Addictive Behaviors 137 (2023) 107524

Contents lists available at ScienceDirect

Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh

Collateral consequences of the school-to-prison pipeline: Adolescent substance use and developmental risk

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ARTICLE INFO

Keywords:
School discipline
School-to-prison pipeline
Substance use
Mental health
Public health

ABSTRACT

Objective: The adolescent health consequences of the school-to-prison pipeline remain underexplored. We test whether initiating components of the school-to-prison pipeline—suspensions, expulsions, and school policing—are associated with higher school-average levels of student substance use, depressed feelings, and developmental risk in the following year.

Method: We linked 2003–2014 data from the California Healthy Kids Survey and the Civil Rights Data Collection from over 4,800 schools and 4,950,000 students. With lagged multi-level models, we estimated relationships between the school prevalence of total discipline, out-of-school discipline, and police-involved discipline, and standardized school-average levels of 6 substance use measures and 8 measures of developmental risk, respectively.

Results: The prevalence of school discipline predicted subsequent school-mean substance use and developmental risk. A one-unit higher prevalence of total discipline predicted higher school levels (in standard deviations) of binge drinking alcohol (0.14, 95% CI: 0.11, 0.17), drinking alcohol (0.15, 95% CI: 0.12, 0.18), smoking tobacco (0.09, 95% CI: 0.06, 0.12), using cannabis (0.16, 95% CI: 0.14, 0.19), using other drugs (0.17, 95% CI: 0.14, 0.21), and violence/harassment (0.16, 95% CI: 0.12, 0.2). Total discipline predicted lower levels of reported community support (−0.07, 95% CI: −0.1, −0.05), feeling safe in school (-0.12, 95% CI: −0.16, −0.09), and school support (−0.16, 95% CI: −0.19, −0.12). Associations were greater in magnitude for more severe out-of-school discipline. Findings were inconsistent for police-involved discipline.

Conclusion: Exclusionary school discipline and school policing—core elements of the school-to-prison pipeline—are previously unidentified population predictors of adolescent substance use and developmental risk.

1. Introduction

Despite broad recognition of the public health crisis caused by mass criminalization and mass incarceration in the United States (US, Cloud, Parsons, & Delany-Brumsey, 2014; Wildeman, 2011), less is known about the public health implications of an auxiliary trend: the school-to-prison pipeline. The school-to-prison pipeline describes a carceral turn in public education, in which schools criminalize and punish the behavior of some students—especially Black and Latinx students—rather than provide quality education and support for underlying social/emotional or developmental needs (Mallett, 2016). Initiating components of the school-to-prison pipeline include exclusionary discipline (suspension or expulsion) and police referrals/arrests in response to misbehavior. The pathways from school to the adult criminal legal system are empirically established (Bacher-Hicks, Billings, & Deming, 2019; Hemez, Brent, & Mowen, 2020), as are the wide-ranging individual and community health consequences of exposure to the criminal legal system (Cloud, Bassett, Graves, Fullilove, & Brinkley-Rubinstein, 2020; Hatzenbuehler, Keyes, Hamilton, Uddin, & Galea, 2015; Kajeepeta, Rutherford, Keyes, El-Sayed, & Prins, 2020, Kajeepeta et al. (2021)), especially for substance use (e.g., Binswanger, Blatchford, Mueller, & Stern, 2013; Møller et al., 2010). However, the population health consequences of the school-to-prison pipeline remain underexplored. In the present study, we establish the first empirical evidence

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https://doi.org/10.1016/j.addbeh.2022.107524
Received 29 March 2022; Received in revised form 5 October 2022; Accepted 10 October 2022
Available online 17 October 2022

that the prevalence of exclusionary school discipline is a potential determinant of school levels of adolescent substance use and other developmental risk factors.

In a recent study of over 4,800 schools comprising 4.9 million students in California, we found that schools with students who had higher average levels of student substance use and depressed feelings, less school and community support, and lower feelings of school safety had a subsequently higher prevalence of exclusionary school discipline and school-based police contact (Authors, 2021). We theorized that exposure to high levels of suspension, expulsion, and police contact in schools likely creates or exacerbates material and psychosocial conditions conducive to adolescent substance use, mental health problems, and developmental risk. In the present study, we explore this hypothesis and establish the first empirical evidence that the prevalence of exclusionary school discipline is not only a consequence, but a potential determinant of, school levels of adolescent substance use and other developmental risk factors.

