvement.

Study population

We created a cohort from the NLSY97 of 5611 individuals followed from 2000 through 2010 and with personal information available every 2 years (figure 1). We chose a study period between 2000 and 2010 because mental health questions were asked biennially in this period. We included respondents interviewed in 2000 and with data on CLS involvement history between 2000 and 2002 (between time 0 (baseline) and time 1). We randomly selected one person for households with multiple respondents to ensure no spillover effect of CLS involvement on mental health within the same household. Individuals identified as other race and non-Hispanic (n=222) were excluded given the small number and our inclusion of interaction terms between CLS exposure and race/ethnicity in the analysis. After baseline, 3.8–8.5% of the respondents were censored at each time point

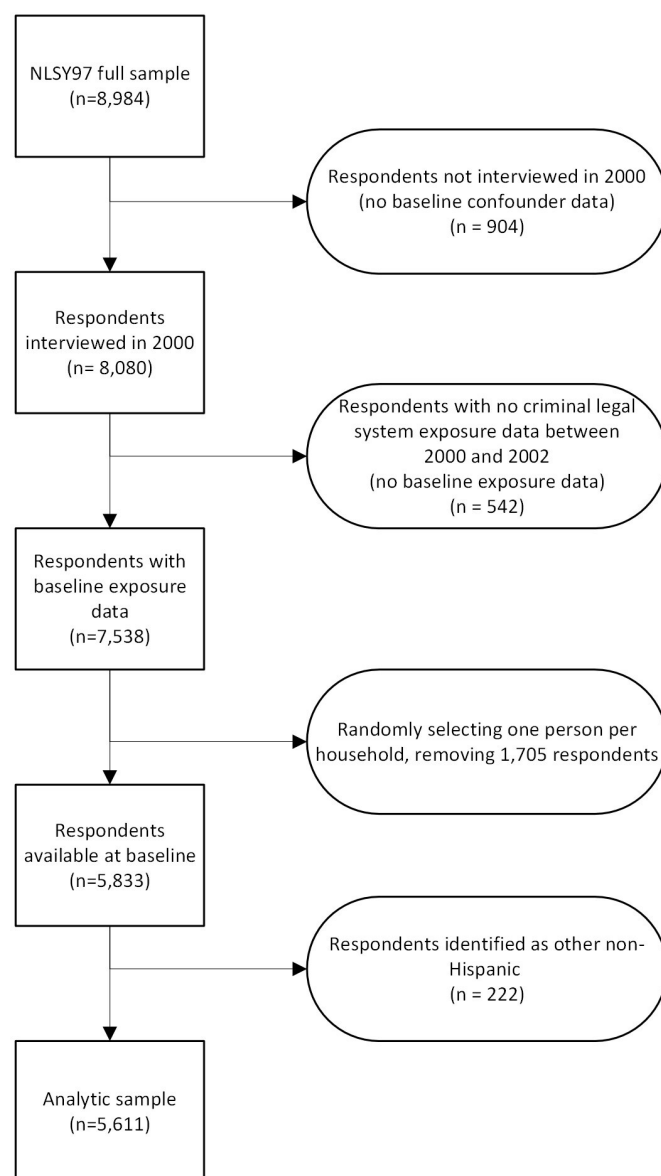


Figure 1 Flowchart for creating the analytical sample. NLSY97, National Longitudinal Survey of Youth 1997.

due to non-response and 4424 (79%) remained uncensored through the end of the study.

CLS exposures

We used two time-varying, binary exposure variables that measured whether a respondent had experienced any (1) arrest or (2) incarceration during each 2-year interval between 2000 and 2010. They were defined using a series of questions in the NLSY97 where respondents provided their arrest and sentencing history since the previous interview. Additionally, we enhanced incarceration status using information of current residence (whether a respondent reported being in jail or prison). Incarceration status was largely nested within the arrest status variable because a person could be incarcerated only after getting arrested. However, there were instances where a person was not arrested but incarcerated in a period, for example, when the person was arrested in the previous period and received an incarceration sentence in the current period.

