Social-ecological Predictors of Opioid Use among Adolescents with Histories of Substance Use Disorders

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Abstract

Adolescent opioid misuse is a public health crisis, particularly among clinical populations of youth with substance misuse histories. Given the negative and often lethal consequences associated with opioid misuse among adolescents, it is essential to identify the risk and protective factors underlying early opioid misuse to inform targeted prevention efforts. Understanding the role of parental risk and protective factors is particularly paramount during the developmental stage of adolescence. Using a social-ecological framework, this study explored the associations between individual, peer, family, community, and school-level risk and protective factors and opioid use among adolescents with histories of substance use disorders (SUDs). Further, we explored the potential moderating role of poor parental monitoring in the associations between the aforementioned risk and protective factors and adolescent opioid use. Participants included 294 adolescents (M_{age} = 16 years; 45% female) who were recently discharged from substance use treatment, and their parents (n = 323). Results indicated that lifetime opioid use was significantly more likely among adolescents endorsing antisocial traits and those whose parents reported histories of substance abuse. Additionally, adolescents reporting more perceived availability of substances were significantly more likely to report lifetime opioid use compared to those reporting lower perceived availability of substances. Results did not indicate any significant moderation effects of parental monitoring on any associations between risk factors and lifetime opioid use. Findings generally did not support social-ecological indicators of opioid use in this high-risk population of adolescents, signaling that the social-ecological variables tested may not be salient risk factors among adolescents with SUD histories. We discuss these findings in terms of continuing care options for adolescents with SUD histories that target adolescents' antisocial traits, perceived availability of substances, and parent histories of substance abuse, including practical implications for working with families of adolescents with SUD histories.

1   Introduction

Opioid misuse, broadly defined as the intentional use of opioids not directed by a prescriber, is a major public health concern in the United States, particularly among adolescents. In 2018, an estimated 699,000 (2.8%) of U.S. adolescents aged 12-17 reported past year opioid misuse and 169,000 reported past month misuse (Substance Abuse and Mental Health Administration [SAMHSA], 2019). In 2019, the Centers for Disease Control and Prevention's 2017 Youth Risk Behavior Surveillance Survey - a nationally representative survey that provides data of 9th through 12th grade students in public and private schools in the United States - found that approximately 14% of U.S. adolescents reported ever misusing opioids (Bhatia et al., 2020). Although U.S. adolescents aged 12-17 are less likely to report opioid use compared to older age groups (Back et al., 2010), adolescence represents a critical developmental stage for initiation of drug use, characterized by increased risk-taking as well as novelty and sensation seeking behaviors. Adolescents are at increased susceptibility to drug use and drug-related risks due in part to the salient influence of peers in conjunction with critical cortical development that occurs during this developmental period (Crews et al., 2007; Dayan et al., 2010; Romer, 2010; Winters & Arria, 2011). Further, early initiation of substance use and related risk behavior patterns increases risk for more progressive forms of substance use into adulthood (Chassin et al., 1999; DuRant et al., 1999; Lynne-Landsman et al., 2010; Van Ryzen et al., 2012). Thus, understanding salient risk factors associated with opioid use during this critical developmental period is paramount.

Adolescent opioid misuse has been associated with increased risk for negative outcomes into adulthood, including subsequent substance use disorders (SUDs) and more severe forms of drug misuse, including use of more potent opioids, such as heroin (Cerdá et al., 2015; McCabe et al., 2019; Miech et al., 2015; Muhuri et al., 2013; Palamar, Shearston, Dawson, et al., 2016). Compared to adolescents with cannabis or alcohol use disorders, those with opioid use disorders may also exhibit poorer long-term prognoses, including higher rates of school drop-out and multiple SUDs (Godley et al., 2017; Subramaniam et al., 2009). Among U.S. high school students, nonmedical prescription opioid use is associated with increased odds of engaging in concurrent risky behaviors, including risky driving behaviors, violent behaviors, risky sexual behaviors, substance use, and suicide attempts (Bhatia et al., 2020). Given the wide-ranging short- and long-term consequences of adolescent opioid use, it is essential to identify the malleable risk and protective factors underlying early opioid misuse to develop more effective preventive interventions.

Adolescents with longstanding histories of excessive substance use or SUDs are considered a high-risk subpopulation who are particularly vulnerable to developing opioid use disorders and experiencing subsequent consequences. For instance, adolescents with histories of SUDs report high rates of comorbid mental health problems (Tanner-Smith et al., 2019) and high risk of relapse following SUD treatment (Chung & Maisto, 2006; Cornelius et al., 2003). Few existing studies have explored opioid-specific outcomes in this high-risk subpopulation, but there is some evidence that youth with SUDs who have received SUD treatment in the United States report high rates of opioid misuse (e.g., Osgood et al., 2012). Opioid misuse has been shown to be prevalent among adolescents in substance use treatment and was associated with an increased likelihood of having three or more co-occurring SUDs (Al-Tayyib et al., 2018). And among students who attended a recovery high school (RHS)—a form of continuing care for youth discharged from SUD treatment—78% reported ever using opioids/narcotics, compared to 13% in a national sample of students who received SUD treatment in the United States who were not enrolled in an RHS (Tanner-Smith et al., 2018). Further, prior research on youth with SUDs attending RHSs reported that among those who use heroin, 80% identified prescription opioid misuse as a precursor to heroin use (Vosburg et al., 2015). These findings demonstrate the unique risk profiles of adolescents with SUD histories and underscore the

87 importance of identifying social-ecological risk and protective factors for opioid misuse specifically
88 for this vulnerable subpopulation.
89
90 **1.1   Social-ecological Predictors of Adolescent Opioid Misuse**
91
92 The social-ecological model (Bronfenbrenner, 1979; Bronfenbrenner, 1994) is a comprehensive
93 conceptual framework for understanding human development and is uniquely suited for
94 understanding risk and protective factors for adolescent opioid misuse (Jalali et al., 2020; Twombly
95 & Holtz, 2008). The social-ecological model posits that human development and behavior are shaped
96 by bidirectional relationships and interactions between an individual and five different environmental
97 systems (microsystem, mesosystem, exosystem, macrosystem, and chronosystem). Particularly
98 salient to identifying actionable mechanisms of adolescent substance use are those more proximal
99 ecological systems, including individual characteristics (e.g., mental health, substance use history);
100 microsystemic (e.g., peer/family substance use history, influence of family/peers); and exosystemic
101 relationships (e.g., access and availability to illicit substances, school). Given the influence and
102 importance of social contexts in adolescents' lives (e.g., school, parents, peers), as well as
103 bidirectional influences of these factors, the current study uses this guiding framework to examine a
104 range of social-ecological predictors of adolescent opioid use and their interactions with parenting
105 behaviors.
106   Extending from the social-ecological model, prior empirical research has found strong
107 evidence for diverse ecological factors predictive of substance use and other related behaviors in
108 adolescence across diverse populations (Arthur et al., 2002; Bränström et al., 2008; Cleveland et al.,
109 2008; Hemphill et al., 2011). Among individual-level predictors, prior tobacco, marijuana, and
110 alcohol use have been consistently identified as salient indicators for subsequent opioid misuse
111 among the general adolescent population (Back et al., 2010; Barnett et al., 2019; Bhatia et al., 2020;
112 Bonar et al., 2020; Griesler et al., 2019; Palamar et al., 2015; Sung et al., 2005; Vaughn et al., 2016).
113 Specifically, the odds of reporting having ever misused opioids were three times higher among
114 adolescents with histories of alcohol use (vs. those without), and two times higher among those with
115 histories of cigarette and marijuana use (vs. those without; Barnett et al., 2019). Additionally,
116 specific mental health concerns, such as depression and anxiety (Bonar et al., 2020; Chan &
117 Marsack-Topolewski, 2019; Edlund et al., 2015; Griesler et al., 2019; Monnat & Rigg, 2016; Schepis
118 & Krishnan-Sarin, 2008; Young, Glover et al., 2012); post-traumatic stress (Mackesy-Amiti et al.,
119 2015; McCauley et al., 2010); and antisocial behavior (Bonar et al., 2020; Edlund et al., 2015;
120 McCabe et al., 2012; McCauley et al., 2010; Nargiso et al., 2015; Sung et al., 2005; Vaughn et al.,
121 2016; Young, Glover et al., 2012) were associated with increased likelihood of adolescent self-
122 reports of opioid misuse.
123   Within the microsystem, peers and parents are critical agents of socialization and influence in
124 adolescents' lives. The peer context contains some of the most robust predictors of adolescent
125 substance use (Bauman & Ennett, 1994). Specifically, peer attitudes favorable toward substances are
126 a consistent predictor of opioid misuse in the general adolescent population (Conn & Marks, 2014;
127 Conn & Marks, 2017; Ford, 2008; Ford & Rigg, 2015; Nargiso et al., 2015; Schaefer & Petkovsek,
128 2017; Vaughn et al., 2016). In a nationally representative sample of youth ages 12 to 17, adolescents
129 who associated with peers that use drugs or had attitudes favorable of drug use were approximately
130 1.4 times more likely to endorse nonmedical prescription drug use compared to peers without these
131 peer associations (Ford, 2008). Although the influence of peers on substance use increases during
132 adolescence, the role of parenting continues to serve as a salient factor in predicting adolescent
133 substance use involvement. Parenting factors, including poor parental monitoring, lack of parental
134 involvement, parental histories of substance use, and tolerant parental attitudes toward substance use
135 are associated with adolescent substance use, including opioid misuse (Bonar et al. 2020; Donaldson

