Full length article

Explaining continuity in substance use: The role of criminal justice system involvement over the life course of an urban African American prospective cohort

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A B S T R A C T

Background: African Americans are disproportionately burdened by substance use consequences and criminal justice system involvement, yet their interrelationship over the life course is not well understood. This study aimed to assess how substance use, crime, and justice system involvement may influence one another from adolescence to midlife.
Methods: Data come from a community cohort of urban African Americans first assessed in childhood and followed up into midlife (n = 1242, 606 males, 636 females). We draw on interview data and local, state, and federal criminal records. Participants were assessed at ages 6, 16, 32, and 42, with additional record retrieval at age 52. Utilizing structural equation modeling, we estimate pathways between substance use, criminal behavior, and arrests over time by gender.
Results: For males, significant paths were found between childhood behavioral problems and adolescent substance use, delinquency, and police interactions. For females, a significant path was found between childhood behavioral problems and only adolescent delinquency. We observed continuity between substance use and between arrest constructs from adolescence through midlife for men only. Direct paths were found between substance use and later arrests for both males and females. Paths were also observed between arrests and later substance use for both genders.
Conclusions: Findings of reciprocal relationships highlight the critical need to break the cycle of substance use and crime and point to specific times in the life course when intervention is necessary. Findings introduce the potential role of the criminal justice system as a key intervention agent in redirecting substance use careers.

1. Introduction

While African American adolescents traditionally have had lower rates of substance use compared to Whites, they are less likely to desist use and more likely to develop substance use disorders as they age into adulthood (Chen and Jacobson, 2012; French et al., 2002; Vogt Yuan, 2010). Graphically, the drug use curve for African Americans shows an upward climb after adolescence but, unlike Whites, continues its upward trajectory to an older age before decline (Doherty et al., 2008a; Watt, 2008). Studies have implicated adverse life events as a major factor in drug dependence (e.g., Turner and Lloyd, 2003) and continuity of substance use over time (Doherty et al., 2012) among African

Americans. One understudied, increasing prevalent life event for African Americans is criminal arrest. Close to half of African American males and almost one-fifth of African American females are arrested by age 23 in the U.S. (Brame et al., 2014). Substance use can lead to crime due to its illegal nature, as well as through its psychopharmacological effects, the need for economic gain (e.g., acquisitive crimes), and the systemic violence inherent in the drug trade (Korf et al., 2008; Resignato, 2000; Sutherland et al., 2015; White and Gorman, 2000). In turn, involvement in a crime, and the criminal justice system, in particular, may contribute to long-term substance use among African Americans.

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1.1. Substance use, crime, and criminal justice system interrelationship

Substance use has been found to be associated with multiple crime types. A systematic review of 22 prospective studies from 1990 to 2014 examining the association between substance use and violence finds that involvement in substance use and illegal drug sales was independently associated with interpersonal violence (McGinty et al., 2016). Among an African American cohort, Green et al. (2010) find an increased risk of drug and property arrests and self-reported crime in adulthood among adolescent heavy marijuana users and an increased risk of violent arrest in adulthood among adolescent heavy drinkers (Green et al., 2011; Odgers et al., 2008; Slade et al., 2008). While substance use and crime share common risk factors early in the life course (Hawkins et al., 1992, 1998; Jessor and Jessor, 1977), these associations hold after taking into account early risk.

Research also suggests that criminal arrests increase the risk of substance use or exacerbate existing substance use problems over time. For instance, Doherty et al. (2016) evaluate the long-term consequences of criminal justice interventions (i.e., arrest and incarceration) on substance use, self-reported offending, and arrest into midlife in an African American cohort using propensity score methods. Results largely point to a criminogenic effect of criminal justice intervention on midlife deviance with a threefold increase in later substance use disorders following an arrest. Similarly, Lopes et al. (2012) examine the impact of juvenile police contact on adult deviance (to age 30), as well as education, employment, and financial hardship, among the Rochester Youth Study participants (65% African American) from adolescence through adulthood and find evidence of a criminogenic effect of police intervention on juveniles for both non-criminal and criminal outcomes into young adulthood.