Outcomes

We measured two binary outcomes at the end of the study period (2010), depressive symptoms and mental health problems. We defined depressive symptoms using a score of 52 or lower in the Mental Health Inventory 5-item version (MHI-5) (0–100), which measured the frequency (all, most, some or none of the time) of feeling (1) happy, (2) nervous, (3) calm and peaceful, (4) downhearted and blue and (5) down in the past month.²⁵ A cut-off of 52 has been used to detect severe depressive symptoms in prior research.²⁶ We defined mental health problems by an affirmative response to either one of the self-reported items: (1) an emotional, mental health or psychiatric problem treated by a mental health professional in the past 12 months or (2) an untreated emotional, mental or psychiatric problem that caused the respondent to miss at least one full day of usual activities in the past 12 months.

Confounders

We selected confounders based on substantive knowledge about the association between CLS involvement and mental health. Our time-fixed confounders, measured at or before baseline, included sex, race/ethnicity, household poverty level, prior arrest, prior participation in illegal activities, presence of both

parents at residence and parental educational attainment. Our time-varying confounders were measured every 2 years between 2000 and 2008 and preceded exposure measurement (eg, for CLS involvement between 2000 and 2002, confounders were measured in 2000). They included age, marital status, childbearing status, school enrolment, educational attainment, full-time employment, participation in any government welfare programmes, illicit drug use, low social support, binge drinking and history of depressive symptoms (see [table 1](#) for confounder definitions).

Statistical analysis

Imputation

Most variables contained little missing data ($\leq 5\%$, except for parental education attainment and household poverty level, of which 7% and 25% were missing, respectively). We singly imputed missing data before performing the parametric g-formula to increase statistical power. The approach of single imputation within bootstrap samples has been employed previously in g-formula analysis.²⁷ Though due to practicality, we performed imputation before bootstrapping. We conducted imputation for each time point sequentially among those not censored using

Table 1 Definitions of time-fixed and time-varying confounders

Variable	Definition	Variable type
Time-fixed confounders		
Sex	Biological sex, measured in 1997	Binary
Race/ethnicity	Race and ethnicity status, measured in 1997	Categorical (black non-Hispanic, Hispanic, white non-Hispanic)
Prior arrest	Ever arrested before 2000	Binary
Prior participation in illegal activities	Ever participated in the following activities before 2000 (ranging from 0 to 5): (1) destroying property, (2) stealing >US\$50, (3) committing other property crime, (4) assaulting someone and (5) selling illegal drugs	Categorical (0, 1, 2+)
Household poverty level	Ratio of household income to federal poverty level in the previous year, measured in 1997	Categorical (<100%, 100% to <200%, 200+%)
Presence of both parents at residence	Had both parents (who might not be biological parents) in the household based on the household roster information in 1997	Binary
Parental educational attainment	Educational attainment of residential parents (who might not be biological parents), taking the highest among the two, measured in 1997. If only one parent's information is available, take the information as is	Categorical (below high school, high school graduate, some college, college graduate)
Time-varying confounders*		
Age	Age at interview	Continuous
Marital status	Married at the time of interview	Binary
Childbearing status	Had any biological children (regardless of living in the same household or not) at the time of interview	Binary
School enrolment	Enrolled in school at the time of interview	Binary
Educational attainment	Number of years of education completed at the time of interview	Categorical (below high school (<12 years), high school graduate (12 years), some college (13–15 years), college graduate (16+ years))
Full-time employment	Whether the average weekly number of hours worked in the previous year was at least 35 hours	Binary
Welfare programme participation	Participated in any government welfare programme in the previous year	Binary
Illicit drug use	Used 'hard' drugs or other substances not prescribed by a doctor since the last interview (excluding marijuana and alcohol)	Binary
Low social support	A positive status was given to respondents who reported no one to turn to when there was an emotional or personal relationship problem	Binary
Binge drinking	Had at least five drinks for male respondents and four drinks for female respondents on one occasion in the past 30 days	Binary
Depressive symptoms (history)	Whether the MHI-5 score ≤ 52 . The MHI-5 measured the frequency (all, most, some or none of the time) of feeling (1) happy, (2) nervous, (3) calm and peaceful, (4) downhearted and blue and (5) down in the past month and was standardised into a scale of 0–100.	Binary

*Time-varying confounders were measured in 2000, 2002, 2004, 2006 and 2008.
MHI-5, Mental Health Inventory 5-item version.

chained equation. In general, we included all time-fixed variables, all concurrent and previous (both imputed and observed) time-varying variables and 2-way interactions between the exposure variables and sex or race/ethnicity in imputation. The R *mice* package was used.²⁸

Parametric g-formula

We applied the parametric g-formula to estimate the outcome risks under two hypothetical interventions, (1) no arrest nor incarceration ('no CLS involvement') and (2) no incarceration, and compared them to outcome risks under the natural course of CLS exposure over the study period. The first intervention removed both arrests and incarcerations, whereas the second allowed a natural course of arrests but removed all incarcerations. The resulting risk differences quantified the effect of (1) CLS involvement or (2) incarceration alone on the outcomes.