136 et al., 2015; Edlund et al., 2015; Gilson & Kreis, 2009; Griesler et al., 2019; Nargiso et al., 2015;
137 Sung et al., 2005; Vaughn et al., 2016). Although peers and parents serve as important risk and
138 protective factors, prior research has documented complex interactions between peer associations and
139 parental monitoring, such that the substance use risk associated with peers may be magnified when
140 adolescents experience low levels of parental monitoring (Kiesner et al., 2010).
141   Prior research has also identified several influential school and community-level (i.e.,
142 exosystem) risk factors for adolescent opioid misuse. Relevant school-level risk factors include
143 academic achievement (Barnett et al., 2019; Bonar et al., 2020; Nargiso et al., 2015; Vaughn et al.,
144 2016; Veliz et al., 2013; Schepis et al., 2018; Young, Glover et al., 2012) as well as school bonding
145 and negative attitudes toward school (Ford, 2009; Ford & Rigg, 2015; Nargiso et al., 2015;
146 Nicholson et al., 2016; Young, Glover et al., 2012). In a systematic review of studies on youth
147 nonmedical prescription drug use, five of six studies assessing low academic performance, school
148 dropout, or lack of school-bonding found a significantly higher prevalence of prescription drug use
149 among youth with these risks (Young, Glover et al., 2012). Relevant community level risk factors for
150 adolescent opioid misuse include (perceived) availability and access to drugs in the community
151 (Monnat & Rigg, 2016; Nargiso et al., 2015). In a nationally representative study of adolescents,
152 perceived ease of access to illicit drugs was associated with 1.03 times greater odds of prescription
153 opioid misuse (Monnat & Rigg, 2016). This body of literature thus demonstrates how diverse social-
154 ecological systems can contribute to adolescent opioid use outcomes.
155   Parental monitoring is perhaps the most widely studied family risk factors for adolescent
156 substance use. Prior research has found that low levels of parental monitoring moderate the
157 associations between some community level risk factors (e.g., exposure to violence; Burlew et al.,
158 2009; Udell et al., 2017), peer risk factors (e.g., substance using with peers; Kiesner et al., 2010), and
159 individual characteristics (e.g., impulsivity; Haas et al., 2018). Low levels of parental monitoring
160 may thus exacerbate the relation between relevant social-ecological risk factors and substance use
161 among adolescents. However, no research to date has examined parental monitoring as a moderator
162 of the relationship between ecological risk and protective factors and opioid misuse among
163 adolescents with SUD histories.
164   Despite the extensive body of evidence on risk and protective factors for adolescent opioid
165 misuse, to date there has been limited evidence examining these associations in clinical samples of
166 adolescents who may be at particularly high risk for opioid misuse (Bonar et al., 2020). Most prior
167 research on this topic has analyzed data from large national surveys of U.S. adolescents, which can
168 yield valuable insights on patterns in the general adolescent population; however, these findings may
169 not be generalizable to high-risk adolescent subpopulations, such as those with SUDs. Among
170 adolescents with SUD histories, the family environment, parental support, and involvement may be
171 uniquely important for sustaining recovery and abstinence (Botzet et al., 2019; Godley et al., 2005;
172 Sussman, 2011; White et al., 2009; Winters et al., 2018). Given the important role of parents in
173 adolescents' recovery from SUDs, further research is warranted to better understand parental risk and
174 protective factors, as well as their interaction with other relevant social-ecological risk factors (e.g.,
175 peer and community factors). Identifying the contexts in which opioid misuse is likely to arise among
176 adolescents with SUDs can inform targeted prevention efforts for this population.

178 **1.2   Study Aims and Hypotheses**

180 The current study examined risk and protective factors for opioid use in a sample of adolescents with
181 histories of SUDs. Guided by ecological systems theory and prior research, we first examined
182 associations between individual (mental health and substance use), microsystemic (peer perceptions
183 of use, parent drug history, parenting behaviors), and exosystemic (academic performance, attitudes
184 toward school, and perceived availability) risk factors and adolescent opioid use. We explored each

185 risk and protective factor by assessing its unique association with opioid use within the broader
186 social-ecology (individual, microsystem, exosystemic domains). Second, to gain a better
187 understanding of the role of parenting behaviors, we examined whether parental monitoring
188 moderates any of the associations between these risk and protective factors and adolescent opioid
189 use.
190   In line with these study aims, we hypothesized that each individual, microsystemic, and
191 exosystemic risk factor would predict lifetime adolescent opioid use among a clinical sample of
192 adolescents with SUD histories. We also hypothesized that parental monitoring would significantly
193 moderate the associations between ecological risk factors and opioid use, such that greater levels of
194 parental monitoring would buffer the relations between ecological risk factors and opioid use.
195
196 **2**   **Methods**
197
198 **2.1**   **Participants and Procedure**
199
200 We analyzed existing data from a longitudinal study that used a quasi-experimental design to
201 examine the effects of post-SUD treatment schooling attendance on student outcomes (Finch et al.,
202 2018). Adolescents and their families were recruited upon adolescents' discharge from SUD
203 treatment programs (baseline assessment); a total of 294 adolescents and 323 parents enrolled in the
204 study at baseline. Although the larger parent study included longitudinal follow-up assessments, the
205 current manuscript analyzes data collected during only the baseline assessment to isolate study
206 findings apart from any intervention effects. Adolescent participants identified as predominantly non-
207 Hispanic white (74.9%) with ages ranging from 13-19 ($M = 16.3$ years, $SD = 1.09$) and were
208 approximately equal in distribution by sex (50.2% male). For more information on sample
209 characteristics, see Finch et al. (2018) and Tanner-Smith et al. (2018). All procedures followed were
210 in accordance with the ethical standards of the University of Minnesota Institutional Review Board
211 and with the Helsinki Declaration of 1975, as revised in 2000.
212
213
214 **2.2**   **Measures**
215
216 **2.2.1**   **Primary Outcome**
217
218 **2.2.1.1 Opioid Use**
219
220 The outcome of interest in this study was measured using a single self-reported dichotomous item
221 about adolescents' lifetime opioid misuse at baseline– "Have you ever used any of these drugs:
222 Opioids/Narcotics (heroin, smack, morphine, codeine, Demerol, methadone, opium, Vicodin,
223 Oxycontin, oxycodone)?" This outcome item was coded as *yes* (1) or *no* (0).
224
225 **2.2.2**   **Individual-Level Predictors**
226
227 **2.2.2.1 Mental Health**
228
229 Several mental health constructs were assessed as individual-level risk factors for the current study.
230 We used the M.I.N.I. Structured Clinical Interview (M.I.N.I.-SCID), a brief structured diagnostic
231 interview for major psychiatric disorders derived from the symptomology defined by the DSM-IV
232 and ICD-10, to examine adolescents' self-reported mental health symptoms of major depressive
233 disorder (MDD), generalized anxiety disorder (GAD), and posttraumatic stress disorder (PTSD), as

234 well as antisocial traits (Sheehan et al., 1999). This measure assessed whether adolescents
235 experienced any symptoms of each diagnosis in the 12 months prior to enrolling in the substance use
236 treatment program (*yes/no*). Antisocial traits were assessed by whether adolescents met the point-in-
237 time clinical threshold of DSM-IV symptoms of antisocial personality disorder (*yes/no*). These
238 measures do not represent a formal clinical diagnosis; rather, they assessed whether adolescents self-
239 reported any symptoms for MDD, GAD, and PTSD, and whether adolescents reported antisocial
240 traits at or above a clinically indicated threshold (i.e., at least three antisocial traits based on DSM-IV
241 criteria).
242
243 **2.2.2.2 Substance Use**
244
245 Tobacco, marijuana, and alcohol use were examined as individual-level risk factors. Tobacco use was
246 assessed through a single binary item (*yes/no*) asking, "in the past 12 months, have you used tobacco
247 products, including cigarettes, cigars, a pipe, or chewing tobacco/snuff?" Marijuana and alcohol use
248 were also measured with two binary items (*yes/no*) indicating whether adolescents reported using
249 marijuana in the past year or using alcohol to the point of intoxication in the past year, respectively.
250
251 **2.2.3   Familial- and Peer-Level Predictors**
252
253 **2.2.3.1 Parenting Practices**
254
255 Parenting practices were measured using a shortened version (15 items) of the original 42-item
256 parent-reported Alabama Parenting Questionnaire (PAPQ; Frick, 1991). The PAPQ includes
257 measures of three subscales of parenting practices: positive parenting (six items), poor parental
258 monitoring (five items), and inconsistent discipline (4 items). Response options used a five-point
259 Likert scale ranging from *Never* (1) to *Always* (5), where parents rated the frequency of parenting in
260 the past 12 months. An example item for poor parental monitoring was, "Your child fails to leave a
261 note or let you know where he/she is going." Scores for the three subscales were determined by
262 calculating the mean for each subscale. Higher mean scores on each subscale indicate higher levels of
263 each parenting construct. The PAPQ subscales have shown strong concurrent and predictive validity
264 in a prior study with this sample (Nichols et al., under review). The current sample showed adequate
265 internal consistency in the three subscales: positive parenting ($\alpha = 0.78$), inconsistent discipline ($\alpha = $
266 0.70), and poor parental monitoring ($\alpha = 0.74$).
267
268 **2.2.3.2 Parent with Drug or Alcohol Abuse History**
269
270 One dichotomous (*yes/no*) adolescent-reported item was used to measure parents' alcohol or drug
271 abuse history: "Do either of your biological parents have a history of an AOD abuse problem?"
272
273 **2.2.3.3 Peer Attitudes Scale**
274
275 Substance approving peer attitudes were assessed using 13 items from the Personal Experiences
276 Inventory (Winters et al., 1989). Response options were measured on a four-point Likert scale, with
277 responses ranging from *Strongly disagree* (1) to *Strongly agree* (4), where responses were anchored
278 to the time in the adolescent's life when they were using drugs at their heaviest level. An example
279 item was, "My friends think it's wrong for people to get drunk or high." A mean score for peer
280 attitudes was determined by calculating the mean of the 13 items, with higher scores indicating
281 higher peer approval of substance use. This measure demonstrated good internal consistency in the
282 analytic sample ($\alpha = 0.87$).

