SAGE Secondary Data Analysis

Patterns of Substance Involvement and Criminal Behavior: A Gender-based Cluster Analysis of Pennsylvania Arrestees

[p. v2-211 ↓]

Patterns of Substance Involvement and Criminal Behavior: A Gender-based Cluster Analysis of Pennsylvania Arrestees

Recent drug-crime scholarship has underscored the importance of conducting disaggregated research that focuses on the consistencies and variations between subcategories of drug misuse and criminal activity and, further, how these associations may vary across sociodemographic and cultural boundaries. The research presented in this article used cluster analysis to independently classify male and female arrestees based on their arrest charges and substance-specific indicators of initiation, use, dependence, and treatment need. The data come from Pennsylvania's Substance Abuse and Need for Treatment Among Arrestees study conducted as part of the State Treatment Needs Assessment Program. Five groups were identified in both the male and female cluster analyses. The results reveal both important differences and strong similarities in the drug-crime typologies of male and female arrestees. Given these findings, implications are discussed for developing and targeting responsive treatment services that match the particular risks and needs of drug-involved offenders.

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It is generally well established that people who use drugs regularly are more likely than nonusers to be involved in a wide variety of illegal activities (Harrison & Backenheimer, 1998). Although the association between drugs and crime is strong, there is no single causal link that defines the drug-crime relationship. Instead, there are multiple and complex pathways linking drug and crime involvement (Anthony & Forman, 2003; White & Gorman, 2000). Drug-crime research over the past three decades has clarified pieces of this puzzle, but a clearer understanding of the variations and consistencies between the abuse of certain psychoactive substances and particular criminal behaviors has been obscured by the tendency for research on drug-crime connections to be either generalized or specialized in nature (Bennett & Holloway, 2005a). Generalist studies rely on aggregate measures of drug and crime involvement (e.g., chronic drug use, annual arrest frequency), whereas specialist studies focus on narrowly defined user or criminal subgroups (e.g., heroin addicts, violent criminals). Both generalist and specialist studies confirm the general co-occurrence of drug use and crime, but a more nuanced delineation of patterns of drug misuse and criminality requires a disaggregated approach that **[p. v2-212 ↓]** highlights the different associations between subcategories of drug and crime involvement (Bennett & Holloway, 2005a, 2005b; Farabee, Joshi, & Anglin, 2001). As Bennett and Holloway (2005b) argue, a disaggregated research agenda could further our understanding of the consistencies and variations in drug-crime connections and elevate empirical research to a level of specificity observed in current academic and theoretical discussions.

Disaggregated drug-crime research also has practical implications for the management and treatment of drug-involved offenders. For example, the risk, needs, and responsivity (RNR) model of offender rehabilitation that emerged during the 1990s established a set of guiding principles for matching offenders to appropriate treatment programs (Andrews, Bonta, & Hoge, 1990; Taxman & Thanner, 2006). Specifically, the RNR framework emphasizes matching the intensity and scope of rehabilitative services to offenders' risks and needs, respectively, and the particular format of those services to the responsivity, or sensitivities and abilities, of offenders (Andrews et al., 1990). The implication for offender services and outcomes research is that generic interventions fail to target the specific rehabilitative needs and criminal propensities of offenders and neglect differences in responsivity across important offender characteristics such

as gender, race/ethnicity, and age (Bloom, Owen, Covington, & Raeder, 2003; Day, Howells, & Casey, 2003; Pelissier & Jones, 2005).

This study therefore adopts a disaggregated analytic framework with the aim of identifying specific drug-crime subtypes among a sample of recent Pennsylvania arrestees. In addition, we assess whether these drug-crime subtypes are conditioned, or influenced, by gender. Specifically, we use cluster analysis to independently classify subsamples of male and female arrestees based on their arrest charges and self-reported histories of substance initiation, use, dependence, and treatment need. In pursuing this line of research, we hope to better characterize the heterogeneous mix of drug-involved offenders to advance our understanding of drug-crime connections and improve the targeting of offender programs and services.

Prior Research on Specific Drug-Crime Associations

Few studies of drug-crime connections have used fully disaggregated measures of both substance involvement and criminal participation, and even fewer have examined these subtype associations by gender. Indeed, we were unable to locate a single study that adopted a fully disaggregated and gendered approach to investigating drug-crime associations. Makkai (2001), for instance, focused on male arrestees in investigating the association between drug test results for five substances and seven offense types. The results showed that male arrestees charged with a violent or public-disorder offense had greater odds of testing positive for cocaine; those charged with a property offense had **[p. v2-213 ↓]** greater odds of testing positive for opiates and sedatives; and those charged with a drug offense had greater odds of testing positive for marijuana.