Fewer studies have explicitly mapped out the interrelationships between substance use and crime to fully understand how they influence one another across the full life course. Using the National Youth Survey, Menard et al. (2001) examine substance use and crime from adolescence to young adulthood and find evidence consistent with a conclusion of mutual causation (i.e., serious crime contributes to continuity in drug use and drug use contributes to continuity in crime) as opposed to unidirectional causation (i.e., substance use causes crime or crime causes substance use) or a spurious relationship. In one of the few investigations to examine reciprocal effects from adolescence into adulthood among minority populations, Brook et al. (2011), in a community sample of African American and Puerto Rican youth, find continuity within substance use and violence, as well as along interrelationships between the two with illegal drug use in late adolescence having direct and indirect paths to violent behavior in adulthood. While these studies examine the interrelationship between substance use and offending into young adulthood, the current study explicitly models prospective associations between substance use, substance use problems, criminal behavior, and criminal justice system involvement from adolescence (age 16) into later midlife (age 52) among a cohort of African Americans.

1.2. Research questions

Our overarching research questions are: Does earlier substance use relate to later criminal behavior and arrest among African American men and women once earlier crime is taken into account? In turn, do earlier criminal behavior and arrests relate to later problematic substance use in this population once earlier substance use is taken into account? We examine potential reciprocal effects from adolescence to midlife for men and women separately because men have both higher rates of substance use disorders (Hasin et al., 2007; Kessler et al., 1994), as well as higher rates of criminal behavior and criminal justice involvement than women (Federal Bureau of Investigation, 2015). Also, there are gender differences in how people become involved in substance use and crime (Chassin et al., 2002; Jang et al., 2005; Wasilow-

Mueller and Erickson, 2001; Windle, 1990) and in their consequences (Eaton et al., 2012; Stolzenberg and D'Alessio, 2004).

2. Methods

2.1. Study design

Data come from the Woodlawn Study, a community cohort study of urban African Americans who were first assessed in childhood. Woodlawn is one of 76 community areas in Chicago, Illinois (USA). All families of first graders in the Woodlawn public and parochial schools were invited to participate; only 13 families declined. Thus, the original cohort of 606 boys and 636 girls represent first graders living in Woodlawn at the study's inception. At the time, Woodlawn was structurally disadvantaged but due to racial segregation, included some socioeconomic diversity, with some blocks having high rates of home ownership and two-parent households (Council for Community Services in Metropolitan Chicago, 1975).

In first grade (1966–67), teachers and mothers of the cohort members reported on family and school domains. Woodlawn Study participants were then followed up in adolescence (age 16, 1976–77) when both mothers (n = 939) and youth (n = 705) were assessed, in young adulthood (age 32, 1992–93), and in midlife (age 42, 2002–03). In adolescence, mothers were interviewed individually on their teenager's home life, behaviors, and well being. Teenagers reported on delinquency and substance use, among other things in small group-based assessments of 5–10 adolescents (Petersen and Kellam, 1977). In young adulthood (n = 952) and midlife (n = 803), participants completed an approximately 90-minute interview with trained interviewers, either in person or by phone, that assessed substance use, crime, other behaviors, health, family, neighborhood and other social factors; 1053 individuals completed at least one adult assessment (85% of the original cohort). This study also draws upon crime records that were collected from age 17 (1977) to age 52 (2012) for all 1242 participants (Doherty and Ensminger, 2014).

The smaller sample at adolescence is due to funding constraints and group-based assessment that only targeted those remaining in Chicago. Missingness in adulthood is due primarily to deaths (11% died by age 50) and inability to locate participants. Extensive attrition analyses are available elsewhere (Crum et al., 2006; Doherty et al., 2008a, b).

2.2. Measures

2.2.1. Childhood behavioral problems

Childhood behavioral problems is a latent variable with three indicators: aggression, inattention, and conduct problems drawn from the Teacher Observation of Classroom Adaptation (TOCA) instrument, which is comprised of teacher reports of aggressive and inattentive behavior in the first grade classroom based on a 0 to 3 scale from adapting to severely maladaptive behavior. Classroom conduct was assessed by using a teacher rating on a 4-point scale from excellent (0) to unsatisfactory (3). Since there were few teacher rating scales for behavior at the time of the initiation of the study TOCA was developed and validated for the study (Kellam et al., 1975) and continues to be used in other studies (Kellam et al., 2014).

2.2.2. Substance use measures

Adolescent substance use was self-reported at age 16 and is a latent variable based on three indicators: the frequency of lifetime use of beer or wine, hard liquor or whiskey, and marijuana, measured on a one to five scale (never to 40+ times). Young and mid-adulthood substance problems are both latent variables composed of four self-report indicators of symptoms of a substance use (i.e., drug and alcohol) disorder. The four indicators were based on Diagnostic and Statistical Manual criteria of abuse and dependence (DSM-IIIR for young adulthood and DSM-IV for mid-adulthood) and include: 1) social and

functional effects of substance use (measured on a 0–5 scale), 2) physical and mental health effects of substance use (measured on a 0–6 scale), 3) extensive and prolonged use (measured on a 0–4 scale), and 4) signs of addiction (measured on a 0–6 scale). This information was collected during the structured interviews using modules developed for the National Comorbidity Survey from the Composite International Diagnostic Interview (CIDI, Anthony et al., 1994; Kessler et al., 1994) and asked about all types of illegal drugs, including the non-medical use of prescription drugs. Alcohol and drug problems were modeled together because of our focus on substance use problems regardless of the substance used, as well as findings of a substantial overlap in disorder diagnoses (Compton et al., 2007; Hasin et al., 2007).