283
284 **2.2.4   School-/Community-Level Predictors**
285
286 **2.2.4.1 Academic Performance**
287
288 Grade point average (GPA) was used to assess adolescents' academic performance. One continuous
289 adolescent-reported item measured adolescents' most recent GPA, on a scale ranging from 0 to 4.
290
291 **2.2.4.2 Perceived Availability of Substances**
292
293 Perceived availability of alcohol, marijuana, prescription drugs, other illicit drugs, and over-the-
294 counter drugs was measured using a modified version of Monitoring the Future's Perceived
295 Availability of Drugs Scale (Bachman et al., 2001). Survey questions began with one question "How
296 difficult do you think it would be for you to get each of the following drugs, if you wanted some?"
297 and listed multiple substance types. Response options were measured on a five-point Likert scale
298 ranging from *Probably impossible* (1) to *Very easy* (5). A mean score was computed for each
299 participant, where higher values represent greater overall perceived availability of drugs and alcohol.
300 This measure demonstrated adequate internal consistency in the current sample ($\alpha = 0.67$).
301
302 **2.2.4.3 Attitudes Toward School**
303
304 Adolescents' attitudes toward school were measured using 10 items from the Behavior Assessment
305 System for Children (BASC; Reynolds & Kamphaus, 1992). Response options were *True/False* with
306 the following prompt: "Thinking back to before you were in treatment, when you were using drugs
307 the heaviest, click on the "True" option if you agree with the sentence or click on "False" if you don't
308 agree." An example item was, "I can hardly wait to quit school." The 10 items were added together to
309 create a sum score, with higher scores representing higher negative attitudes toward school. The
310 BASC demonstrated adequate internal consistency among the current sample ($\alpha = 0.75$).
311
312 **2.3   Analytic Plan**
313
314 To address the current study's aims, we estimated a series of logistic regression models to examine
315 the magnitude of associations between the individual, interpersonal, and school/community risk and
316 protective factors and the odds of adolescent opioid use. All models adjusted for adolescent's sex,
317 race/ethnicity, whether they lived in a two-parent household, and whether they were enrolled in a
318 recovery high school (RHS) versus a more traditional, non-recovery high school. First, a hierarchical
319 logistic regression was conducted to examine the association between risk and protective factors of
320 all the domains and adolescent opioid use. The first step of the hierarchical model examined
321 associations between covariates and lifetime opioid use. The following step included all individual-
322 level variables as predictors of adolescent opioid use. The third step in the model examined peer and
323 parental risk and protective factors on opioid use while adjusting for individual-level predictors and
324 covariates. The final step of the model examined the associations between school-/community-level
325 predictors and adolescent opioid use, while adjusting for covariates and individual-, peer-, and
326 parental-level risk and protective factors.
327   To address the second study aim, we added a multiplicative interaction term to test whether
328 poor parental monitoring moderated the effect of each risk and protective factor on the odds of
329 adolescent opioid use. When an interaction was tested (e.g., MDD symptoms and poor parental
330 monitoring), all risk and protective factors were included in the model, as well as covariates. Results
331 are presented as logit coefficients (*b*) from the logistic regression models, alongside corresponding

332 odds ratio (*OR*) effect sizes and their 95% confidence intervals. Model fit for each logistic regression
333 tested was assessed using the Akaike Information Criterion (AIC).
334   There was a modest amount of missing data due to participant non-response and study
335 attrition; missingness ranged from 5-24% among the variables of interest. Missing data were
336 addressed using multiple imputation by chained equations (van Buuren & Groothuis-Oudshoorn,
337 2010) to create 30 multiply imputed datasets with 30 iterations. All reported model estimates were
338 obtained by pooling results across the imputed datasets using Rubin's rules (1987). All analyses were
339 conducted using R 4.0.3 (R Core Team, 2020)**.**
340
341 **3   Results**
342
343 Table 1 shows the descriptive statistics for study variables included in the analyses. About 50%
344 identified as male and approximately 75% identified as white. Less than one-half of the sample
345 (47.4%) stated that they were enrolled in an RHS and approximately 36% of the adolescents in the
346 sample stated they lived in a two-parent household. Approximately 67% of adolescents reported
347 lifetime opioid use. Regarding mental health symptoms in the past 12 months, 31.6% of adolescents
348 reported experiencing symptoms of MDD, 28.5% and 10.8% of adolescents reported experiencing
349 symptoms of GAD and PTSD respectively, and 39% of adolescents endorsed antisocial traits. Most
350 adolescents reported at least some use of tobacco (84.2%), alcohol (69%), and marijuana (77.4%) in
351 the past year. Approximately 57% of the sample reported a parent with past drug or alcohol abuse.
352   Table 2 presents the findings from the hierarchical logistic regression models. In the covariate
353 model, there was no evidence of significant associations between being male, white, enrolled in RHS,
354 and living in a two-parent household with engaging in opioid use. [1]The inclusion of individual-level
355 risk factors in the subsequent model indicated that adolescents who endorsed antisocial traits had
356 three times the odds of engaging in opioid use than adolescents who did not (AOR = 3.01, *p* < .001,
357 95% CI [1.55, 5.86]). Experiencing MDD symptoms, GAD symptoms, or PTSD symptoms in the last
358 12 months were not significantly associated with engagement in opioid use. Use of tobacco, alcohol,
359 and marijuana in the past year were also not significantly associated with engagement in opioid use.
360 After adding parent and peer risk and protective factors, the model showed that having a parent with
361 past alcohol or drug abuse was associated with an 87% increase in the odds of engaging in opioid use
362 (AOR = 1.87, *p* = .04*,* 95% CI [1.04, 3.39]) when adjusted for other individual, parent, and peer
363 predictors. Other parental dimensions, including poor parental monitoring, inconsistent discipline,
364 and positive parenting, were not significantly associated with engagement in opioid use. Similarly,
365 peer attitudes did not show evidence of a significant association with engagement in opioid use. In
366 the final model, including school-level and community-level predictors, the community-level
367 predictor (perceived availability of substances) was significantly associated with ever using opioids
368 (AOR = 1.90, *p* = .02, 95% CI [1.12, 3.20]). School-level predictors, including GPA and negative
369 attitudes toward school, however, were not significantly associated with engagement in opioid use. A
370 significant association was found for adolescents with a two-parent household having higher odds of
371 engaging in engaging in opioid use (AOR = 2.09, *p* = .038, 95% CI [1.04, 4.20]) when including the
372 school- and community-level predictors. As seen in Table 2, both parent with a past drug or alcohol
373 abuse and antisocial traits remained significantly associated with engaging in opioid use when
374 including additional ecological predictors in subsequent models.
375

8

[1] Post hoc analyses excluding non-significant covariates were conducted to increase statistical power. Results of these post hoc analyses yielded no substantial or meaningful changes in model fit, statistical significance, or conclusions.

376 **3.1** **Potential Moderating Effect of Poor Parental Monitoring with Individual-level**
377 **Predictors**
378
379 As shown in Table 3, there was no evidence that poor parental monitoring significantly moderated
380 the association between the individual-level predictors and opioid use. Indeed, the interaction
381 between MDD symptoms and poor parental monitoring was not significantly associated with odds of
382 adolescents ever using opioids (AOR = 1.25, *p* = .60, 95% CI [0.54, 2.90]). Similarly, there was no
383 evidence that poor parental monitoring moderated the associations between other mental health
384 constructs, including GAD symptoms (AOR = 2.24, *p* = .12, 95% CI [0.81, 6.20]), PTSD symptoms
385 (AOR = 1.23, *p* = .74, 95% CI [0.35, 4.27]), and antisocial traits (AOR = 1.16, *p* = .69, 95% CI [
386 0.55, 2.45]), with using opioids. Finally, there was no evidence that poor parental monitoring
387 moderated the associations between other individual-level predictors and adolescents' opioid use:
388 tobacco use (AOR = 0.82, *p* = .90, 95% CI [0.04, 15.60]), alcohol use (AOR = 1.17, *p* = .75, 95% CI
389 [0.45, 3.02]), marijuana use (AOR = 1.92, *p* = .18, 95% CI [0.73, 5.05]).
390
391 **3.2** **Potential Moderating Effect of Poor Parental Monitoring with Parental-/Peer-level**
392 **Predictors**
393
394 Table 4 shows that there was no evidence that poor parental monitoring significantly moderated the
395 association between parental- and peer-level predictors and adolescent opioid use. Specifically, there
396 was no evidence of a significant association between the interaction of positive parenting and poor
397 parental monitoring with adolescents ever using opioids (AOR = 1.09, *p* = .77, 95% CI [0.61, 1.94]).
398 Similarly, there was no evidence that poor parental monitoring moderated the associations between
399 the other parental constructs, including inconsistent discipline (AOR = 1.18, *p* = .46, 95% CI [0.76,
400 1.81]) and having parents with histories of drug or alcohol abuse (AOR = 0.94, *p* = .87, 95% CI
401 [0.45, 1.97]) with opioid use. Lastly, the interaction between peer attitudes and poor parental
402 monitoring was not significantly associated with odds of adolescents ever using opioids (AOR =
403 1.30, *p* = .48, 95% CI [0.62, 2.76]).
404
405 **3.3** **Potential Moderating Effect of Poor Parental Monitoring with School-/Community-level**
406 **Predictors**
407
408 Table 5 shows the interaction findings between school-/community-level predictors and poor parental
409 monitoring with adolescents ever using opioids. There was no evidence that poor parental monitoring
410 significantly moderated the associations between GPA, negative attitudes towards school, and
411 perceived availability with ever engaging in opioids. Specifically, there was no evidence that poor
412 parental monitoring significantly moderated the association between GPA and adolescents ever using
413 opioids (AOR = 0.95, *p* = .86, 95% CI [0.56, 1.62]), nor between negative attitudes toward school
414 and opioid use (AOR = 1.14, *p* = .07, 95% CI [0.99, 1.32]). Finally, there was no evidence of a
415 significant association between the interaction of perceived availability and poor parental monitoring
416 with adolescents ever using opioids (AOR = 1.53, *p* = .18, 95% CI [0.82, 2.85]).
417
418 **4** **Discussion**
419
420 This study examined several social-ecological risk and protective factors associated with lifetime
421 opioid use among a sample of adolescents with histories of SUDs. Our results suggest that opioids
422 are a commonly used illicit substance among this clinical adolescent sample, evidenced by the 67%
423 of adolescents reporting lifetime opioid use. This prevalence rate is comparable to previous findings
424 of opioid use rates among adolescents in recovery from SUDs (Tanner-Smith et al., 2018; Vosburg et