Details about implementing the parametric g-formula have been described elsewhere.²² Briefly, we first used the observed data to model the time-varying confounders, exposures and the end-of-follow-up outcomes as a function of the time-fixed confounders and the history of the time-varying confounders and exposures. Next, we applied the model fit to simulate population trajectories and obtain outcome risks under the natural course of the exposures and under the interventions with 10 000 randomly sampled (with replacement) persons from the study population. We calculated the risk differences between the natural-course and intervention scenarios of the exposures and obtained the 95% CIs with 300 bootstrap samples.

Generally, all models of confounders and exposures included the following predictors: all time-fixed variables, all time-varying variables at the previous (t-1) and, if already modelled, the current (t) time points, quadratic function of time, and interactions between CLS exposures and sex, between CLS exposures and race/ethnicity, between school enrolment and age and between educational attainment and age. The outcome model did not require time as a predictor and was otherwise similarly specified (see table 2 for details in model specification and the order in which the time-varying variables were modelled). Logistic and multinomial logistic models were used to model binary variables and categorical variables, respectively. We examined model misspecification by comparing the natural-course outcome risk estimates from g-formula to the observed risks and by comparing the means of the simulated confounder and exposure data against the observed means through plotting.^{29 30} The parametric g-formula applies an implicit intervention of no censoring to account for informative censoring (by assuming exchangeability for censoring conditional on our measured covariates). Thus, the observed data (where there was censoring) were weighted to the inverse probability of censoring (IPC) to ensure proper comparison with the g-formula estimates (where there was no censoring) (see table 2 for censoring model specification).³⁰

We used the R *gfoRmula* package.³¹ We did not incorporate the NLSY97 survey weights in this analysis due to limitation of the package, so effect estimates pertain to the analytical sample and not necessarily to the broader NLSY97 target population.

Sensitivity analyses

We conducted multiple sensitivity analyses. First, we conducted a complete case analysis excluding respondents with incomplete data at each time point (treated as censored) (baseline n=3719). Second, we explored different ways of specifying histories of confounders and exposures, including using (1) the cumulative

Table 2 Parametric g-formula model specification

Variable	Model specification
Time-varying confounders and exposures*	▶ Time-fixed confounders. ▶ Time-varying age and its quadratic term.† ▶ Time-varying confounders and both CLS exposure variables at t were included only after they have been simulated. ▶ Time-varying confounders, except educational attainment‡, and both CLS exposure variables at t-1. ▶ Quadratic function of time. ▶ 2-way interaction between CLS exposure§ at t-1 and sex or race/ethnicity. ▶ 2-way interaction between educational attainment or school enrolment¶ and age at t.
Outcome (t=4)	▶ Time-fixed confounders. ▶ Age at t=4 and its quadratic term. ▶ Time-varying confounders and both CLS exposure variables at t. ▶ Time-varying confounders, except educational attainment, and both CLS exposure variables at t-1. ▶ 2-way interaction between CLS exposure§ at t and sex or race/ethnicity. ▶ 2-way interaction between educational attainment or school enrolment at t and age at t.
Censoring	▶ Time-fixed confounders. ▶ Time-varying age and its quadratic term.† ▶ Time-varying confounders and both CLS exposure variables at t. ▶ Time-varying confounders, except educational attainment, and both CLS exposure variables at t-1. ▶ Quadratic function of time. ▶ 2-way interaction between CLS exposure§ at t and sex or race/ethnicity. ▶ 2-way interaction between educational attainment or school enrolment at t and age at t.
*We modelled in the order of demographic characteristics, socioeconomic status and mental health risk factors regardless of the hypothetical intervention and the outcome of interest. Specifically, we modelled in the following order: marital status, childbearing status, school enrolment, educational attainment, full-time employment, programme participation, illicit drug use, low social support, binge drinking and history of depressive symptoms. We modelled the exposure variables, arrest and then incarceration, after simulating all the confounders. †The R <i>gfoRmula</i> package does not allow inclusion of time-varying variables that do not require modelling. As such, we could not use the actual ages at which the interview took place at each time point. We instead included an approximate age at each time point (t) by adding $2 \times t$ years to the age at time 0 (2000 interview). ‡When educational attainment at t was included, educational attainment at t-1 was excluded because of the high collinearity between the two variables. §A binary indicator for being arrested or incarcerated was used. ¶Educational attainment or school enrolment at t if the variables were already simulated or else at t-1. CLS, criminal legal system.	