1.1. Public education in the carceral state

Economic austerity in the US has had profound effects on public education. Systematic disinvestment in social services and infrastructure, or "organized abandonment" (Gilmore, 2008; Harvey, 2018), exacerbated dramatic racial and class inequities in funding for public education and healthy child development (Chingos & Blagg, 2017; Giroux, 2013; Morgan & Amerikaner, 2018; Nguyen, Smith, & Granja, 2020; Urban Institute, 2017). As with social policy more broadly (Scull & Wacquant, 2009), local, state, and federal government managed the consequences of austerity in education with investments in social control and punishment (Kupchik & Monahan, 2006), justified by racialized, largely manufactured crime panics (Welch, Price, & Yankey, 2002). As a result, schools have internalized carceral logics (Hirschfield, 2008; Kupchik & Monahan, 2006; Simon, 2007), as they increasingly function to manage, through criminalization, populations rendered surplus by the neoliberal transformation of the state (cf. Feeley & Simon, 1992; Wacquant, 2009).

This carceral turn in education increases adolescent criminalization in several ways, as school responses to student misbehavior have become more extreme and punitive (Hirschfield, 2008). "Zero tolerance" policies, or rules that require the use of exclusionary discipline regardless of the severity or context of misbehavior (American Psychological Association Zero Tolerance Task Force, 2008; Skiba & Knesting, 2001), were mandated in 75–90% of schools before the end of the 20th century (Mallett, 2016). Out-of-school suspension rates have more than doubled since the 1970s (Losen & Skiba, 2010), and students are more than twice as likely to be arrested in the month they are removed from school compared to months when they are not removed (Monahan, VanDerhei, Bechtold, & Cauffman, 2014). School securitization, including metal detectors, video surveillance, and police presence, has also increased dramatically (Mallett, 2016). Approximately 67% of high schoolers, 45% of middle schoolers, and 19% of elementary school students attended a school with at least one police officer present in the building in 2013–2014 (Lindsay, Lee, & Lloyd, 2018), and school-based arrests have increased 300–500% since the 1990s (Mallett, 2016).

Race and class disparities throughout the school-to-prison pipeline are profound. Black students, poor students, and students with disabilities are more likely to be disciplined than non-Black, wealthy, and non-disabled students (Fabelo et al., 2011; Freeman & Steidl, 2016). Black students are more than three times as likely to be suspended or expelled than white students, controlling for socioeconomic status and misbehavior (Okonofua, Walton, & Eberhardt, 2016; Wallace, Goodkind, Wallace, and Bachman (2008)), and these racialized disparities likely contribute to the overrepresentation of Black people in the criminal legal system (Barnes & Motz, 2018; Rocque & Paternoster, 2011). At the school level, discipline and arrest rates are higher in districts with higher proportions of Black students and higher levels of disadvantage (Freeman & Steidl, 2016; Mendez, Knoff, & Ferron, 2002).

1.2. Hypothesized adolescent substance use and mental health consequences of exclusionary school discipline

Adolescence is a critical developmental period for substance use initiation and psychiatric symptom incidence, and schools are the place that adolescents spend the majority of their time outside their homes (Ali et al., 2019; Dawson, Goldstein, Chou, Ruan, & Grant, 2008; Grant, 1998; Kessler et al., 2005, 2007; King & Chassin, 2007; Solmi et al., 2022). By 12th grade, 40% of US adolescents have used an illegal drug in the past year (primarily cannabis), and roughly 17% of 12th graders reported binge drinking in the past two weeks (Johnston et al., 2021). However, in 2019, of the 1.1 million adolescents who needed substance use treatment, only 6% received it in a specialty facility, and fewer than 1 in 10 adolescents with a substance use disorder (SUD) reported any past-year treatment (Substance Abuse and Mental Health Services Administration. (2019), 2019).

Within this context, more than a third of US adolescents who do access any mental health treatment access it *only* at school; they are disproportionately Black and low-income (Ali et al., 2019). Schools are thus crucial intervention targets for substance use and mental health treatment and prevention, and health equity therein. But instead, more than 10 million students in the US attend schools with police but no counselor, nurse, psychologist, or social worker (Whitaker et al., 2019).

Theory and evidence suggest that exposure to criminalization is developmentally harmful and has adverse effects on adolescent substance use and mental health. For example, exposure to police stops increases trauma and anxiety symptoms among young men (Geller, Fagan, Tyler, & Link, 2014). Exposure to the criminal legal system can increase subsequent behavioral and substance use problems among adolescents (Huizinga, Henry, & Liberman, 2008). Students who attended schools with more severe exclusionary discipline policies had higher levels of depressive symptoms than students in schools with less severe exclusionary discipline policies (Eyllon, Salhi, Griffith, & Lincoln, 2020). And students who were subsequently suspended or expelled had nearly 50% higher odds of subsequent drug use compared with students who were not suspended or expelled (Dong & Krohn, 2020).