425   al., 2015), highlighting the generalizability of opioid use characteristics among high-risk clinical
426   populations of adolescents. Our hypothesis that risk factors at each social-ecological level would
427   significantly predict lifetime opioid use was partially supported. Regarding the role of family and
428   parenting contexts, our results demonstrated that adolescents whose parents have a history of alcohol
429   or drug abuse were more likely to report ever using opioids compared to those who did not report a
430   parental substance use history. As hypothesized, adolescents who endorsed antisocial traits also had
431   greater odds of reporting lifetime opioid use compared to adolescents who did not meet this
432   threshold. This finding is consistent with prior research linking antisocial behavior to adolescent
433   opioid misuse (Griesler et al., 2019; Nargiso et al., 2015; Sung et al., 2005; Vaughn et al., 2016).
434   Additionally, adolescents who reported greater perceived availability of substances had greater odds
435   of reporting lifetime opioid use compared to adolescents with lower perceived availability of
436   substances. We found no evidence that adolescents' past year substance use (tobacco, marijuana, or
437   alcohol) was associated with their lifetime opioid use, nor any evidence that adolescents' prior mental
438   health symptoms of MDD, GAD, or PTSD, nor peer attitudes favorable toward drugs, were
439   predictive of lifetime opioid use. Given that previous studies have consistently reported significant
440   associations between substance use and mental health histories and subsequent opioid use outcomes
441   (Barnett et al 2019; Bhatia et al., 2020; Bonar et al., 2020; Griesler et al., 2019), further research is
442   warranted to replicate the null findings reported herein.
443   These results highlight the potentially impactful role of parental substance use histories on
444   adolescent opioid use. The family context is incredibly influential during the developmental stage of
445   adolescence, underlying the significance of understanding the development and progression of SUDs
446   among adolescents, particularly among those with parents who have existing substance use-related
447   concerns and histories (Chassin & Handley, 2006). Prior research has documented that parental
448   SUDs increase the likelihood that their children will develop SUDs (Biederman et al., 2000).
449   Moreover, effects of protective parenting behaviors on children's outcomes might be diminished
450   among parents with SUDs compared to parents without substance use problems (Arria et al., 2012).
451   Family and parenting characteristics therefore affect adolescents' behaviors both directly and
452   indirectly, highlighting the complex nature of parenting when substance use is a factor within the
453   family context. Growing behavior genetic research suggests that substance use during adolescence is
454   heavily influenced by environmentally mediated factors, including parent–child relationship
455   problems and peer deviance, which influence adolescent phenotypes, over and beyond heritable
456   biological influences alone (Walden et al., 2004). Although parental substance abuse was examined
457   as a microsystemic predictor of opioid use, future research should consider examining this variable as
458   a possible proxy of biological vulnerability for addiction or substance use among adolescents. Such
459   an investigation may provide more context and nuance to the complex nature of substance use in the
460   context of family and parents.
461   The hypothesis that level of parental monitoring would moderate associations between social-
462   ecological risk factors and opioid use was not supported in the current study. We found no evidence
463   that parental monitoring levels significantly moderated associations between social-ecological risk
464   factors and adolescents' lifetime opioid use. These null results could be due to limited statistical
465   power using our analytic sample of 294 adolescents. Future research should thus attempt to replicate
466   this effect in larger samples of adolescents with SUD histories and similar risk profiles as the current
467   sample. These null findings might also reflect a lack of nuance and sensitivity in our measure of
468   parental monitoring (see Kerr & Stattin, 2000; Kerr et al., 2010; Stattin & Kerr, 2000), despite its
469   demonstrated predictive validity among other samples of adolescents (Elgar et al., 2007; Gross et al.,
470   2017; Zlomke et al., 2014; Zlomke et al., 2015). Historically, parental monitoring has been
471   conceptualized as an active attempt by parents to monitor and follow the whereabouts of their
472   children. However, this parental management strategy has been found to be most effective in the
473   context of positive parent-adolescent relationships that would evoke adolescent self-disclosure of

474   information and risk behaviors (Fletcher et al., 2004; Keijsers et al., 2009; Rusby et al., 2018; Stattin
475   & Kerr, 2000). Indeed, adolescent self-disclosure is an important component of parental monitoring
476   (Kerr & Stattin, 2000; Rusby et al., 2018; Stattin & Kerr, 2000), supporting the need to understand
477   the relationship quality alongside factors such as conflict and communication. Thus, family-focused
478   interventions of adolescents with SUD histories may need to consider the way in which parental
479   monitoring is being assessed, especially in the context of adolescent attitudes toward school. This
480   may be an important area for prevention among adolescents with histories of SUDs.
481   Our results demonstrate the applicability of studying adolescents' perceived availability of
482   substances (at the exosystem level), parent's substance use (microsystem level), and antisocial traits
483   (individual level) among students in recovery from SUDs. Some theoretical frameworks, such as the
484   recovery capital framework (Granfield & Cloud, 1999; Hennessy, 2017), highlight how access to and
485   accumulation of resources across multiple ecological levels can aid the substance use recovery
486   process. Continuing care options that address the multiple social-ecological needs of youth in
487   recovery, are therefore likely to successfully support youths' recovery needs. For example, RHSs,
488   which aim to support students' social and community capital by fostering social connectedness with
489   sober peers, supportive school staff, and family members, have shown positive effects in prolonging
490   abstinence from substance use during recovery (Finch & Karakos, 2014; Finch et al., 2018; Tanner-
491   Smith et al., 2019; Tanner-Smith et al., 2020). Other approaches drawing on integrated and holistic
492   care models providing tailored therapeutic services to adolescents in recovery from SUDs (e.g.,
493   Latimer et al., 2000) may thus be similarly effective in addressing the numerous issues facing these
494   adolescents.
495
496   **4.1   Limitations**
497
498   The findings from the current study should be considered alongside several study limitations. First,
499   because we relied on existing data, we were only able to study the outcome of interest – opioid use –
500   using one binary item. This item inherently limited our ability to examine predictors of the frequency
501   or severity of adolescent opioid use. Future research studies in samples of adolescents with SUDs
502   should collect more nuanced data about opioid misuse to better understand predictors of both the
503   likelihood and extent of opioid use (e.g., Boyd et al., 2006). There were additional limitations due to
504   measures used in the current study that are important to note. It is possible that there was insensitive
505   measurement bias if the measures were not developmentally appropriate for this sample of
506   adolescents. Additionally, it is possible that opioid use was under-reported in the present sample, as
507   well as other national samples of adolescents (Palamar, Shearston, & Cleland, 2016); a possible
508   source of attention bias. Given that adolescents had recently been discharged from SUD treatment, it
509   is possible that some participants felt pressure to respond favorably to the questionnaire items
510   regarding drug use. Second, given the small and relatively homogenous sample (in terms of
511   race/ethnicity and socioeconomic status), future research should aim to study these ecological risk
512   and protective factors in larger clinical samples of adolescents from more diverse backgrounds.
513   Finally, given our reliance on previously collected data, there were several potential confounding
514   variables highlighted in the literature that were not included in our final analytic models, such as
515   adolescents' sensation-seeking and self-medication motives (Boyd et al., 2006; Boyd et al., 2009;
516   Khantzian, 1997; Romer et al., 2017; Young, McCabe et al., 2012). Similarly, the scope of this study
517   did not include examining potential mediators; however, prior research suggests these associations
518   may hold additional complexity that should be further explored. For instance, prior studies have
519   demonstrated that positive parental involvement may act as a mediator between parent characteristics
520   such as SUD history on youth psychosocial outcomes, which may include adolescent opioid and
521   other substance use (Bijttebier et al., 2006; Burstein et al., 2006). Future research is thus warranted to
522   examine possible differences in motivations for opioid use among adolescents with SUD histories as

523 well as potential mediators that may elucidate the mechanisms underlying the link between various
524 risk factors and adolescent opioid misuse.
525
526 **4.2   Conclusions**
527
528 This study adds to the empirical evidence base on adolescent opioid misuse in several important
529 ways. First, this is the first study to our knowledge that uses a social-ecological framework to study
530 risk and protective factors of opioid use among adolescents with a history of SUDs. Examining these
531 associations in this understudied clinical population is critical for promoting positive outcomes
532 among adolescents after they are discharged from formal substance use treatment. High school
533 students with histories of SUDs represent a high-risk clinical subpopulation for problematic
534 substance use and relapse. More research is needed on the social epidemiology of substance use –
535 and opioid use, more specifically – in this population, which can be used to inform efficacious and
536 targeted preventive and continuing care interventions for these adolescents. Continuing care
537 programs that offer individualized treatment plans should concentrate on the important roles that
538 families, peers, and school environment have in promoting positive outcomes among adolescents
539 with histories of SUDs and opioid misuse.
540

5   Conflict of Interest

All authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

6   CRediT Author Contribution Statement

LMN: Conceptualization, Writing- Original Draft, Writing – Review & Editing, Project Administration. **JAP**: Conceptualization, Methodology, Formal Analysis, Writing – Review & Editing. **CMF**: Conceptualization, Methodology, Writing – Review & Editing. **KMO**: Conceptualization, Writing – Review & Editing. **ETS**: Conceptualization, Investigation, Resources, Writing – Review & Editing, Supervision.