By way of contrast, Martin and Bryant (2001) adopted a gendered approach that was limited to the analysis of just two crime types. Specifically, they examined the influence of four types of substance use (i.e., alcohol, cocaine, marijuana, and other drugs) on violent versus property offending in subsamples of male and female U.S. arrestees. They found for both men and women that frequent drinking and testing positive for

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cocaine and other drugs was significantly associated with property offending and, conversely, that being under the influence of alcohol at the time of the offense and testing positive for marijuana was significantly associated with violent offending. Cross-gender differences were also observed, including a significant association between the need for alcohol treatment and violent offending among men and combined alcohol-cocaine use and property offending among women. These results underscore not only the need to include measures of alcohol use and abuse in studies investigating subtype drug-crime associations but also the importance of analyzing the outcomes by gender to unmask divergent male and female drug-crime patterns.

In addition to the evidence from studies using simple drug and crime prevalence measures, research has also shown that periods of higher frequency drug use and addiction are associated with increased rates and diversity of criminal activity (Chaiken & Chaiken, 1990; Nurco, Hanlon, Kinlock, & Duszynski, 1988). For example, Chaiken and Chaiken (1990) concluded in their review of the literature on drugs and predatory crime that "offenders who persistently and frequently use large amounts of multiple types of drugs commit crimes at significantly higher rates over longer periods than do less drug-involved offenders" (p. 235). These findings highlight the importance of using frequency and severity measures to capture the qualitatively different drug-crime associations that occur between the extremes of nonuse and addiction.

Another line of research has used a classification approach to identify variations in drug-crime associations. For example, in a recent series of studies, Yacoubian (1999, 2000, 2001; Yacoubian & Kane, 1998) categorized several geographically diverse samples of U.S. arrestees according to their patterns of drug and crime involvement. Yacoubian first used principal components analysis (PCA) to reduce more than 40 variables measuring specific types and patterns of drug use into several principal components (e.g., "experimental use of all illicit drugs," "use of powerful CNS drugs," and "use of stimulants and hallucinogens"). Cluster analysis was then performed with these components and additional crime type and demographic measures. Depending on the study, the cluster analysis resulted in the formation of three to six unique clusters. Some of the more common clusters reported by Yacoubian (1999, 2000, 2001; Yacoubian & Kane, 1998) were the "Converters" (i.e., property offenders with high rates of addiction to multiple substances), "Dope Fiends/Injectors" (i.e., drug/other offenders with high injectable drug use rates), and "Zombies" **[p. v2-214 ↓]** (i.e., drug

offenders with a high propensity to use all drug types). Unfortunately, Yacoubian's use of principal components obscures the specific drug-crime characteristics of the clusters. Moreover, using PCA prior to cluster analysis poses both statistical (e.g., suboptimal utilization of between-group covariance structures) and interpretive (e.g., PCA-introduced measurement distortions) problems (Jackson, 1991; Kettenring, 2006). In short, barring computational issues and other selective considerations, preliminary PCA is not recommended, and analysts would be better off performing cluster analysis on the original variables (Jackson, 1991, pp. 337–338).

Overall, there is a limited body of extant research investigating variations and consistencies in specific drug-crime associations, and it is difficult to draw generalizations given differences across samples in the drug and crime types examined. We can be even less certain about specific drug-crime associations when factoring in different patterns and severities of substance use or the divergent cultural and demographic characteristics of offenders. Methodological limitations in prior studies have also impeded our ability to draw conclusions about specific drug-crime associations in offender populations. We seek to address these shortcomings in this study to develop a better understanding of drug-crime connections and whether these differ by gender so as to improve how offender programs and services are targeted.

Method

We use cluster analysis to independently classify a sample of male and female Pennsylvania arrestees based on their arrest charges (violent, property, drug, or public-order offense) and self-reported indicators of substance use and abuse (adolescent onset, recent use, dependence, and need for treatment) across a range of psychoactive substances (alcohol, marijuana, crack/cocaine, and heroin/opiates). Cluster analysis encompasses a range of techniques used to group people or objects into categories based on their degree of similarity across specified dimensions of interest (Everitt, Landau, & Leese, 2001; Kaufman & Rousseeuw, 1990; Romesberg, 1984).

Sample

The data for this study come from Pennsylvania's Substance Abuse and Need for Treatment Among Arrestees (SANTA) study conducted between July 1997 and March 1998. Pennsylvania was one of 28 states funded through the Center for Substance Abuse Treatment of the Substance Abuse and Mental Health Services Administration as part of the State Treatment Needs Assessment Program. The Pennsylvania Department of Health contracted with the University of Pittsburgh's Graduate School of Public Health and University **[p. v2-215 ↓]** Center for Social and Urban Research to conduct a family of needs assessment studies. The Pennsylvania SANTA study, which was one of the studies, was designed to produce estimates of the need for substance abuse treatment among adult arrestees. The study had institutional review board approval and was covered by a federal Certificate of Confidentiality, and each participant gave his or her informed consent. The second author participated in the original SANTA study data collection.