2.2.3. Delinquent and criminal behavior measures

To measure delinquency in adolescence, we created a latent variable based on 17 frequency indicators of violent, property and status offenses in the past 3 years, including: serious fighting/injury, stealing, damaging property, weapon carrying, trespassing, threats, school suspensions, and skipping school (Gold, 1970). These activities were categorized into violent (8 items), property (6 items), and other (3 items) delinquent acts, measured on a five-point scale (1 = never, 5 = 5 or more times).

To operationalize adult criminal behavior, we rely on a sum of self-reported behaviors (yes/no) between ages 17–32 and 33–42, respectively. Each latent construct comprises four indicators of property (12 items), violent (9 items), drug-related (3 items), and other crimes (3 items). Property crimes include such things as stealing, shoplifting, pickpocketing, handling stolen goods, breaking into a home or store, using a stolen credit card, vandalism, and motor vehicle theft. Violent crimes include serious fighting, purposely injuring others, beating up those in and not in one's family, using a weapon in a fight, forced sex, and using threats to get something. Drug crimes include drug dealing and trading drugs for sex. Other crimes include prostitution, arson, and weapon carrying. We model different types of crime together in a single construct because they are highly correlated, especially in young adulthood (r's > .95).

2.2.4. Criminal justice system involvement measures

Criminal justice system involvement in adolescence is based on a single self-reported item. This question asks, how often have you had "trouble with the police" ranging from never (1) to 5 or more times (5). In adulthood, we rely on arrest records, which were collected from the Chicago Police Department and the Federal Bureau of Investigations in 1993 and the State of Illinois in 2012. Criminal histories span ages 17–52 (17 was the age of majority at that time in Illinois). Of the 1217 individuals with valid arrest data, 565 were arrested at some point

between 17 and 52. Arrest records include date, type of crime (up to 3 unique charges), type and method of disposition, and type of sentence for all those arrested. The charge types, which are based on the Illinois Criminal Code, are categorized into broader categories of violent (e.g., homicide, assault, robbery), property (e.g., burglary, larceny, auto theft), drug (e.g., narcotics, both selling and possession) and other offenses (e.g., public order crimes, non-violent sex crimes, and weapons offenses). Traffic offenses and warrants are excluded. Arrest counts for each of the four categories of crime (violent, property, drug, other) are summed for ages 17–32, ages 33–42, and ages 43-52. Due to a desire to guard against extreme outliers driving findings, we truncate the top approximately 1% of responses property and violent arrests into a single value (12 arrests for property crimes and 7 arrests for violent crimes).

Data are not available for days incarcerated; as a proxy, we incorporate the sentencing data from the arrest records such that a person is considered incarcerated in any year where he/she has zero offenses and is known to have been sentenced to more than one year in prison at that age. Using this strategy, we reduce the chances of presuming someone has no arrests due to non-offending rather than incapacitation. This coding decision results in altering 20 percent of the 565 arrested cohort's criminal histories to reflect the potential time in prison (n = 114) (Doherty and Ensminger, 2014).

2.3. Analytic plan

We use structural equation modeling (SEM) to assess the associations over the life course. All constructs except adolescent police interactions were modeled as latent variables based on multiple indicators. We include correlations for all constructs from the same developmental period (e.g., within adolescence) and estimate pathways for constructs across time (e.g., adolescence to young adulthood). We run separate models for men and women allowing both the structural and measurement models to vary by gender. Maximum likelihood estimation accounts for missing data, as it produces unbiased estimates and is more efficient than other missing data procedures (Enders and Bandalos, 2001), which allows us to retain the entire population of 1242 despite attrition. All analyses were conducted in M*plus* 8.1 using the MLR estimator, which is robust to non-normality.

3. Results

Table 1 provides descriptive statistics and factor loadings for the substance use variables while Table 2 provides this information for the criminal behavior and criminal justice system involvement variables. Overall, we find adequate model fit for both men (RMSEA = .040,

Table 1
Descriptives and Factor Loadings of Substance Use Variables by Gender.