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9   References

Al-Tayyib, A., Riggs, P., Mikulich-Gilbertson, S., & Hopfer, C. (2018). Prevalence of nonmedical use of prescription opioids and association with co-occurring substance use disorders among adolescents in substance use treatment. *Journal of Adolescent Health, 62*(2), 241-244.

Arria, A. M., Mericle, A. A., Meyers, K., & Winters, K. C. (2012). Parental substance use impairment, parenting and substance use disorder risk. *Journal of Substance Abuse Treatment, 43*(1), 114-122.

Arthur, M. W., Hawkins, J. D., Pollard, J. A., Catalano, R. F., & Baglioni Jr, A. J. (2002). Measuring risk and protective factors for use, delinquency, and other adolescent problem behaviors: The Communities That Care Youth Survey. *Evaluation Review, 26*(6), 575-601.

Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (2001). The Monitoring the Future Project after twenty-seven years: Design and procedures. Ann Arbor, MI: Institute for Social Research.

Back, S. E., Payne, R. L., Simpson, A. N., & Brady, K. T. (2010). Gender and prescription opioids: Findings from the National Survey on Drug Use and Health. *Addictive Behaviors, 35*(11), 1001-1007.

Barnett, T. E., Thompson, E. L., Litt, D. M., & Lewis, M. A. (2019). Correlates of nonmedical prescription opioid use among US adolescents. *American Journal of Preventive Medicine, 57*(5), e175-e179.

Bauman, K. E., & Ennett, S. T. (1994). Peer influence on adolescent drug use. *American Psychologist, 49*(9), 820-822.

584 Bhatia, D., Mikulich-Gilbertson, S. K., & Sakai, J. T. (2020). Prescription opioid misuse and risky
585   adolescent behavior. *Pediatrics, 145*(2), 1-6.
586 Biederman, J., Faraone, S. V., Monuteaux, M. C., & Feighner, J. A. (2000). Patterns of alcohol and
587   drug use in adolescents can be predicted by parental substance use disorders. *Pediatrics*,
588   *106*(4), 792-797.
589 Bijttebier, P., Goethals, E., & Ansoms, S. (2006). Parental drinking as a risk factor for children's
590   maladjustment: The mediating role of family environment. *Psychology of Addictive*
591   *Behaviors, 20*(2), 126–130.
592 Bonar, E. E., Coughlin, L., Roche, J. S., Philyaw-Kotov, M. L., Bixler, E. A., Sinelnikov, S., Kolosh,
593   A., Cihak, M. J., Cunningham, R. M., & Walton, M. A. (2020). Prescription opioid misuse
594   among adolescents and emerging adults in the United States: A scoping review. *Preventive*
595   *Medicine, 132*, 105972.
596 Botzet, A. M., Dittel, C., Birkeland, R., Lee, S., Grabowski, J., & Winters, K. C. (2019). Parents as
597   interventionists: Addressing adolescent substance use. *Journal of Substance Abuse Treatment,*
598   *99*, 124-133.
599 Boyd, C. J., McCabe, S. E., Cranford, J. A., & Young, A. (2006). Adolescents' motivations to abuse
600   prescription medications. *Pediatrics, 118*(6), 2472-2480.
601 Boyd, C. J., Young, A., Grey, M., & McCabe S. E. (2009). Adolescents' nonmedical use of
602   prescription medications and other problem behaviors. *Journal of Adolescent Health, 45*(6),
603   543–5550.
604 Bränström, R., Sjöström, E., & Andréasson, S. (2008). Individual, group and community risk and
605   protective factors for alcohol and drug use among Swedish adolescents. *European Journal of*
606   *Public Health*, *18*(1), 12-18.
607 Bronfenbrenner, U. (1979). The ecology of human development. Cambridge, Mass: Harvard
608   University Press.
609 Bronfenbrenner, U. (1994). Ecological models of human development. In International encyclopedia
610   of education (Vol. 3, 2nd ed.). Oxford: Elsevier. Reprinted in: Gauvain, M., & Cole, M.
611   (Eds.), *Readings on the development of children* (2nd ed., pp. 37–43). New York, NY:
612   Freeman.
613 Burlew, A. K., Johnson, C. S., Flowers, A. M., Peteet, B. J., Griffith-Henry, K. D., & Buchanan, N.
614   D. (2009). Neighborhood risk, parental supervision and the onset of substance use among
615   African American adolescents. *Journal of Child and Family Studies, 18*(6), 680-689.
616 Burstein, M., Stanger, C., Kamon, J., & Dumenci, L. (2006). Parent psychopathology, parenting, and
617   child internalizing problems in substance-abusing families. *Psychology of Addictive*
618   *Behaviors, 20*(2), 97– 106.
619 Cerdá, M., Santaella, J., Marshall, B. D., Kim, J. H., & Martins, S. S. (2015). Nonmedical
620   prescription opioid use in childhood and early adolescence predicts transitions to heroin use
621   in young adulthood: A national study. *The Journal of Pediatrics, 167*(3), 605-612.
622 Chan, K. T. K., & Marsack-Topolewski, C. (2019). Gender differences in adolescent opioid misuse
623   and major depressive episodes. *Child and Adolescent Social Work Journal*, *37*, 397-409.
624 Chassin, L., & Handley, E. D. (2006). Parents and families as contexts for the development of
625   substance use and substance use disorders. *Psychology of Addictive Behaviors, 20*(2), 135.
626 Chassin, L., Pitts, S., Delucia, C., & Todd, M. (1999). A longitudinal study of children of alcoholics:
627   Predicting young adult substance use disorders, anxiety, and depression. *Journal of Abnormal*
628   *Psychology*, *108*(1), 106–119.
629 Chung, T., & Maisto, S. A. (2006). Relapse to alcohol and other drug use in treated adolescents:
630   Review and reconsideration of relapse as a change point in clinical course. *Clinical*
631   *Psychology Review, 26*(2), 149–161.

Cleveland, M. J., Feinberg, M. E., Bontempo, D. E., & Greenberg, M. T. (2008). The role of risk and protective factors in substance use across adolescence. *Journal of Adolescent Health*, *43*(2), 157-164.

Conn, B. M., & Marks, A. K. (2014). Ethnic/racial differences in peer and parent influence on adolescent prescription drug misuse. *Journal of Developmental & Behavioral Pediatrics, 35*(4), 257-265.

Conn, B. M., & Marks, A. K. (2017). An ecological approach to understanding adolescent prescription drug misuse. *Journal of Adolescent Research, 32*(2), 183-204.

Cornelius, J. R., Maisto, S. A., Pollock, N. K., Martin, C. S., Salloum, I. M., Lynch, K. G., & Clark, D. B. (2003). Rapid relapse generally follows treatment for substance use disorders among adolescents. *Addictive Behaviors, 28*(2), 381–386.

Crews, F., He, J., & Hodge, C. (2007). Adolescent cortical development: a critical period of vulnerability for addiction. *Pharmacology Biochemistry and Behavior, 86*(2), 189-199.

Dayan, J., Bernard, A., Olliac, B., Mailhes, A. S., & Kermarrec, S. (2010). Adolescent brain development, risk-taking and vulnerability to addiction. *Journal of Physiology-Paris, 104*(5), 279-286.

Donaldson, C. D., Nakawaki, B., & Crano, W. D. (2015). Variations in parental monitoring and predictions of adolescent prescription opioid and stimulant misuse. *Addictive Behaviors, 45*, 14-21.

DuRant, R. H., Smith, J. A., Kreiter, S. R., & Krowchuk, D. P. (1999). The relationship between early age of onset of initial substance use and engaging in multiple health risk behaviors among young adolescents. *Archives of Pediatrics & Adolescent Medicine, 153*(3), 286-291.

Edlund, M. J., Forman-Hoffman, V. L., Winder, C. R., Heller, D. C., Kroutil, L. A., Lipari, R. N., & Colpe, L. J. (2015). Opioid abuse and depression in adolescents: Results from the National Survey on Drug Use and Health. *Drug and Alcohol Dependence, 152*, 131-138.

Elgar, F. J., Waschbusch, D. A., Dadds, M. R., & Sigvaldason, N. (2007). Development and validation of a short form of the Alabama Parenting Questionnaire. *Journal of Child and Family Studies, 16*(2), 243-259.

Finch, A. J., & Karakos, H. L. (2014). Substance abuse recovery and schooling: The role of recovery high schools and collegiate recovery communities. *Peabody Journal of Education, 89*(2), 159-164.

Finch, A. J., Tanner-Smith, E., Hennessy, E., & Moberg, D. P. (2018). Recovery high schools: Effect of schools supporting recovery from substance use disorders. *The American Journal of Drug and Alcohol Abuse, 44*(2), 175-184.

Fisher, E.A. (2014). Recovery Supports for Young People: What Do Existing Supports Reveal About the Recovery Environment?, *Peabody Journal of Education, 89*(2), 258-270.