Finally, relationships with key supportive adults, such as teachers, are documented protective factors against adolescent substance use (Suldo, Mihalas, Powell, & French, 2008). Removing adolescents from school environments through exclusionary discipline, therefore, has the potential to exacerbate substance use risk, increase feelings of alienation and disengagement, and decrease feelings of social cohesion and physical safety in schools (Noltemeyer, Ward, & Mcloughlin, 2015).

1.3. Study hypotheses

Prior research provides some direct evidence for the individual- and institutional-level substance use and mental health consequences of exclusionary school discipline and the school-to-prison pipeline. In the present study, we add to the body of evidence about institutional relationships between adolescent criminalization and adolescent health. If school discipline and policing are conceptualized as institutional responses to organized abandonment, attendant disinvestment in adolescent health and developmental needs, and a mechanism of structural racism and criminalization (Gilmore, 2008; Hirschfield, 2008; Kupchik & Monahan, 2006), then we would expect exclusionary school discipline and policing to reproduce or exacerbate conditions harmful to adolescent health in ways apparent at the school level, not just the individual level.

To test this institutional-level hypothesis, we needed a unique data structure that contained school-level rather than student-level discipline data, as well as information on school-aggregate levels of student substance use, mental health, and developmental risk factors. We also needed school-district covariates. To ensure detectable variation in the

associations between these variables, we also required a sufficiently large sample of schools. We created this data structure by linking multiple previously unconnected distinct sources, described below. Our hypothesis is that a higher prevalence of exclusionary school discipline and school-based police contact will be associated with subsequently higher school-aggregate levels of substance use, depressed feelings, and individual, peer, family, school, and community risk factors.

2. Method

2.1. Data

We connected 11 years of repeated cross-sectional California state data from three sources: adolescent health and wellbeing data from the statewide California Healthy Kids Survey (CHKS), school discipline prevalence data from the Civil Rights Data Collection (CRDC), and demographic data on California school districts from the American Community Survey (ACS).

For outcome measures, we used 11 consecutive years (2003–2005 through 2013–2014) of the CHKS, in which approximately 85% of public-school districts in California participate annually (surveys are typically conducted in 2-year cycles). The survey is the largest of its kind in the US, and asks students about their behavior, experiences, and attitudes related to their school, health, and well-being. The CHKS is administered anonymously to all 5th-, 7th-, 9th-, and 11th-grade students (Austin et al., 2011, 2013; Furlong, Ritchey, & O'Brennan, 2009; Hanson & Kim, 2007), and typically has a response rate greater than 70% (Austin, Hanson, & Polik, 2016). The sampling strategy and psychometric properties of CHKS measures have been described in-depth elsewhere (Austin & Duerr, 2004; Hanson & Austin, 2003; Hanson & Kim, 2007).

Exposure data come from the Civil Rights Data Collection (CRDC), a national survey of public schools in the US, which collects data on education and civil rights issues, including school discipline (Office for Civil Rights, 2018). Since 2011, the CRDC has surveyed designated school officials and official records from all public schools (N = 97,172) in the US (response rate = 98–100%)(Office for Civil Rights, 2016). Prior to 2011, the CRDC used a stratified random, representative sample of all US public schools.

Covariate data come from the American Community Survey (ACS) Education Tabulation, a custom tabulation of ACS data for the National Center for Education Statistics (NCES) (National Center for Education Statistics. (n.d.). American Community Survey – Education Tabulation (ACS-ED). Education Demographic and Geographic Estimates. Retrieved September 15 (2020)). The data files, which contain publicly available demographic data for US school districts, are based on ACS five-year estimates and are updated annually.

We linked NCES school identifiers in the CRDC with CHKS unique County-District-School (CDS) codes using a crosswalk developed by NCES. School district demographic data from the ACS were also linked using NCES school identifiers.

2.2. Measures

2.2.1. Adolescent substance use and developmental risk factors

For each measure described below, we calculated the mean or proportion of student responses within each school, since schools are the primary unit of analysis. We then standardized the measures (i.e., calculated Z-scores) across all schools by year. Table S1 presents item composition and scoring for each measure.

Substance use, depressed feelings. In the CHKS, students reported how many times, respectively, in the past 30 days they had at least one drink of alcohol, binge drank (defined as four drinks for girls and five drinks for boys per drinking occasion), used cannabis, smoked a cigarette, and used a variety of other drugs (smokeless tobacco, inhalants, cocaine, methamphetamines, or amphetamines, ecstasy, LSD, or other psychedelics, any other illegal drug). Alpha coefficients range from 0.90 to 0.98 (Hanson & Austin, 2003). Students also reported how many times in the past 30 days they felt depressed.