Latent Variables and Observed Indicators (Range)	Men (n = 606)		Women (n = 636)	
	M, SD	Factor Loading	M, SD	Factor Loading
Adolescent Substance Use Frequency (Lifetime)				
Beer/Wine (0 = never, 5 = 40 times or more)	2.56, 1.78	0.819	1.83, 1.62	0.860
Hard Liquor (0 = never, 5 = 40 times or more)	1.20, 1.63	0.751	0.79, 1.27	0.778
Marijuana (0 = never, 5 = 40 times or more)	2.35, 2.04	0.726	1.40, 1.75	0.690
Young Adulthood (Age 32) Substance Use Problems (Lifetime)				
Social and Functional Effects (0 = no problems, 5 = problems)	0.52, 1.08	0.887	0.29, 0.85	0.870
Physical and Mental Health Effects (0 = no problems, 6 = problems)	0.61, 1.21	0.860	0.30, 0.88	0.853
Extensive and Prolonged Use (0 = none, 4 = 4 problems)	0.51, 1.09	0.854	0.29, 0.86	0.905
Dependence Symptoms (0 = none, 6 = 6 symptoms)	0.90, 1.46	0.887	0.42, 1.10	0.891
Early Midlife (Ages 33-42) Substance Use Problems (Past 10 years)				
Social and Functional Effects (0 = no problems, 5 = problems)	0.91, 1.59	0.918	0.40, 1.15	0.949
Physical and Mental Health Effects (0 = no problems, 6 = problems)	0.41, 0.71	0.887	0.16, 0.48	0.880
Extensive and Prolonged Use (0 = none, 4 = 4 problems)	0.51, 0.98	0.963	0.26, 0.76	0.965
Dependence Symptoms (0 = none, 6 = 6 symptoms)	0.72, 1.46	0.943	0.36, 1.15	0.932

Table 2
Descriptives and Factor Loadings of Crime Variables by Gender.

Latent Variables and Observed Indicators (Range)	Men (n = 606)		Women (n = 636)	
	M, SD	Factor Loading	M, SD	Factor Loading
Childhood Behavior Based on First Grade Teacher Ratings (Age 6, current)				
Aggressive Behavior (0-3)	0.52, 0.87	0.852	0.33, 0.77	0.792
Inattentive Behavior (0-3)	0.73, 0.97	0.827	0.46, 0.83	0.842
Conduct Problems (0-3)	1.54, 0.78	0.599	1.11, 0.76	0.586
Adolescent Delinquency Measure (Age 16, past 3 years)				
Violent Behavior (1-5)	2.00, 0.94	0.789	1.38, 0.50	0.757
Property Crimes (1-5)	2.29, 1.20	0.767	1.85, 1.09	0.571
Other Crimes (1-5)	1.82, 0.81	0.730	1.52, 0.60	0.690
Adolescent Criminal Justice System Involvement (Age 16, past 3 years)				
Trouble with Police (1-5)	2.03, 1.32	n/a	1.27, 0.72	n/a
Young Adulthood Self-Reported Crime (Ages 17-32)				
Drug-Related Criminal Behavior (0-3)	0.39, 0.73	0.706	0.09, 0.33	0.812
Property-Related Criminal Behavior (0-12)	1.81, 2.24	0.817	0.99, 1.55	0.825
Violent Criminal Behavior (0-9)	2.13, 2.00	0.740	1.08, 1.43	0.572
Other Criminal Behavior (0-3)	0.55, 0.68	0.602	0.30, 0.56	0.580
Young Adulthood Arrest Counts (Ages 17-32)				
Drug Arrests (0-16)	0.67, 1.64	0.486	0.07, 0.36	0.657
Property Arrests (0-12)	1.47, 2.56	0.803	0.36, 1.29	0.693
Violent Arrests (0-7)	1.09, 1.84	0.787	0.14, 0.53	0.710
Other Arrests (0-13)	0.64, 1.35	0.753	0.13, 0.51	0.646
Early Midlife Self-Reported Crime (Ages 33-42)				
Drug-Related Criminal Behavior (0-3)	0.22, 0.61	0.877	0.05, 0.21	0.767
Property-Related Criminal Behavior (0-12)	0.39, 1.03	0.794	0.21, 0.69	0.836
Violent Criminal Behavior (0-9)	0.43, 1.07	0.487	0.22, 0.72	0.644
Other Criminal Behavior (0-3)	0.18, 0.41	0.290	0.09, 0.32	0.695
Early Midlife Arrest Counts (Ages 33-42)				
Drug Arrests (0-11)	0.40, 1.13	0.473	0.07, 0.41	0.504
Property Arrests (0-12)	0.75, 2.09	0.721	0.21, 1.00	0.647
Violent Arrests (0-7)	0.48, 1.22	0.701	0.10, 0.50	0.624
Other Arrests (0-8)	0.23, 0.76	0.622	0.09, 0.46	0.677
Later Midlife Arrest Counts (Ages 43-52)				
Drug Arrests (0-7)	0.25, 0.74	0.400	0.05, 0.31	0.781
Property Arrests (0-12)	0.39, 1.55	0.729	0.09, 0.76	0.435
Violent Arrests (0-7)	0.21, 0.81	0.800	0.03, 0.27	0.659
Other Arrests (0-5)	0.08, 0.40	0.590	0.02, 0.15	0.671