Fletcher, A. C., Steinberg, L., & Williams-Wheeler, M. (2004). Parental influences on adolescent problem behavior: Revisiting Stattin and Kerr. *Child Development, 75*(3), 781-796.

Ford, J. A. (2008). Social learning theory and nonmedical prescription drug use among adolescents. *Sociological Spectrum, 28*(3), 299-316.

Ford, J. A. (2009). Nonmedical prescription drug use among adolescents: The influence of bonds to family and school. *Youth & Society, 40*(3), 336-352.

Ford, J. A., & Rigg, K. K. (2015). Racial/ethnic differences in factors that place adolescents at risk for prescription opioid misuse. *Prevention Science, 16*(5), 633-641.

Frick, P. J. (1991). Alabama parenting questionnaire. University of Alabama: Unpublished rating scale.

678   Geisner, I. M., Trager, B. M., Hultgren, B. A., Larimer, M. E., Mallett, K. A., & Turrisi, R. (2018).
679   Examining parental monitoring as a moderator of the relationship between depressed mood
680   and alcohol use and problems. *Addictive Behaviors, 81,* 117-124.
681   Gilson, A. M. & Kreis, P. G. (2009). The burden of nonmedical use of prescription opioid analgesics.
682   *Pain Medicine, 10*(2), 89-100.
683   Godley, M. D., Kahn, J. H., Dennis, M. L., Godley, S. H., & Funk, R. R. (2005). The stability and
684   impact of environmental factors on substance use and problems after adolescent outpatient
685   treatment for cannabis abuse or dependence. *Psychology of Addictive Behaviors, 19*(1), 62-70.
686   Godley, M. D., Passetti, L. L., Subramaniam, G. A., Funk, R. R., Smith, J. E., & Meyers, R. J.
687   (2017). Adolescent community reinforcement approach implementation and treatment
688   outcomes for youth with opioid problem use. *Drug and Alcohol Dependence, 174*, 9-16.
689   Granfield, R., & Cloud, W. (1999). Coming clean: Overcoming addiction without treatment. New
690   York University Press: New York.
691   Griesler, P. C., Hu, M. C., Wall, M. M., & Kandel, D. B. (2019). Nonmedical prescription opioid use
692   by parents and adolescents in the US. *Pediatrics, 143*(3), 1-10.
693   Gross, T. J., Fleming, C. B., Mason, W. A., & Haggerty, K. P. (2017). Alabama parenting
694   questionnaire–9: Longitudinal measurement invariance across parents and youth during the
695   transition to high school. *Assessment, 24*(5), 646-659.
696   Haas, A. L., Zamboanga, B. L., Bersamin, M., & Hyke, T. (2018). Perceived access and parental
697   monitoring as moderators of impulsivity and marijuana use among adolescents. *The Journal
698   of Primary Prevention, 39*(2), 155-169.
699   Hemphill, S. A., Heerde, J. A., Herrenkohl, T. I., Patton, G. C., Toumbourou, J. W., & Catalano, R.
700   F. (2011). Risk and protective factors for adolescent substance use in Washington State, the
701   United States and Victoria, Australia: A longitudinal study. *Journal of Adolescent Health,*
702   *49*(3), 312-320.
703   Hennessy, E. A. (2017). Recovery capital: A systematic review of the literature. *Addiction Research
704   & Theory, 25*(5), 349-360.
705   Jalali, M. S., Boticelli, M., Hwang, R. C., Koh, H. K., & McHugh, R. K. (2020). The opioid crisis: A
706   contextual, social-ecological framework. *Health Research Policy and Systems, 18*(87).
707   Keijsers, L., Frijns, T., Branje, S. J., & Meeus, W. (2009). Developmental links of adolescent
708   disclosure, parental solicitation, and control with delinquency: Moderation by parental
709   support. *Developmental Psychology, 45*, 1314-1327.
710   Kerr, M., & Stattin, H. (2000). What parents know, how they know it, and several forms of
711   adolescent adjustment: Further support for a reinterpretation of monitoring. *Developmental
712   Psychology, 36*(3), 366-380.
713   Kerr, M., Stattin, H., & Burk, W. J. (2010). A reinterpretation of parental monitoring in longitudinal
714   perspective. *Journal of Research on Adolescence, 20*(1), 39-64.
715   Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: A reconsideration
716   and recent applications. *Harvard Review of Psychiatry, 4*(5), 231-244.
717   Kiesner, J., Poulin, F., & Dishion, T. J. (2010). Adolescent substance use with friends: Moderating
718   and mediating effects of parental monitoring and peer activity contexts. *Merrill-Palmer
719   Quarterly, 56*(4), 529-556.
720   Latimer, W. W., Newcomb, M., Winters, K. C., & Stinchfield, R. D. (2000). Adolescent substance
721   abuse treatment outcome: The role of substance abuse problem severity, psychosocial, and
722   treatment factors. *Journal of Consulting and Clinical Psychology, 68*(4), 684-696.
723   Lynne-Landsman, S. D., Bradshaw, C. P., & Ialongo, N. S. (2010). Testing a developmental cascade
724   model of adolescent substance use trajectories and young adult adjustment. *Development and
725   Psychopathology, 22*(4), 933-948.

Mackesy-Amiti, M. E., Donenberg, G. R., & Ouellet, L. J. (2015). Prescription opioid misuse and mental health among young injection users. *Americal Journal of Alcohol Abuse, 41*(1), 100-106.

Masche, J. G. (2010). Explanation of normative declines in parents' knowledge about their adolescent children. *Journal of Adolescence, 33*(2), 271-284.

McCabe, S. E., Veliz, P. T., Boyd, C. J., Schepis, T. S., McCabe, V. V., & Schulenberg, J. E. (2019). A prospective study of nonmedical use of prescription opioids during adolescence and subsequent substance use disorder symptoms in early midlife. *Drug and Alcohol Dependence, 194*, 377-385.

McCabe, S. E., West, B. T., Teter, C. J., Cranford, J. A., Ross-Durow, P. L., & Boyd, C. J. (2012). Adolescent nonmedical users of prescription opioids: Brief screening and substance use disorders. *Addictive Behaviors, 37*(5), 651-656.

McCauley, J. L., Danielson, C. K., Amstadter, A. B., Ruggiero, K. J., Resnick, H. S., Hanson, R. F., Smith, D. W., Saunders, B. E., & Kilpatrick, D. G. (2010). The role of traumatic event history in non-medical use of prescription drugs among a nationally representative sample of US adolescents. *Journal of Child Psychology and Psychiatry, 51*(1), 84-93.

Miech, R., Johnston, L., O'Malley, P. M., Keyes, K. M., & Heard, K. (2015). Prescription opioids in adolescence and future opioid misuse. *Pediatrics, 136*(5), e1169-e1177.

Monnat, S. M., & Rigg, K. K. (2016). Examining rural/urban differences in prescription opioid misuse among US adolescents. *The Journal of Rural Health, 32*(2), 204-218.

Muhuri, P. K., Gfroerer, J. C., Davies, & M. C. (2013). Associations of nonmedical pain reliever use and initiation of heroin use in the United States [Internet]. [cited 2020 November 18]. Available from Center for Behavioral Health Statistics and Quality. https://www. samhsa.gov/data/sites/default/files/DR006/DR006/nonmedical-pain-reliever-use- 2013.htm.

Nargiso, J. E., Ballard, E. L., & Skeer, M. R. (2015). A systematic review of risk and protective factors associated with nonmedical use of prescription drugs among youth in the United States: A social-ecological perspective. *Journal of Studies on Alcohol and Drugs, 76*(1), 5-20.

Nichols, L. M., Fleming, C. M., Pedroza, J. A., O'Brien, K. M., & Tanner-Smith, E. E. (Under review). Psychometric properties of the Alabama parenting questionnaire among adolescents with substance use disorder histories [Manuscript submitted for publication]. Department of Counseling Psychology and Human Services, University of Oregon.

Nicholson, J., Dawson-Edwards, C., Higgins, G. E., & Walton, I. N. (2016). The nonmedical use of pain relievers among African-Americans: A test of primary socialization theory. *Journal of Substance Use, 21*(6), 636-639.

Osborne, V., Striley, C. W., Nixon, S. J., Winterstein, A. G., & Cottler, L. B. (2019). Sex differences in patterns of prescription opioid non-medical use among 10-18 year olds in the U.S. *Addictive Behaviors, 89,* 163-171.

Osborne, V., Striley, C. W., Nixon, S. J., Winterstein, A. G., & Cottler, L. B. (2020). Sex differences in peer and parental risk factors for non-medical use of prescription opioids in youth. *The American Journal of Drug and Alcohol Abuse, 46*(2), 203-215.

Osgood, E. D., Eaton, T. A., Trudeau, J. J., & Katz, N. P. (2012). A brief survey to characterize oxycodone abuse patterns in adolescents enrolled in two substance abuse recovery high schools. *The American Journal of Drug and Alcohol Abuse, 38*(2), 166-170.

Palamar, J. J., Griffin-Tomas, M., & Kamboukos, D. (2015). Reasons for recent marijuana use in relation to use of other illicit drugs among high school seniors in the United States. *The American Journal of Drug and Alcohol Abuse, 41*(4), 323-331.

Palamar, J. J., Shearston, J. A., & Cleland, C. M. (2016). Discordant reporting of nonmedical opioid use in a nationally representative sample of U.S. high school seniors. *The American Journal of Drug and Alcohol Abuse, 42*(5), 530-538.