average up to t-1 and (2) the values at both t-1 and t-2. Third, we explored six other sequences of the time-varying confounders being modelled (including three random sequences). Fourth, we repeated the analysis for the outcome of mental health problems using the measurement from 2011 instead of 2010. Fifth, we replaced the definition of depressive symptoms (for both the outcome and confounder) with an MHI-5 score of 60 or lower, which has been used to detect moderate to severe depressive symptoms.²⁶

RESULTS

Baseline characteristics

The 5611 respondents in this study were fairly similar to those excluded from the study (n=3373) in select characteristics measured in 1997, except for race/ethnicity (other non-Hispanic persons: 0% vs 9.9%; white non-Hispanic persons: 51.8% vs

Table 3 Baseline characteristics of the study population, overall and by censoring status (n=5611)

Characteristics	% or mean (SE)		
	Overall (n=5611)	Not censored (n=4424)	Censored (n=1187)
Age (years)	17.9 (1.4)	17.9 (1.4)	17.9 (1.5)
Sex			
Female	49.3	51.5	41.0
Male	50.7	48.5	59.0
Race/ethnicity			
Black non-Hispanic	27.2	27.8	24.9
Hispanic	21.0	20.6	22.5
White non-Hispanic	51.8	51.6	52.6
Household's federal poverty level%			
<100%	23.0	23.1	22.8
100–199%	21.0	21.4	19.5
200+%	55.9	55.5	57.6
Prior history of arrests	19.2	18.1	23.5
Prior participation in illegal activities (0–5)*			
0	45.5	45.8	44.1
1	24.3	24.9	22.3
2+	30.2	29.3	33.5
Presence of both parents at residence	63.9	63.7	64.4
Parental educational attainment			
Less than high school graduate	17.8	17.7	18.3
High school graduate	31.7	31.6	32.1
Some college or associate degree	25.6	25.7	25.4
College graduate	24.9	25.1	24.2
Married	2.6	2.8	1.8
Childbearing status	9.0	9.0	8.8
School enrolment	66.9	67.9	63.1
Educational attainment			
Less than high school graduate	62.5	62.2	63.6
High school graduate	25.2	25.4	24.6
Some college or associate degree	12.3	12.4	11.7
College graduate	0.0	0.0	0.1
Full-time employment	10.0	10.0	10.2
Participating in welfare programmes	7.0	7.3	6.0
Illicit drug use	6.8	6.8	6.8
Low social support	4.1	3.8	5.0
Binge drinking	21.4	21.2	22.1
Depressive symptoms	13.8	14.2	12.4
Arrested or incarcerated between time 0 and time 1	11.0	10.1	14.7
Arrested between time 0 and time 1	10.6	9.8	13.6
Incarcerated between time 0 and time 1	3.0	2.2	5.7

*Including destroying property, stealing >US\$50, committing other property crime, assaulting someone and selling illegal drugs (possible range=0–5).

44.7%) and household poverty level (income at 200+% of the federal poverty level: 43.0% vs 36.6%) (online supplemental table 1).

At baseline, the study population was on average 18 years old and were evenly split between female and male respondents (table 3). The majority were white non-Hispanic individuals (51.8%), lived in households with income at least 200% of the federal poverty level (55.9%) and lived with both parents (63.9%). A quarter (24.9%) had at least one parent with a college degree. Marriage (2.6%) and having any child (9.0%) were uncommon, so were full-time employment (10.0%) and participating in welfare programmes (7.0%). With respect to

mental health risk factors, illicit drug use (6.8%) and low social support (4.1%) were rare, whereas binge drinking (21.4%) and severe depressive symptoms (MHI-5 score ≤ 52) (13.8%) were more prevalent. Most respondents did not have a history of arrest before baseline (80.8%), but at least half had previously participated in some illegal activities (eg, destroying property) (54.5%). Between time 0 and time 1, 10.6% experienced arrests and 3.0% experienced incarceration.