CFI = .901, TLI = .890) and women (RMSEA = .040, CFI = .865, TLI = .850). Structural models are identical for men and women with one exception – the female model included a correlation between property-related arrests for ages 33–52 and 43–52, based on modification index results.

3.1. Substance use, criminal behavior, and criminal arrests among men

Table 3 shows all correlations between substance use, crime, and criminal arrest for men. Table 4 displays all pathway estimates for men, while Fig. 1 highlights statistically significant (p < .05) pathways and correlations.

We find significant continuity in substance use and crime from adolescence, through young adulthood (age 32) and midlife (age 42), into later midlife (age 52), with the strongest associations for continuity in arrests ($\beta = 0.729$ from young adulthood to early midlife, $\beta = 0.802$ from early to later midlife), as well as reciprocal associations. Multiple manifestations of deviance begin in childhood for boys; boys with more behavioral problems during childhood have greater substance use ($\beta = 0.222$), delinquency ($\beta = 0.205$), and police interactions ($\beta = 0.165$) in adolescence. A direct path of continuity is seen with substance use; boys who engaged in substance use at higher frequencies have more substance use problems by age 32 ($\beta = 0.221$), leading to more substance use problems in midlife ($\beta = 0.321$). Similarly, boys with more police interactions in adolescence have more criminal arrest in young adulthood ($\beta = 0.385$), which relates to greater criminal arrests in early midlife ($\beta = 0.729$), which are associated with greater

criminal arrests in later midlife ($\beta = 0.802$).

Important to the pathway of continuity of substance use and substance use problems over the life course for men is the finding that more criminal arrests by young adulthood are associated with greater substance use problems in midlife ($\beta = 0.157$), and greater substance use problems by young adulthood are associated with greater criminal behavior in early midlife ($\beta = 0.282$), which in turn are associated with more criminal arrests in later midlife ($\beta = 0.230$). Conversely, more substance use problems in early midlife are associated with fewer criminal arrests in later midlife ($\beta = -0.284$).

3.2. Substance use, criminal behavior, and criminal arrests among women

Fig. 2 shows the statistically significant pathways and correlations between substance use, crime, and criminal arrests for women (p < .05). All correlations for women are included in Table 3, which again, like men, shows significant contemporaneous correlations in adolescence and young adulthood for all constructs. Moreover, as shown in Table 4, we find continuity in substance use and criminal arrests across time with this continuity beginning in young adulthood for women rather than in childhood and adolescence, as seen in the male models. We find a particularly strong association ($\beta = 0.958$) for continuity in criminal arrests from young adulthood to early midlife.

Beginning in childhood, girls with behavioral problems have greater delinquency ($\beta = 0.227$) but not substance use or interactions with the police. This adolescent delinquency is associated with greater arrests ($\beta = 0.376$) and criminal behavior ($\beta = 0.371$) by young adulthood.

Table 3
Correlations between Variables by Gender within Data Collection Time Periods.

	Men (n = 606)		Women (n = 636)	
	Correlation	p-value	Correlation	p-value
Adolescent Variables				
Substance Use ⟷ Delinquency	0.474	< 0.001	0.564	< 0.001
Substance Use ⟷ Trouble with Police	0.268	< 0.001	0.357	< 0.001
Delinquency ⟷ Trouble with Police	0.658	< 0.001	0.568	< 0.001
Young Adulthood Variables				
Substance Use Problems ⟷ Criminal Behavior	0.660	< 0.001	0.682	< 0.001
Substance Use Problems ⟷ Arrests	0.273	< 0.001	0.164	0.015
Criminal Behavior ⟷ Arrests	0.364	< 0.001	0.277	0.009
Early Midlife Variables				
Substance Use Problems ⟷ Criminal Behavior	0.586	< 0.001	0.540	< .0001
Substance Use Problems ⟷ Arrests	0.193	0.121	0.184	0.501
Criminal Behavior ⟷ Arrests	0.323	0.061	0.248	0.469

Moreover, criminal behavior and arrests in young adulthood are associated with greater criminal behavior in later midlife ($\beta = 0.453$ and $\beta = 0.275$, respectively). Arrests in young adulthood also are associated with more substance use problems in mid-adulthood ($\beta = 0.242$) with more substance use problems in mid-adulthood, in turn, relating to greater criminal arrests in later midlife ($\beta = 0.212$).