Community, home, peer, and school social support, and student resilience. Students reported, on a scale ranging from 0 (not at all true) to 3 (very true), whether they had support in their environments at home, in school, and in their community; support from and relationships with their friends; and their resilience, including items on self-efficacy, self-awareness, empathy, and problem-solving. We took the school mean of student responses to the items from each domain to create school-level summary measures, respectively, for community (8 items), home (8 items), peer (5 items), and school (9 items) social support, as well as student resilience (12 items). See online supplement Table S1 for the specific items in each of these domains. Alpha coefficients for these items ranged from 0.79 to 0.96 (Hanson & Austin, 2003).

Violence/harassment and school safety. Students reported how much they agreed that they felt safe in their schools and neighborhoods, scored from 1 (strongly disagree) to 5 (strongly agree). Students were also asked 18 questions about the number of times in the past 12 months they experienced violence and harassment in school, scored from 0 (zero times) to 3 (four or more times) (Russell, Sinclair, Poteat, & Koenig, 2012). See online supplement Table S1 for each of these items.

2.2.2. Exclusionary school discipline and police contact

We constructed three measures of school discipline based on item availability and our hypotheses about the health consequences of school discipline specifically, and the criminalization of students more broadly: total school discipline, out-of-school discipline only, and police-involved discipline.

The CRDC began collecting detailed school discipline data in 2009. Schools reported expulsions, out-of-school suspensions, in-school suspensions (when a student is removed from classes and activities but remains in the school building) and police-involved discipline (school-based arrests and police referrals). We divided the sum of these discipline measures by total enrollment to create a school-level total discipline prevalence proportion, covering the years 2009–2014. Before 2009, the CRDC collected data only on out-of-school-discipline, i.e., expulsions and out-of-school suspensions. To take complete advantage of all waves of available data, we created an out-of-school discipline prevalence proportion by dividing the sum of out-of-school-suspensions and expulsions by total enrollment. This measure covers the years 2003–2014. Finally, given the direct role that police play in student criminalization, we were interested in whether school policing alone predicted adolescent health outcomes. We created a school-level prevalence proportion of police-involved discipline (school-based arrests and police referrals) divided by total enrollment, covering the years 2009–2014.

2.2.3. Potential confounders

Since racialized group membership and class are strongly associated with school discipline and the school-to-prison pipeline (Mendez et al., 2002; Rocque & Paternoster, 2011), as well as systematic disinvestment in child health and development (García, 2015; Johnson-Staub, 2017), we hypothesized several school- and school-district-level variables would confound the relationships among school discipline/policing and adolescent health and development outcomes. These included the school percentage of Black students; school district median age and median income; as well as the percentages of school district residents that were unemployed, had a high school degree, and identified as Black. Bivariate models testing the association between these confounders and the school discipline exposure variables and substance use/developmental risk outcome variables, respectively, supported their inclusion as controls.

2.3. Analysis

We fit multi-level linear models regressing each standardized health

and well-being factor on each one-year-lagged school discipline measure. Schools are the level one unit of analysis; schools were measured repeatedly over time (level 2). One-year lags were chosen to establish temporality. Models included random intercepts for school and controlled for year. In a second set of adjusted models, we added one-year-lagged confounding variables described above to each model. Models can be written as:

$$y_{tj} = \beta_{00} + \beta_{10}X_{tj} + u_{0j} + e_{tj}$$

where y_{tj} is the school-level value of a health and well-being outcome (e.g., binge drinking) for school j at time t, β_{00} is the average school mean outcome, X_{tj} is a vector of independent variables (the school discipline exposure as well as the confounding variables described above) for school j at time t, β_{10} is the vector of level-one fixed-effect parameters, u_{0j} represents individual school deviations around the average school mean (allowing for each school to have its own intercept, and accounting for nonindependence of observations of the same school over time), and e_{tj} is the school j residual at time t (Bell & Jones, 2014; Diez Roux, 2002). The variance components are assumed to be normally distributed and independent (u_{0j} $N(0, \sigma_u^2)$, e_{tj} $N(0, \sigma_e^2)$ (Bell & Jones, 2014; Diez Roux, 2002). For each of the 42 models presented below, we examined quantile-quantile and residual plots and found that model assumptions of homoscedasticity and normally distributed residuals were generally met, with some evidence of skewing due to the presence of outliers. Including the lagged outcome variable as an independent variable did not appreciable alter our findings.