The 1187 censored respondents were similar to the 4424 who remained throughout the study; most differences were fewer than 5 percentage points (PP), except sex and arrest history (table 3).

End-of-follow-up outcome risks

Between time 1 and time 4 (the end of the follow-up), a declining percentage of respondents had arrests (from 8.2% between time 1 and time 2 to 5.6% at the end) and incarceration remained rare (2.5–3.3% across time). The median length of incarceration over the study period was 7 months. We observed 426 (9.6%) respondents with severe depressive symptoms and 423 (9.6%) with self-reported mental health problems at time 4 among the 4424 uncensored respondents (average follow-up length among all=8.8 years).

From the g-formula analysis, when our study population followed the natural course of CLS involvement, the estimated risk at time 4 for severe depressive symptoms was 9.5% (95% CI 8.8% to 10.5%) and was 9.5% (95% CI 8.6% to 10.4%) for mental health problems (table 4). A hypothetical intervention of no CLS involvement changed the risks to 9.1% (95% CI 8.2% to 10.1%) and 8.8% (95% CI 7.9% to 9.8%), respectively, with a statistically significant reduction in the risks (risk difference (RD) for depressive symptoms: -0.4 pp, 95% CI -0.8 to -0.04 ; RD for mental health problems: -0.6 pp, 95% CI -1.0 to -0.3) (table 4). This decrease resulted from the removal of arrests and incarcerations in 27.6% of the study population over the study period. A hypothetical intervention of no incarcerations (while allowing a natural course of arrests) did not significantly change the risks for any of the outcomes (RD for severe depressive symptoms: 0.08 pp, 95% CI -0.4 to 0.4; RD for mental health problems: -0.08 pp, 95% CI -0.4 to 0.2) (table 4).

We observed little discrepancies between the IPC-weighted observed estimate and the g-formula natural course estimate for each outcome (depressive symptoms: 9.42% vs 9.47%; mental health problems: 9.37% vs 9.46%). We also observed similar trajectories of the mean confounder and exposure values over time between the observed and simulated data (online supplemental figure 1).

Sensitivity analyses

The sensitivity analyses showed generally similar risk differences and 95% CIs as the ones from the main analysis, with the complete case analysis showing statistically non-significant and relatively different results, where the risk difference was 0.05 pp for depressive symptoms (95% CI -0.6 to 0.5) and -0.2 pp (95% CI -0.8 to 0.1) for mental health problems (online supplemental table 2).

DISCUSSION

Using longitudinal data collected from a US youth cohort, we explored how hypothetically removing CLS involvement affects mental health at the end of a 10-year follow-up period. We found evidence that CLS involvement has a modest effect on mental health, with a modest reduction in the risks of severe

Table 4 Outcome risks under the natural course of CLS involvement and hypothetical interventions on CLS involvement and the corresponding risk differences

Outcome	Intervention	Risk under natural course, % (95% CI)	Risk under intervention, % (95% CI)	Risk difference (95% CI)	Cumulative percentage intervened
Depressive symptoms	No CLS involvement*	9.5 (8.8 to 10.5)	9.1 (8.2 to 10.1)	−0.4 (−0.8 to −0.04)	27.6
	No incarceration†		9.5 (8.6 to 10.6)	0.08 (−0.4 to 0.4)	9.8
Mental health problems	No CLS involvement*	9.5 (8.6 to 10.4)	8.8 (7.9 to 9.8)	−0.6 (−1.0 to −0.3)	27.6
	No incarceration†		9.4 (8.4 to 10.3)	−0.08 (−0.4 to 0.2)	9.8

300 bootstraps were used. Bold text indicates statistically significant difference ($p < 0.05$).

*No arrest nor incarceration.

†No intervention on arrest, which followed the natural course.

CLS, criminal legal system.

depressive symptoms and mental health problems in adulthood had none of the youth experienced any arrest or incarceration. We did not find evidence suggesting adverse impacts on mental health from incarceration alone.