4. Discussion

4.1. Contextualizing findings for men and women

This study prospectively investigates the interrelationship between substance use, crime, and criminal arrests over the life course modeling pathways beginning at age 6 with childhood behavioral problems and ending with criminal arrests through age 52. Overall, our work provides additional evidence of reciprocal effects between substance use, crime, and criminal justice system involvement over the life course. This study extends previous research (e.g., Brook et al., 2011, Menard et al., 2001)

by demonstrating these associations over a longer span and including criminal arrest as a distinct influence beyond criminal behavior.

We find both similar and distinct pathways for men and women with associations varying by behavioral domain and developmental stage. For men, we find significant continuity in substance use over the full life course. Greater teacher-identified behavioral problems in first grade significantly relate to more substance use, delinquency, and police interactions at age 16. For women, greater adolescent delinquency seems to set girls on a path of deviance. Moreover, the story of reciprocal associations for these African American men and women is one that is predominantly between substance use and criminal arrest, as opposed to criminal behavior. This direct link may be particularly relevant to African Americans who are more likely to reside in disadvantaged communities where drug use is concentrated, and police presence is high (Kirk, 2008; LaVeist and Wallace, 2000), making the risk of arrest particularly high for those with substance use problems.

For women, the continuity in substance use begins later–starting in young adulthood (as opposed to adolescence). Moreover, unlike with

Table 4
Pathways Across Time by Gender.