Given that the outcome variables are standardized, model coefficients for the school discipline independent variables can be interpreted as the change in standard deviations of the outcome associated with a 1-unit increase in the prevalence of school discipline. All analyses were conducted in R version 3.6.

The study was approved by the Institutional Review Boards of Columbia University.

3. Results

Table 1 displays the grand average characteristics of schools in the sample. The analytic sample contained data from 4,840 schools, representing mean responses from 4,950,633 students. Students sampled were 30% white, 7.4% Black, 6.3% American Indian/Alaska Native, 10.6% Asian, 3.7% Native Hawaiian/Pacific Islander, and 43% Latinx. The mean school prevalence of total school discipline, out-of-school discipline, and police-involved discipline were 32%, 19%, and 2% respectively (Table 1). Figures S1-S4 present the means or proportions of all measures over time.

Fig. 1 presents results from adjusted multi-level linear models regressing the six-substance use/depressed feelings measures on the three one-year-lagged school discipline measures (18 models total). Tables S3 and S4 present unadjusted and adjusted (respectively) coefficients, 95% CIs, and model fit statistics for each relationship. Adjusted estimates ranged from 0.09 (95% CI: 0.03, 0.14) for out-of-school discipline predicting subsequent school-mean-level of depressed feelings, to 0.39 (95% CI: 0.30, 0.48) for police-involved discipline predicting subsequent school-level cannabis use. In other words, a one-unit higher prevalence of police-involved discipline was associated with a 0.39 standard deviation higher school-mean level of cannabis use in the subsequent year.

After adjusting for school and school district confounders, higher total school discipline predicted subsequently higher school-mean levels of binge drinking alcohol, drinking alcohol, smoking tobacco, using cannabis, and using other drugs. Out-of-school discipline predicted subsequently higher binge drinking, depressed feelings, drinking alcohol, smoking tobacco, using cannabis, and using other drugs. Police-involved discipline predicted subsequently higher school-mean levels of drinking alcohol, using cannabis, and using other drugs.

Table 1
Grand average characteristics of California schools in the sample.

Variable	Mean	SD	Min	Max
Schools (N = 4,840)				
Students (N = 4,950,633)				
Demographics				
Age	13.95	1.69	10	18
School proportion female	0.49	0.11	0	1
School proportion white	0.30	0.22	0	1
School proportion Black	0.07	0.09	0	1
School proportion Latinx	0.43	0.25	0	1
Substance use and depression outcomes (school proportion)				
Binge drink alcohol	0.42	0.50	0	5
Depressed past year	0.29	0.10	0.01	1
Drink alcohol	0.61	0.59	0	5
Smoke tobacco	0.42	0.64	0	5
Use cannabis	0.55	0.69	0	5
Use other drug	0.37	0.45	0	5
Developmental risk outcomes (raw scale score)				
Community support	1.99	0.33	0	3
Feel safe in neighborhood	4.01	1.06	1	5
Feel safe in school	3.50	0.43	1	5
Home support	1.70	0.70	0	3
Peer support	1.73	0.67	0	3
School support	1.60	0.23	0	3
Student resilience	1.69	0.70	0	3
Violence/harassment in school	0.43	0.15	0	2.5
School discipline exposures (prevalence)				
Out-of-school discipline (2003–2014)	0.19	0.38	0	10.53
Total school discipline (2009–2014)	0.32	0.61	0	15.09
Police-Involved Discipline (2009–2014)	0.02	0.11	0	5.73
School district sociodemographics				
Proportion high school grad	0.81	0.12	0.14	1
Proportion unemployed	0.06	0.02	0	0.3
Median household income ($)	63,129	21,461	18,750	23,8917
Proportion Black	0.06	0.06	0	0.49
Median age	36.4	6.2	20	66.3