Our findings are consistent with previous findings about a deleterious association between CLS contacts and mental health outcomes in the general and youth populations,^{2–12} and suggest compromised psychological well-being from CLS exposures among youth over time. Given that arrest events substantially outnumbered incarceration events in our data, the observed harmful effects likely primarily resulted from arrests. Arrest experiences may impair mental health through various mechanisms. First, individuals with an arrest history are stigmatised at both the structural and individual levels (eg, perceived as deviating from social norms; interpersonal discrimination); such stigmatisation may have downstream impacts on health outcomes, including mental health.¹⁵ Indeed, stigma is considered a social determinant of health that contributes significantly to health inequities.³² Second, having a criminal arrest record, regardless of the outcome, may bring negative consequences to life, including personal relationships and opportunities for employment and housing.³³ Reduced social capital and financial strains are linked to psychological distress and mental health symptoms.^{34 35}

Despite a significant adverse effect of CLS involvement on the outcomes through arrests, we did not observe similar harms from incarceration. Incarcerations are often considered more severe CLS exposures than arrests, with potentially more harms to mental health due to possible exposures to solitary confinement and enduring community reintegration after release.^{10 36} However, incarceration events were rare in our youth population and thus might not have observable impacts with our modest sample size. Moreover, the relationship between incarceration and health is intricate, as prison environments may provide unique opportunities for access to healthcare.³⁷ Additionally, incarcerated individuals may become religious to cope with stigma from imprisonment and prior research has shown a protective association between religiosity and depression.³⁸

The estimated effect sizes from our study were modest. Although not shown, among those who had ever been arrested over the study period, a majority experienced arrests at only one time point. It would be unlikely that such an exposure could lead to a severe long-term mental health consequence. That said, the presence of any effect is noteworthy and suggests the importance of considering the elevated risks for poor mental health among young people with prior CLS involvement. This study also has policy implications. Our findings are suggestive of potential public health benefits of replacing law enforcement with diversion programmes or policies minimising CLS contact,

a scenario like the hypothetical intervention of removing arrests and incarcerations explored in this study. Diversion programmes have been considered an alternative to juvenile justice system and could reduce recidivism,³⁹ but their public health benefits have not been widely studied. Our study provides indirect evidence on the topic; however, understanding the impacts from such a policy change would require evaluation accounting for systemic changes to the society from the proposed policy, which could be different from the observed average individual effect from this study.

Strengths and limitations

The main strength of our study was the study design. We applied the parametric g-formula to a 10-year longitudinal dataset with comprehensive confounders and clear temporal relationships between the confounders, exposures and outcomes, strengthening our ability to infer causality. This study is also among the first to address time-varying confounding and treatment-confounder feedback loops in the relationships between CLS involvement and health outcomes.

Our study also has limitations. First, as with any observational study, we cannot rule out bias from unmeasured confounding. For example, we did not have information about parental CLS involvement and involvement in illegal violent activities (which might affect one's likelihood of encountering law enforcement). We also lacked community-level contextual factors, such as poverty and crime rates, which may influence the presence of police officers in an area and are associated with mental health resources. The largest available geographical region in the public use NLSY97 dataset is the county, which is arguably too large to meaningfully capture community-level context. There may also be measurement error in our confounders (eg, drug use was not current but was based on retrospective reporting) and CLS exposure (eg, self-report bias). Nonetheless, our study is one of the few with rich information on confounders and CLS exposure. Second, g-computation is subject to bias from model misspecification. However, our sensitivity analyses showed reasonable robustness of our findings to different model specifications, and we also observed similar natural-course estimates between the IPC-weighted observed data and our parametric g-formula analysis. Third, our exposure measures had limitations. We did not examine 'dosage' of CLS encounters. We were also unable to investigate mental health impacts from other CLS contact, such as police stops, which have a well-established association with poor mental health,^{13 40} nor could we tease out if our findings were driven by police stops (but not necessarily the experience of arrest). Future research examining the drivers through which CLS contact affects mental health is warranted. Fourth,

our findings may not be generalisable to the original NLSY97 target population (youth born between 1980 and 1984) or other populations with different distributions of confounders and exposures. Further, the youth population in this study is likely distinct from the one in the present day. Mental health impacts from CLS involvement may be amplified or modified in the presence of additional stressors unique to the current time (eg, social media, COVID-19 pandemic experiences). Fifth, we were unable to conduct stratified analysis by sex or race/ethnicity due to small sample size within strata. Given that some demographic subgroups (eg, black men) are disproportionately exposed to and impacted by the CLS, future studies on subgroup-specific effects and differences across subgroups are warranted.