|	Men (n = 606)		Women (n = 636)	
	Beta	P-value	Beta	P-Value
Childhood → Adolescence				
Behavioral Problems→Adolescent Substance Use	0.222	< 0.001	−0.060	0.363
Behavioral Problems→Adolescent Delinquency	0.205	0.002	0.227	0.005
Behavioral Problems→Adolescent Trouble with Police	0.165	0.004	0.045	0.527
Adolescence → Young Adulthood (YA)				
Adolescent Substance Use→YA Substance Use Problems	0.221	0.012	0.084	0.387
Adolescent Substance Use→YA Criminal Behavior	0.149	0.127	0.108	0.273
Adolescent Substance Use→YA Arrests	0.198	0.038	−0.074	0.406
Adolescent Delinquency→YA Substance Use Problems	0.016	0.902	0.180	0.118
Adolescent Delinquency→YA Criminal Behavior	0.193	0.189	0.371	0.007
Adolescent Delinquency→YA Arrests	−0.097	0.479	0.376	0.023
Adolescent Trouble with Police→YA Substance Use Problems	0.026	0.803	−0.059	0.409
Adolescent Trouble with Police→YA Criminal Behavior	−0.005	0.966	−0.050	0.552
Adolescent Trouble with Police→YA Arrests	0.385	< 0.001	0.122	0.318
Young Adulthood → Early Midlife				
YA Substance Use Problems→Early Midlife Substance Use Problems	0.321	0.004	0.279	0.033
YA Substance Use Problems→Early Midlife Criminal Behavior	0.282	0.033	−0.073	0.531
YA Substance Use Problems→Early Midlife Arrests	0.147	0.078	0.231	0.028
YA Criminal Behavior→Early Midlife Substance Use Problems	0.036	0.758	0.023	0.884
YA Criminal Behavior→Early Midlife Criminal Behavior	0.148	0.260	0.453	0.012
YA Criminal Behavior→Early Midlife Arrests	−0.132	0.180	−0.181	0.094
YA Arrests→Early Midlife Substance Use Problems	0.157	0.047	0.242	0.028
YA Arrests→Early Midlife Criminal Behavior	0.116	0.184	0.275	0.031
YA Arrests→Early Midlife Arrests	0.729	< .001	0.958	< 0.001
Early Midlife → Later Midlife				
Early Midlife Substance use Problems→Later Midlife Arrests	−0.284	0.001	0.212	0.048
Early Midlife Criminal Behavior→Later Midlife Arrests	0.230	0.013	−0.141	0.183
Early Midlife Arrests→Later Midlife Arrests	0.802	< .001	0.331	0.081
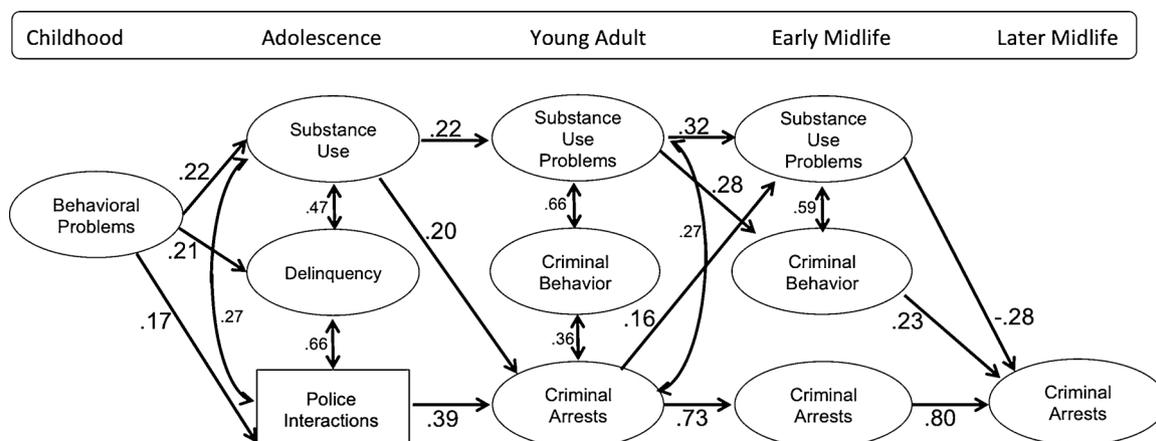
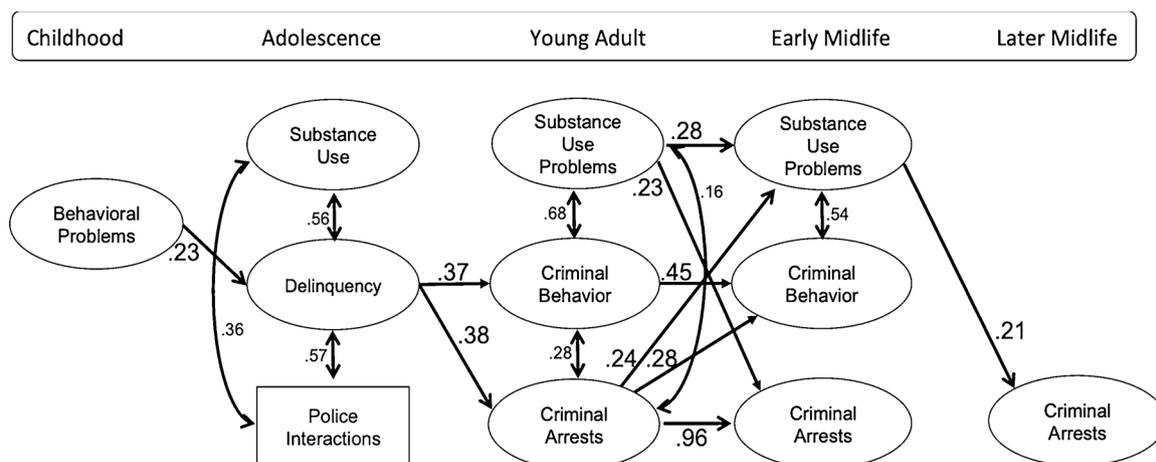**Fig. 1.** Structural Equation Model for Men of Statistically Significant Pathways (p < .05, N = 606).

Fig. 2. Structural Equation Model for Women of Statistically Significant Pathways (p < .05, N = 636).

the men, more substance use problems by young adulthood and substance use problems in early midlife are directly associated with more criminal arrests in early and later midlife, respectively. For men, we find a negative association between greater substance use problems in early midlife and later midlife arrests. While it is unclear if this association is an artifact of the structural modeling technique, it may also represent an important new finding that as men with substance use problems enter older ages, their substance use may protect them from later life involvement in the criminal justice system due to incapacitation, as much research has shown significant physical health problems among substance-using adults, including cardiovascular problems, diabetes, cancer, organ damage and injury (Schulte and Hser, 2013).