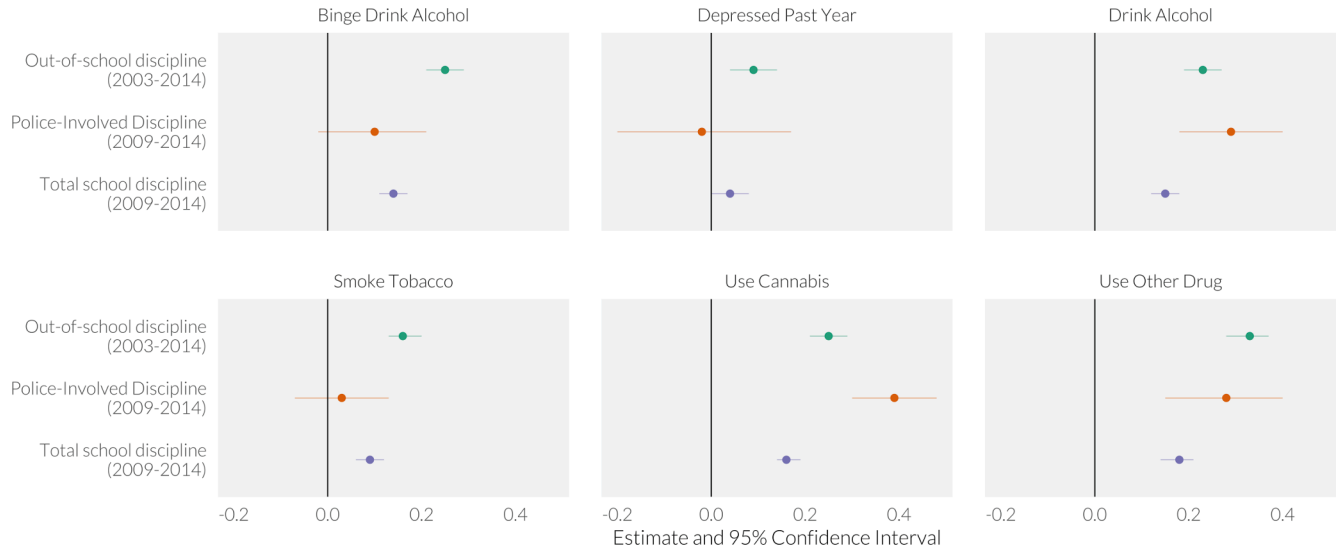
Note: SOURCES: U.S. Department of Education, Office for Civil Rights, Civil Rights Data Collection, 2003–2014; California Healthy Kids Survey, 2003–2014; American Community Survey Education Tabulation, 2003–2014.

Fig. 2 presents results from adjusted multi-level linear models regressing the eight developmental risk measures on the three one-year-lagged school discipline measures (24 models total). Tables S5 and S6 present unadjusted and adjusted (respectively) coefficients, 95% Cis, and model fit statistics for each relationship. Estimates ranged from −0.24 (95% CI: −0.39, −0.08) for out-of-school discipline and subsequent school-mean level of reported school support, to 0.28 (95% CI: 0.24, 0.33) for out-of-school discipline and subsequent school-level violence/harassment. In other words, a one-unit increase in the prevalence of out-of-school discipline was associated with a −0.24 standard deviation lower school-mean level of reported school support in the subsequent year.

In adjusted models, higher prevalence of total school discipline predicted lower school-mean levels of reported community support, feeling safe in school, school support, and higher school-mean levels of violence/harassment. Out-of-school discipline predicted lower subsequent school-mean levels of reported community support, feeling safe in school, school support, and higher school-mean levels of violence/harassment. Higher prevalence of police-involved discipline predicted lower subsequent school-mean levels of school support.

4. Discussion

We created an unprecedented longitudinal dataset linking statewide school discipline records and a statewide survey of student health and development from California, the state with the largest number of kindergarten-12th grade students in the US. We found that the prevalence of exclusionary school discipline (suspension and expulsion) and school-based police contact—initiating components of the school-to-



SOURCES: U.S. Department of Education, Office for Civil Rights, Civil Rights Data Collection, 2003-2014 and California Healthy Kids Survey, 2003-2014. Data for this figure appears in Appendix Table A3.

Fig. 1. Results of 18 adjusted multi-level models regressing 6 standardized measures of substance use and depressed feelings on 3 lagged measures of school discipline.

prison pipeline—were associated with higher school-average levels of student substance use, depressed feelings, social support, and developmental risk factors in the following year.

Associations between total discipline and some outcomes were smaller than out-of-school discipline and confidence intervals sometimes included the null. This is likely because the total discipline measure included in-school suspensions, which are more common and less severe than out-of-school suspensions and expulsions. Findings for police-involved discipline were less consistent and warrant cautious interpretation; while the magnitudes of associations between police-involved discipline and many outcomes were often large (consistent with the hypothesized severity of this form of discipline), confidence intervals were wide and often included the null, indicating that estimates were imprecise. This is likely because police-involved discipline was rare relative to suspensions and expulsions. Findings for out-of-school discipline were more consistent and precise relative to total discipline and police-involved discipline, likely due in part because there were more waves of data available for this form of discipline.