CONCLUSIONS

Our study provides causal evidence on the negative impacts of CLS involvement on mental health. Our findings suggest that arrests, despite being a less serious form of CLS involvement, can contribute to depressive symptoms and mental health problems in adulthood, and that interactions with the CLS at a young age can negatively affect mental health over the life course. Our study also reaffirms that CLS involvement, often rooted in structural oppression and targeted social control of communities of colour, is a social determinant of health and warrants attention in public health programming addressing social determinants.

Acknowledgements This work was disseminated as an oral presentation at the 2025 Society of Epidemiologic Research Annual Meeting.

Contributors PYC conceptualised the study and led data acquisition and management, statistical analyses and writing of the manuscript. ZS, KW, KT, and HEJ contributed to the study design and provided methodology advisement. All authors interpreted the data, reviewed and edited manuscript drafts and approved the submitted manuscript. PYC is the guarantor.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval This study was determined exempt by the CUNY School of Public Health and Health Policy Institutional Review Board.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. This study used a public use dataset of the National Longitudinal Survey of Youth 1997, which is available on the NLS Investigator (<https://www.nlsinfo.org/investigator/>). The analytical dataset used in this study can be made available upon reasonable request.

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REFERENCES

- Office of Juvenile Justice and Delinquency Prevention. Arrests by offense, age, and race. Available: https://ojjdp.ojp.gov/statistical-briefing-book/crime/faqs/ucr_table_2 [Accessed 21 Oct 2025].
- Baquero M, Zweig K, Angell SY, et al. Health Behaviors and Outcomes Associated With Personal and Family History of Criminal Justice System Involvement, New York City, 2017. *Am J Public Health* 2020;110:378–84.
- Esposito M, Lee H, Hicken M, et al. The consequences of contact with the criminal justice system for health in the transition to adulthood. *Longitud Life Course Stud* 2017;8:57–74.
- Boen CE. Criminal Justice Contacts and Psychophysiological Functioning in Early Adulthood: Health Inequality in the Carceral State. *J Health Soc Behav* 2020;61:290–306.
- Hensel JM, Casiano H, Chartier MJ, et al. Prevalence of mental disorders among all justice-involved: A population-level study in Canada. *Int J Law Psychiatry* 2020;68:101523.
- Archibald PC. Criminal Justice Contact, Stressors, and Depressive Symptoms Among Black Adults in the United States. *Am J Crim Just* 2018;43:486–508.
- Lorvick J, Comfort M, Kral AH, et al. Exploring Lifetime Accumulation of Criminal Justice Involvement and Associated Health and Social Outcomes in a Community-Based Sample of Women who Use Drugs. *J Urban Health* 2018;95:584–93.
- Sugie NF, Turney K. Beyond Incarceration: Criminal Justice Contact and Mental Health. *Am Sociol Rev* 2017;82:719–43.
- Fernandes AD. How Far Up the River? Criminal Justice Contact and Health Outcomes. *Soc Curr* 2020;7:29–45.
- Porter LC, DeMarco LM. Beyond the dichotomy: Incarceration dosage and mental health*. *Criminology* 2019;57:136–56.
- Semenza DC, Silver IA, Jackson DB. Youth Incarceration in Adult Facilities and Mental Health in Early Adulthood. *J Adolesc Health* 2024;74:989–95.
- Clemens WM, Longmore MA, Giordano PC, et al. Criminal Justice Involvement and Young Adult Health: The Role of Adolescent Health Risks and Stress. *Ohio J Public Health* 2019;2.
- Jackson DB, Fahmy C, Vaughn MG, et al. Police Stops Among At-Risk Youth: Repercussions for Mental Health. *J Adolesc Health* 2019;65:627–32.
- Porter LC. Being “on Point”: Exploring the Stress-related Experiences of Incarceration. *Soc Ment Health* 2019;9:1–17.
- Howell BA, Earnshaw VA, Garcia M, et al. The Stigma of Criminal Legal Involvement and Health: a Conceptual Framework. *J Urban Health* 2022;99:92–101.