A key finding is that more arrests by young adulthood, for both men and women, are associated with greater substance use problems in midlife, even after adjusting for earlier substance use problems and criminal behavior. This finding aligns with our previous work with the Woodlawn cohort suggesting a criminogenic impact of interactions with the criminal justice system on substance use problems (Doherty et al., 2016). This relationship could be the result of labeling whereby criminal justice intervention leads to stigma from identification as a criminal encouraging continuity in deviance (Becker, 1963; Lemert, 1951) or through the process of cumulative disadvantage whereby criminal sanctions increase the risk for deviant behaviors by limiting opportunities for attaining conventional social bonds, such as employment and marriage (e.g., Bernburg and Krohn, 2003; Davies and Tanner, 2003; Huebner, 2005; Pager, 2003; Sampson and Laub, 1993, 1997) and facilitating deviant peer associations (Bernburg et al., 2006; Wiley et al., 2013).

4.2. Considerations when assessing findings

Woodlawn participants represent a single community cohort of urban children born in 1960 followed through midlife (age 52) with high rates of retention. We additionally use maximum likelihood estimation to account for attrition and include official crime records for the entire cohort, which minimizes missing data. Despite these strengths, this urban cohort is relatively small and may be subject to cohort effects. Moreover, we rely on observational data; thus causal conclusions should be interpreted with caution, especially considering we did not model other possible mechanisms beyond substance use, arrests, and crime. Finally, we rely on self-reported substance use and criminal behavior, which may be subject to underreporting.

4.3. Future directions

Future studies should investigate if the potential effect of arrests on substance use we found, is direct, with arrest representing a stressful life event that requires coping through continued substance use, or an indirect one. A potential indirect pathway could be through reduced employment opportunities as a result of having an arrest record or through the cultivation of deviant social networks of offenders, who provide access to substance use. As Woodlawn represents a single cohort, future research should assess if these pathways are apparent in other cities, among other minority groups, and among those from different time periods to assess cohort effects. The Woodlawn cohort graduated high school (1978) at the time of the highest drug use according to Monitoring the Future data (Johnston et al., 2017). They

were in their late 20 s at the height of the crack cocaine epidemic in Chicago and experienced adulthood during the mass incarceration of African Americans (Blumstein and Wallman, 2006), particularly for drug crimes, with 65% of Woodlawn cohort men and 29% of Woodlawn cohort women having an arrest record (Doherty and Ensminger, 2014). Finally, future research should disaggregate types of substances and types of crime as the interrelationships may vary by subtypes. For example, it would be important to probe the interrelationship of alcohol and violence over the life course.

4.4. Implications

Our study offers evidence suggesting an adverse impact of substance use problems on criminal arrests, in particular, over the long-term, as well as for the reciprocal – the impact of criminal arrests on perpetuating substance use problems over time. These mutually reinforcing associations underscore the critical nature of not only preventing substance use problems early in the life course but of the urgency of screening and treating substance use problems throughout the life course for urban African Americans. As African Americans typically have longer courses of substance use and poorer treatment outcomes (Caetano, 2003; Jacobson et al., 2007), it is critical that screening and culturally appropriate, evidence-based treatment continue into midlife, as this study provides strong evidence of continuity, and these were some of the strongest associations noted for both men and women. Moreover, evidence-based diversion programs should be expanded to the extent possible to reduce the cycle of drugs and crime that plague many inner cities.

Finally, attention to the potential criminogenic nature of the criminal justice system is needed, particularly in African American communities that are overpoliced and disproportionately affected by mass incarceration. This "normalization" of criminal justice contact necessitates "theories which…implicate the justice system in helping perpetuate delinquency, crime, and imprisonment" (Hirschfield, 2008, pp. 597; see also Liberman et al., 2014) and "the reconfiguration of criminal justice along the lines of reintegrative justice, substantive rationality, and proportional and procedural fairness" (Fagan and Meares, 2008, pp. 229). Similar to therapeutic communities in prisons (Deitch et al., 2000), probation and parole officers could play a more integral role in substance use treatment communities (rather than a monitoring and/or disciplinary role), which may reduce substance use problems along with preventing recidivism of arrest, as the strongest associations relate to continuity in arrests across time, even more so than criminal behavior or substance use problems. Within the Woodlawn cohort only about one-third of those arrested have served time in prison (Doherty et al., 2016); thus, it is critical to address substance use among all those who are arrested regardless of sentencing.

Contributors

KG, ED and ME conceptualized the study. KG prepared the data, conducted the analysis and wrote the first draft of the manuscript. ED coded the arrest records and contributed significantly to the writing. MS assisted with the literature review, and contributed to writing of the methods and the creation of tables. All authors provided feedback on manuscript drafts and approved of the final manuscript.

Conflict of interests

No conflict declared.

Acknowledgements

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