While this institutional-level analysis does not permit inferences about individual-level pathways from suspension, expulsion, or school policing to negative adolescent health and developmental outcomes, our findings are nonetheless consistent with the view that as an educational paradigm, school discipline is not developmentally appropriate or responsive (and may be harmful) to adolescent health and developmental needs. At minimum, our findings suggest that schools that engage in more exclusionary discipline have students who, on average, subsequently engage in more substance use and have less community and school support.

Exposure to high levels of exclusionary discipline and policing in schools likely produces and reproduces material and psychosocial conditions that increase the risk of adolescent substance use and mental health problems, and erode social supports and healthy development (American Psychological Association Zero Tolerance Task Force, 2008). Meanwhile, heavy investments in school securitization and policing divert resources from school and community supports and services that might address the root causes of student disciplinary and health problems. For example 90% of students in public schools experience staffing ratios for counselor, nurse, psychologist, and social worker positions that fail to meet professional standards (Whitaker et al., 2019). Our findings support efforts to reduce schools' reliance on exclusionary discipline and school-based policing in response to misbehavior, and instead invest in public health programs and personnel, including primary prevention and behavioral health services.

Our findings are subject to several limitations. First, the CRDC did not require data reporting on school discipline for years prior to the 2013–2014 school year. This missing data may be informative, if schools' failure to report was related to high rates of discipline, or may be random, if some schools chose not to report due to unfamiliarity with the questions or procedures. Second, our analyses are limited by the information provided in the CRDC, which is self-reported by designated officials who may be motivated to underreport school discipline, which may make estimates conservative. Regarding school discipline, the CRDC does not include information on reasons for reported school discipline, specific disciplinary infractions, or severity of behaviors that resulted in disciplinary measures. Third, approximately 15% of schools in California are not included in the CHKS, which may contribute to either random or biased missingness. Further, CHKS is a school-based sample and therefore does not include adolescents who had already been suspended, expelled, or incarcerated. This underrepresentation may have resulted in more conservative estimates of substance use, depressed feelings, and risk and resilience factors reported in this study, as these outcomes are likely elevated among students who have experienced these forms of school discipline. Fourth, data from the CHKS are self-reported. Finally, because our data was aggregated to the school level, discipline prevalence ratios may reflect multiple suspensions, expulsions, or police contacts for the same student. However, we do not have any reason to believe that this would systematically bias other students' responses to the CHKS. School-level aggregation also limits our ability to make conclusions about individual-level behavior or associations; at the same time, aggregation to the school level is appropriate for our research question, which seeks to examine institutional factors related to the school-to-prison pipeline. These limitations suggest that the relatively modest magnitudes of associations we found are likely conservative estimates. Nonetheless, even small effects can have a substantial impact when scaled over a large population of adolescents.

The purpose of the present study was to empirically establish school-level adolescent substance use, depressed feelings, and developmental risk factors as consequences of exclusionary school discipline and policing, known initiating components of the school-to-prison pipeline. As noted at the outset, there are strong theoretical reasons to believe,