- Lopoo LM, Western B. Incarceration and the Formation and Stability of Marital Unions. *J Marriage Fam* 2005;67:721–34.
- Krieger N. Methods for the scientific study of discrimination and health: an ecosocial approach. *Am J Public Health* 2012;102:936–44.
- Pearlin LI, Schieman S, Fazio EM, et al. Stress, health, and the life course: some conceptual perspectives. *J Health Soc Behav* 2005;46:205–19.
- Duarte CDP, Salas-Hernández L, Griffin JS. Policy Determinants of Inequitable Exposure to the Criminal Legal System and Their Health Consequences Among Young People. *Am J Public Health* 2020;110:S43–9.
- Chan PY, Kaba F, Lim S, et al. Identifying demographic and health profiles of young adults with frequent jail incarceration in New York City during 2011–2017. *Ann Epidemiol* 2020;46:41–8.
- Cauffman E, Beardslee J, Sbeglia C, et al. Trajectories of offending over 9 years after youths’ first arrest: What predicts who desists and who continues to offend? *J Res Adolesc* 2024;34:1312–25.
- Robins JM, Greenland S, Hu FC. Estimation of the Causal Effect of a Time-Varying Exposure on the Marginal Mean of a Repeated Binary Outcome. *J Am Stat Assoc* 1999;94:687–700.
- Hernan MA, Robins JM. Causal inference: what if. Chapman & Hall/CRC, 2020. Available: <https://miguelfhernan.org/whatifbook>
- Braveman PA, Arkin E, Proctor D, et al. Systemic And Structural Racism: Definitions, Examples, Health Damages, And Approaches To Dismantling. *Health Aff (Millwood)* 2022;41:171–8.
- Ware JE. SF-36 health survey: manual and interpretation guide. Health Institute, New England Medical Center, 1993.
- Yamazaki S, Fukuhara S, Green J. Usefulness of five-item and three-item Mental Health Inventories to screen for depressive symptoms in the general population of Japan. *Health Qual Life Outcomes* 2005;3:48.
- Daniel RM, De Stavola BL, Cousens SN. Gformula: Estimating Causal Effects in the Presence of Time-Varying Confounding or Mediation using the G-Computation Formula. *Stata J* 2011;11:479–517.
- Buuren SV, Groothuis-Oudshoorn K. mice: Multivariate Imputation by Chained Equations in R. *J Stat Softw* 2011;45.
- Young JG, Cain LE, Robins JM, et al. Comparative effectiveness of dynamic treatment regimes: an application of the parametric g-formula. *Stat Biosci* 2011;3:119–43.
- Chiu YH, Wen L, McGrath S, et al. Evaluating Model Specification When Using the Parametric G-Formula in the Presence of Censoring. *Am J Epidemiol* 2023;192:1887–95.
- McGrath S, Lin V, Zhang Z, et al. gfoRmula: An R Package for Estimating the Effects of Sustained Treatment Strategies via the Parametric g-formula. *Patterns (N Y)* 2020;1:100008.
- Hatzenbuehler ML, Phelan JC, Link BG. Stigma as a fundamental cause of population health inequalities. *Am J Public Health* 2013;103:813–21.
- Lageson SE. Found Out and Opting Out: The Consequences of Online Criminal Records for Families. *Ann Am Acad Pol Soc Sci* 2016;665:127–41.
- Frank C, Davis CG, Elgar FJ. Financial strain, social capital, and perceived health during economic recession: a longitudinal survey in rural Canada. *Anxiety Stress Coping* 2014;27:422–38.

- 35 Ryu S, Fan L. The Relationship Between Financial Worries and Psychological Distress Among U.S. Adults. *J Fam Econ Issues* 2023;44:16–33.
- 36 Addison HA, Richmond TS, Lewis LM, *et al.* Mental health outcomes in formerly incarcerated Black men: A systematic mixed studies review. *J Adv Nurs* 2022;78:1851–69.
- 37 Patterson EJ. Incarcerating death: mortality in U.S. state correctional facilities, 1985–1998. *Demography* 2010;47:587–607.
- 38 Eytan A. Religion and mental health during incarceration: a systematic literature review. *Psychiatr Q* 2011;82:287–95.
- 39 Gigante CI, Rak K, Kaplan A, *et al.* A Community-Based Youth Diversion Program as an Alternative to Incarceration, Illinois, 2017–2019. *Am J Public Health* 2022;112:1265–8.
- 40 Geller A, Fagan J, Tyler T, *et al.* Aggressive policing and the mental health of young urban men. *Am J Public Health* 2014;104:2321–7.