775 Palamar, J. J., Shearston, J. A., Dawson, E. W., Mateu-Gelabert, P., & Ompad, D. C. (2016).
776   Nonmedical opioid use and heroin use in a nationally representative sample of U.S. high
777   school seniors. *Drug and Alcohol Dependence, 158*, 132-138.
778 R Core Team. (2020). R: A Language and Environment for Statistical Computing. Available online:
779   https://www.r-project.org.
780 Reynolds, G. R., & Kamphaus, R. W. (1992). Manual: Behavior Assessment System for Children.
781   Circle Pines, MN: American Guidance Service.
782 Romer, D. (2010). Adolescent risk taking, impulsivity, and brain development: Implications for
783   prevention. Developmental Psychobiology: *The Journal of the International Society for
784   Developmental Psychobiology, 52*(3), 263-276.
785 Romer, D., Reyna, V. F., & Satterthwaite, T. D. (2017). Beyond stereotypes of adolescent risk
786   taking: Placing the adolescent brain in developmental context. *Developmental Cognitive
787   Neuroscience, 27,* 19-34.
788 Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys* (Vol. 81). New York, NY:
789   Wiley.
790 Rusby, J. C., Light, J. M., Crowley, R., & Westling, E. (2018). Influence of parent-youth
791   relationship, parental monitoring, and parent substance use on adolescent substance use onset.
792   *Journal of Family Psychology, 32*(3), 310-320.
793 Schaefer, B. P., & Petkovsek, M. A. (2017). Adolescence use of opioids and stimulants: Testing the
794   influence of peers, self-control, and sports participation. *Criminal Justice Studies, 30*(4), 365-
795   380.
796 Schepis, T. S., & Krishnan-Sarin, S. (2008). Characterizing adolescent prescription misusers: A
797   population-based study. *Journal of the American Academy of Child & Adolescent Psychiatry,
798   47*(7), 745-754.
799 Schepis, T. S., Teter, C. J., & McCabe, S. E. (2018). Prescription drug use, misuse and related
800   substance use disorder symptoms vary by educational status and attainment in U.S.
801   adolescents and young adults. *Drug and Alcohol Dependence, 189,* 172-177.
802 Sheehan, D. V., Janavs, R., Baker, R., Harnett-Sheehan, K., Knapp, E., & Sheehan, M. (1999). Mini
803   international neuropsychiatric interview. Tampa: University of South Florida Press.

804 Stattin, H., & Kerr, M. (2000). Parental monitoring: A reinterpretation. *Child Development, 71*, 1072-
805   1085.
806 Subramaniam, G., Stitzer, M.A., Woody, G., Fishman, M.J., Kolodner, K., (2009). Clinical
807   characteristics of treatment seeking adolescents with opioid versus cannabis/alcohol use
808   disorders. *Drug and Alcohol Depend*ence, *99*, 141–149.
809 Substance Abuse and Mental Health Services Administration. (2019). Results from the 2018 National
810   Survey on Drug Use and Health: Detailed tables. Rockville, MD: Center for Behavioral
811   Health Statistics and Quality, Substance Abuse and Mental Health Services Administration.
812   https://www.samhsa.gov/data/
813 Sung, H. E., Richter, L., Vaughan, R., Johnson, P. B., & Thom, B. (2005). Nonmedical use of
814   prescription opioids among teenagers in the United States: Trends and correlates. *Journal of
815   Adolescent Health, 37*(1), 44-51.
816 Sussman, S. (2011). Preventing and treating substance abuse among adolescents. *The Prevention
817   Science Researcher, 18*(2), 3-8.
818 Tanner-Smith, E. E., Finch, A. J., Hennessy, E. A., & Moberg, D. P. (2018). Who attends recovery
819   high schools after substance use treatment? A descriptive analysis of school aged youth.
820   *Journal of Substance Abuse Treatment, 89*, 20-27.

821 Tanner-Smith, E. E., Finch, A. J., Hennessy, E. A., & Moberg, D. P. (2019). Effects of recovery high
822   school attendance on students' mental health symptoms. *International Journal of Mental*
823   *Health and Addiction, 17*(2), 181-190.
824 Tanner-Smith, E. E., Nichols, L. M., Loan, C. M., Finch, A. J., & Moberg, D. P. (2020). Recovery
825   high school attendance effects on student delinquency and substance use: The moderating role
826   of social problem solving styles. *Prevention Science, 21*(8), 1104-1113.
827 Twombly, E. C., & Holtz, K. D. (2008). Teens and the misuse of prescription drugs: Evidence-based
828   recommendations to curb a growing societal problem. *Journal of Primary Prevention, 29*(6),
829   503-516.
830 Udell, W., Hotton, A. L., Emerson, E., & Donenberg, G. R. (2017). Does parental monitoring
831   moderate the impact of community violence exposure on probation youth's substance use and
832   sexual risk behavior? *Journal of Child and Family Studies, 26*(9), 2556-2563.
833 van Buuren, S., & Groothuis-Oudshoon, K. (2011). MICE: Multivariate Imputation by Chained
834   Equations in R. *Journal of Statistical Software*.
835 Vaughn, M. G., Nelson, E. J., Salas-Wright, C. P., Qian, Z., & Schootman, M. (2016). Racial and
836   ethnic trends and correlates of non-medical use of prescription opioids among adolescents in
837   the United States 2004–2013. *Journal of Psychiatric Research, 73*, 17-24.
838 Veliz, P. T., Boyd, C., & McCabe, S. E. (2013). Playing through pain: sports participation and
839   nonmedical use of opioid medications among adolescents. *American Journal of Public*
840   *Health, 103*(5), e28-e30.
841 Vosburg, S. K., Eaton, T. A., Sokolowska, M., Osgood, E. D., Ashworth, J. B., Trudeau, J. J., ... &
842   Katz, N. P. (2016). Prescription opioid abuse, prescription opioid addiction, and heroin abuse
843   among adolescents in a recovery high school: A pilot study. *Journal of Child & Adolescent*
844   *Substance Abuse, 25*(2), 105-112.
845 Walden, B., McGue, M., Burt, S. A., & Elkins, I. (2004). Identifying shared environmental
846   contributions to early substance use: The respective roles of peers and parents. *Journal of*
847   *Abnormal Psychology, 113*(3), 440-450.
848 White, W.L., Evans. A.C., Ali, S., Abrahams, I. & King, J. (2009). The recovery revolution: Will it
849   include children and adolescents? Philadelphia: Department of Behavioral Health and Mental
850   Retardation Services.
851 Winters, K. C., & Arria, A. (2011). Adolescent brain development and drugs. The *Prevention*
852   *Researcher, 18*(2), 21-24.
853 Winters, K. C., Botzet, A. M., Stinchfield, R., Gonzales-Castaneda, R., Finch, A. J., Piehler, T. F., ...
854   & Hemze, A. (2018). Adolescent substance abuse treatment: A review of evidence-based
855   research. In *Adolescent Substance Abuse* (pp. 141-171). Springer, Cham.
856 Winters, K. C., & Henley, G. A. (1989). The personal experience inventory test and User's manual.
857   Los Angeles, CA: Western Psychological Services.
858 Young, A. M., Glover, N., & Havens, J. R. (2012). Nonmedical use of prescription medications
859   among adolescents in the United States: A systematic review. *Journal of Adolescent Health,*
860   *51*(1), 6-17.
861 Young, A., McCabe, S. E., Cranford, J. A., Ross-Durow, P., & Boyd, C. J. (2012). Nonmedical use
862   of prescription opioids among adolescents: Subtypes based on motivation for use. *Journal of*
863   *Addictive Diseases, 31*(4), 332-341.
864 Zlomke, K., Bauman, S., & Lamport, D. (2015). Adolescents' perceptions of parenting behavior:
865   Validation of the Alabama Parenting Questionnaire adolescent self report. *Journal of Child*
866   *and Family Studies, 24*(11), 3159-3169.
867 Zlomke, K. R., Lamport, D., Bauman, S., Garland, B., & Talbot, B. (2014). Parenting adolescents:
868   Examining the factor structure of the Alabama Parenting Questionnaire for adolescents.
869   *Journal of Child and Family Studies, 23*(8), 1484-1490.

870 **10   Tables**

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872 **10.1 Table 1**

873 *Descriptive Statistics for Covariates, Individual-, Peer-, Parental-, School-/Community-level*
874 *Domains, and Opioid Use (N = 294)*

Variable	*M* (*SD*)	Range	*n* (%)
Ever used opioids (1 = yes)			216 (66.9%)
Male (1 = yes)			162 (50.2%)
White (1 = yes)			242 (74.9%)
RHS enrollment (1 = yes)			153 (47.4%)
Two-parent household (1 = yes)			116 (35.9%)
MDD symptoms (1 = yes)			102 (31.6%)
GAD symptoms (1 = yes)			92 (28.5%)
PTSD symptoms (1 = yes)			35 (10.8%)
Antisocial traits (1 = yes)			126 (39%)
PY Tobacco use (1 = yes)			272 (84.2%)
PY Alcohol use (1 = yes)			223 (69%)
PY Marijuana use (1 = yes)			250 (77.4%)
Positive parenting	3.96 (0.59)	(1-5)	
Inconsistent discipline	2.70 (0.76)	(1-5)	
Poor parental monitoring	2.58 (0.81)	(1-5)	
Parent with past AOD abuse (1 = yes)			183 (56.7%)
Peer attitudes	3.05 (0.52)	(1-4)	
GPA	2.56 (0.87)	(0-4)	
Negative attitudes toward school	5.69 (2.60)	(0-10)	
Perceived availability	4.33 (0.59)	(1-5)	

875 *Note.* RHS = Recovery High School; MDD = Major Depressive Disorder; GAD = Generalized
876 Anxiety Disorder; PTSD = Posttraumatic Stress Disorder; PY = Past year; AOD = alcohol or drug;
877 GPA = Grade point average; *M*= mean; *SD* = Standard Deviation; *n* = number of observations.
878 Standard deviations are in parentheses. Percentages of adolescents that stated yes for each variable is
879 reported in parentheses.