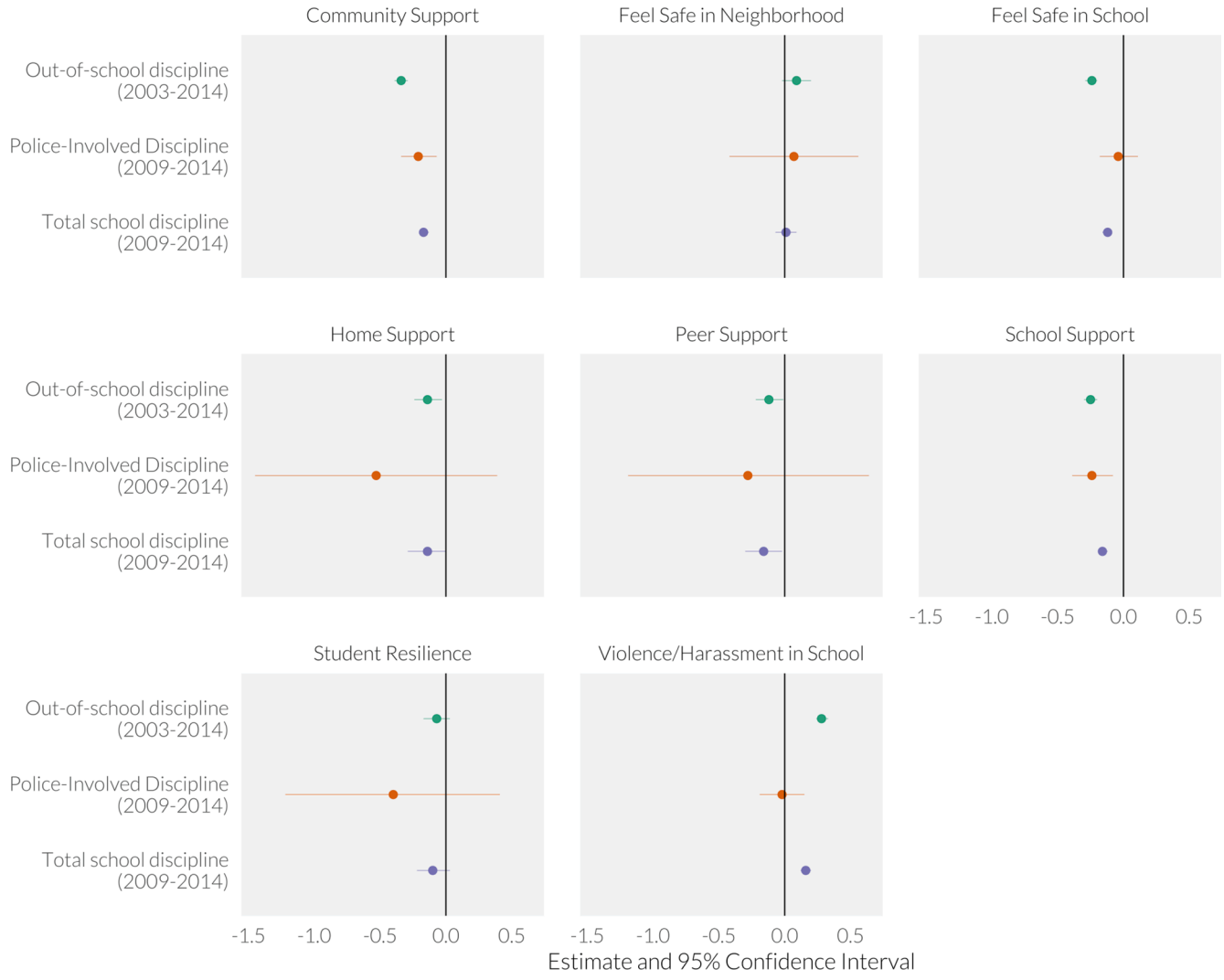


Fig. 2. Results of 24 adjusted multi-level models regressing 8 measures of developmental risk on 3 lagged measures of school discipline.

and initial evidence to suggest, that the relationships identified here are bidirectional, mutually compounding phenomena (Authors, 2021). Future research should identify the mechanisms for these bidirectional pathways and determine whether they remain consistent at the individual level. Moreover, it is likely the substance use and developmental risk outcomes mediate and modify each other with respect to school discipline. For example, it is possible that high rates of school discipline are worse for substance use outcomes in communities with less social support. Given the number of associations we tested, the distinct pathways through which these more complex relationships are likely to operate, and the limitations of our data, fully exploring these pathways was beyond the scope of the present paper, but should be tested in future research.

Further, existing empirical evidence and gray literature has documented the extent to which the school-to-prison-pipeline is an institutional mechanism of structural racism, given the profound racial disparities in the students it targets (Freeman & Steidl, 2016; Wallace, Jr. et al., 2008). In future research, we plan to determine the extent to which the associations identified in the present study are also racialized, and to what degree both the racialized criminalization of substance use and the consequences of community and school disinvestment help explain disparities in the school-to-prison pipeline.

This study found evidence that exclusionary school discipline and policing in schools—core elements of the school-to-prison pipeline—are a previously unidentified population predictors of adolescent substance use and developmental risk. As the social and health sciences continue to conduct research on the collateral consequences of mass criminalization and incarceration, they must also recognize schools as institutions that are implicated in the development and maintenance of carceral systems of control and the social production of poor health.

CRediT authorship contribution statement

Seth J. Prins: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Writing – original draft, Supervision, Funding acquisition. **Ruth T. Shefner:** Writing – original draft, Writing – review & editing. **Sandhya Kajeepeta:** Writing – original draft, Writing – review & editing. **Mark L. Hatzenbuehler:** Conceptualization, Methodology, Writing – review & editing. **Charles C. Branas:** Conceptualization, Methodology, Writing – review & editing. **Lisa R. Metsch:** Conceptualization, Methodology, Writing – review & editing. **Stephen T. Russell:** Conceptualization, Methodology, Writing – review & editing, Data curation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Acknowledgements

This work was supported by the National Institute on Drug Abuse, National Institutes of Health [grant numbers K01 DA045955 and T32-DA037801].

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.addbeh.2022.107524.

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