880 **10.2 Table 2**

881 *Hierarchical Logistic Regression of Individual-, Parent- and Peer, School-/Community-level Predictors of Opioid Use*

Variable	Covariates		Individual		Parent/Peer		School/Community	
	b (SE)	OR [95% CI]	b (SE)	OR [95% CI]	b (SE)	OR [95% CI]	b (SE)	OR [95% CI]
Male	0.15 (0.30)	1.16 [0.64, 2.11]	0.21 (0.30)	1.23 [0.68, 2.23]	0.18 (0.31)	1.20 [0.65, 2.20]	0.11 (0.32)	1.12 [0.60, 2.09]
White	0.55 (0.41)	1.74 [0.76, 3.96]	0.68 (0.40)	1.97 [0.90, 4.31]	0.60 (0.40)	1.82 [0.82, 4.03]	0.64 (0.41)	1.89 [0.84, 4.27]
RHS enrollment	0.47 (0.28)	1.59 [0.81, 2.78]	0.39 (0.32)	1.48 [0.79, 2.77]	0.45 (0.32)	1.57 [0.83, 2.96]	0.33 (0.33)	1.38 [0.73, 2.63]
Two-parent household	0.52 (0.30)	1.69 [0.93, 3.05]	0.48 (0.32)	1.62 [0.87, 3.03	0.62 (0.34)	1.86 [0.95, 3.63]	0.74 (0.35)*	2.09 [1.04, 4.20]
MDD symptoms			0.00 (0.35)	1.00 [0.50, 2.00]	0.02 (0.36)	1.02 [0.50, 2.07]	0.03 (0.37)	1.03 [0.50, 2.13]
GAD symptoms			0.48 (0.338)	1.62 [0.77, 3.41]	0.52 (0.39)	1.68 [0.78, 3.61]	0.51 (0.39)	1.67 [0.77, 3.63]
PTSD symptoms			0.27 (0.53)	1.31 [0.46, 3.71]	0.22 (0.53)	1.24 [0.43, 3.56]	0.09 (0.54)	1.10 [0.38, 3.18]
Antisocial traits			1.10 (0.34)**	3.01 [1.55, 5.86]	1.12 (0.35)**	3.05 [1.54, 6.04]	0.98 (0.35)*	2.65 [1.32, 5.32]
PY Tobacco use			0.47 (1.10)	1.61 [0.17, 15.20]	0.42 (0.35)	1.52 [0.14, 16.20]	0.27 (1.19)	1.31 [0.12, 14.9]
PY Alcohol use			0.27 (0.42)	1.31 [0.58, 2.99]	0.28 (0.42)	1.32 [0.57, 3.04]	0.15 (0.44)	1.17 [0.49, 2.76]
PY Marijuana use			0.08 (0.50)	1.08 [0.40, 2.91]	0.18 (0.50)	1.19 [0.44, 3.22]	0.24 (0.52)	1.27 [0.45, 3.54
Positive parenting					0.09 (0.26)	1.09 [0.66, 1.81]	0.10 (0.26)	1.11 [0.66, 1.85]
Inconsistent discipline					0.10 (0.21)	1.11 [0.74, 1.66]	0.08 (0.21)	1.08 [0.72, 1.64]
Poor parental monitoring					-0.05 (0.20)	0.96 [0.65, 1.40]	0.03 (0.20)	1.03 [0.69, 1.54]
Parent with past AOD abuse					0.63 (0.30)*	1.87 [1.04, 3.39]	0.67 (0.31)*	1.95 [1.05, 3.59]
Peer attitudes					-0.09 (0.29)	0.91 [0.51, 1.63]	-0.30 (0.32)	0.74 [0.39, 1.40]
GPA							0.12 (0.20)	1.13 [0.76, 1.69]
Negative attitudes toward school							0.06 (0.06)	1.06 [0.94, 1.21]
Perceived availability							0.64 (0.27)*	1.90 [1.12, 3.20]
Likelihood ratio test statistic			$\chi^2 = 1.45$		$\chi^2 = 0.92$		$\chi^2 = 2.10$	
AIC	376.24		366.91		370.59		366.76	

882 *Note.* RHS = Recovery High School; MDD = Major Depressive Disorder; GAD = Generalized Anxiety Disorder; PTSD = Posttraumatic Stress Disorder;

883 PY = Past year; AOD = alcohol or drug; GPA = Grade point average; *b* = Unstandardized logit coefficient; *SE* = Standard errors; OR = Odds ratio; CI =

884 Confidence interval; AIC = Akaike Information Criterion. Standard errors are in parentheses.

885 *$p < .05$ **$p < .01$

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888 **10.3 Table 3**
889 *Moderation Analyses of Individual-level Predictors and Poor Parental Monitoring on Opioid Use*

	MDD symptoms		GAD symptoms		PTSD Symptoms		Antisocial Traits	
Effect	*b (SE)*	OR [95% CI]	*b (SE)*	OR [95% CI]	*b (SE)*	OR [95% CI]	*b (SE)*	OR [95% CI]
Main effect	0.04 (0.37)	1.04 [0.50, 2.16]	0.60 (0.42)	1.82 [0.80, 4.14]	0.11 (0.54)	1.12 [0.38, 3.27]	0.98 (0.35)*	2.66 [1.32, 5.33]
Poor parental monitoring	-0.05 (0.24)	0.95 [0.59, 1.53]	-0.13 (0.22)	0.88 [0.56, 1.36]	0.01 (0.21)	1.01 [0.67, 1.53]	-0.03 (0.26)	0.97 [0.58, 1.61]
Interaction	0.22 (0.43)	1.25 [0.54, 2.90]	0.81 (0.51)	2.24 [0.81, 6.20]	0.21 (0.63)	1.23 [0.35, 4.27]	0.15 (0.38)	1.16 [0.55, 2.45]
AIC	368.13		365.00		368.41		368.47	

	Past Year Tobacco Use		Past Year Alcohol Use		Past Year Marijuana Use		
Effect	*b (SE)*	OR [95% CI]	*b (SE)*	OR [95% CI]	*b (SE)*	OR [95% CI]	
Main effect	0.09 (1.97)	1.09 [0.02, 58.90]	0.16 (0.44)	1.18 [0.49, 2.81]	0.34 (0.54)	1.41 [0.49, 4.06]	
Poor parental monitoring	0.10 (0.26)	1.11 [0.66, 1.85]	0.10 (0.26)	1.11 [0.66, 1.86]	0.12 (0.26)	1.13 [0.68, 1.89]	
Interaction	-0.20 (1.47)	0.82 [0.04, 15.60]	0.15 (0.48)	1.17 [0.45, 3.02]	0.65 (0.49)	1.92 [0.73, 5.05]	
AIC	367.86		368.22		366.37		

890 *Note.* MDD = Major Depressive Disorder; GAD = Generalized Anxiety Disorder; PTSD = Posttraumatic Stress Disorder; *b* =
891 Unstandardized logit coefficient; *SE* = Standard errors; AIC = Akaike Information Criterion.
892 *p < .05
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898 **10.4 Table 4**
899 *Moderation Analyses of Parental- and Peer-level Predictors and Poor Parental Monitoring on Opioid Use*

	Positive Parenting		Inconsistent Discipline		Parent with Past AOD Abuse		Peer Attitudes	
Effect	*b (SE)*	OR [95% CI]	*b (SE)*	OR [95% CI]	*b (SE)*	OR [95% CI]	*b (SE)*	OR [95% CI]
Main effect	0.10 (0.26)	1.11 [0.66, 1.86]	0.05 (0.21)	1.06 [0.69, 1.61]	0.66 (0.31)*	1.94 [1.05, 3.59]	-0.29 (0.32)	0.75 [0.40, 1.42]
Poor parental monitoring	0.03 (0.20)	1.03 [0.69, 1.54]	0.03 (0.20)	1.03 [0.69, 1.54]	0.07 (0.31)	1.07 [0.58, 1.98]	0.04 (0.21)	1.05 [0.70, 1.57]
Interaction	0.09 (0.29)	1.09 [0.61, 1.94]	0.16 (0.22)	1.18 [0.76, 1.81]	-0.06 (0.38)	0.94 [.045, 1.97]	0.27 (0.38)	1.30 [0.62, 2.76]
AIC	368.47		368.07		368.58		368.04	

900 *Note.* b = Unstandardized logit coefficient; *SE* = Standard errors; Standard errors are in parentheses; AOD = alcohol or drug; AIC = Akaike
901 Information Criterion.
902 *$p < .05$

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10.5 Table 5
Moderation Analyses of School-/Community-level Predictors and Poor Parental Monitoring on Opioid Use

	GPA		Perceived Availability		Negative Attitudes Toward School	
Effect	*b (SE)*	OR [95% CI]	*b (SE)*	OR [95% CI]	*b (SE)*	OR [95% CI]
Main effect	0.13 (0.20)	1.14 [0.76, 1.70]	0.61 (0.27)*	1.84 [1.08, 3.13]	0.07 (0.07)	1.07 [0.94, 1.22]
Poor parental monitoring	0.03 (0.20)	1.03 [0.69, 1.54]	0.06 (0.21)	1.07 [0.70, 1.61]	0.04 (0.21)	1.04 [0.68, 1.58]
Interaction	-0.05 (0.27)	0.95 [0.56, 1.62]	0.42 (0.32)	1.53 [0.82, 2.85]	0.13 (0.07)	1.14 [0.99, 1.32]
AIC	368.17		366.33		364.65	

Note. b = Unstandardized logit coefficient; *SE* = Standard errors; AIC = Akaike Information Criterion. Standard errors are in parentheses.
*$p < .05$

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