The project sampled recent arrestees from holding facilities in Allegheny, Philadelphia, and Westmoreland counties.[1] Voluntary interviews were conducted with arrestees who had been booked within the previous 48 hours. Because the SANTA studies were intended to estimate unmet community treatment needs, the recruitment strategy was based on a set of inclusion criteria that identified newly arrested offenders who were most likely to be released back into the community. Thus, eligibility was based on a crime-severity system that identified low-grade felons and misdemeanants who were expected to receive probation or an intermediate sanction (based on state sentencing guidelines).

Male arrestees who met the inclusion criteria were randomly selected from the daily docket report. If an interview could not be completed either because of refusal or release from the facility, the interviewer went on to the next arrestee on the list. All female arrestees were recruited for the study because of their low base rate of arrest. Interviews were conducted by trained research staff using a structured computer-assisted personal interview (CAPI) survey that took approximately 1 hour to complete. Respondents were paid with a $15 department store gift certificate for their participation.

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Interviews were completed with a total of 436 arrestees (64 women and 372 men). The refusal rate across all three sites was 10% for men and 5% for women. The analytic sample is based on 377 arrestees (58 women and 319 men) who were charged with a low-grade violent, property, drug, or public-order offense. Fifty-nine arrestees charged with other offense types (e.g., warrant, escape, probation/parole violation) were dropped from the analyses because it was not possible to discern the underlying offense, and their inclusion would obscure the specific drug-crime associations we aim to uncover.

Measures

The data for this study were collected via CAPI methods using two complementary questionnaires (i.e., the Drug Use Forecasting and SANTA instruments) designed to measure drug and crime involvement among recent arrestees (National Institute of Justice, 1996; Shepard et al., 2005). The cluster analysis and supplementary descriptive variables used in this study are described below.

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Crime Type.

Site coordinators recorded the most serious charge from official booking information. For our purposes, the specific charged offenses were collapsed into violent, property, drug, and public-order offense categories.

Adolescent Substance Use Onset.

Longitudinal cohort research finds that the highest risk of initiation for most legal (cigarettes and alcohol) and illegal drugs peaks at age 18 (Chen & Kandel, 1995; Kandel & Logan, 1984). Thus, if individuals have not initiated substance use by late adolescence, they are highly unlikely to initiate later in life. Based in the item "When you first tried [drug] how old were you?" we created measures of adolescent onset for each of the four substance categories examined (i.e., alcohol, marijuana, crack/cocaine, and

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heroin/opiates), coded 1 for arrestees who reported that their first use occurred before age 18 and 0 otherwise.

Recent Substance Use.

For each of the four substance categories, recent substance use was measured using the item "In the last three days did you use [drug]?" Thus, each variable was coded 1 for self-reported substance use in the previous 3 days and 0 for no use during this period.

Substance Dependence.

Data were collected on a wide array of substance-related problems and symptomatology. This information was run through a computer-scoring algorithm to generate a *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1987) substance dependence diagnosis (*dependence* = 1, *no dependence* = 0) for alcohol, marijuana, crack/cocaine, and heroin/opiates over the previous 18-month period.

Need for Treatment.

Respondents were asked whether they were currently in need of drug or alcohol treatment ("Do you feel that you could use treatment for drug or alcohol use?"). If drug treatment need was indicated, the respondent was asked to identify the specific drug (or drugs) for which treatment was needed. Thus, the variable for each substance was coded 1 for arrestees who expressed a need for treatment and 0 otherwise.

Supplementary Descriptive Variables.

In addition to the cluster analysis variables described above, supplementary demographic and drug/crime descriptors were used in post hoc comparisons of the cluster groups. The demographic measures include age, race, education, marital

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status, and primary source of financial support. Age was calculated from the year of birth entered on the booking slip. Race was dichotomized into White and non-White (93% of non-Whites were Black). Education was measured by high school or graduate equivalency degree (GED) completion ("Did you graduate from high school or get a GED certificate?"). Marital status was measured as currently married versus not (i.e., single, divorced, widowed). The main source of financial support was derived from the item "In the past month, how did you mainly support yourself?"[2] The supplementary drug and crime measures were past-month illegal income ("In the past month, how much money did you derive from all *illegal* sources?"), typical weekly drug expenditures ("How much money do you spend in an average week for your drug use, **[p. v2-217 ↓]** excluding alcohol or tobacco?"), and past 6-month drug injection ("Have you injected any drugs in the last six [6] months?").

Analytic Approach

Analysis proceeded in several stages. First, descriptive statistics of sociodemographic characteristics were calculated by crime type and gender. Second, hierarchical agglomerative cluster analysis (Everitt et al., 2001; Kaufman & Rousseeuw, 1990; Romesberg, 1984; StataCorp, 2003) was used to independently classify male and female arrestees by their patterns of drug and crime involvement. Third, post hoc validation of the cluster groups (Blashfield, Aldenderfer, & Morey, 1982; Jain & Dubes, 1988) was performed using chi-square (χ^2) analysis and analysis of variance (ANOVA). All analyses were conducted using Stata/SE 8.2.

Hierarchical agglomerative clustering methods operate by sequentially joining individual objects into groups based on their degree of similarity, ultimately forming a single group (Everitt et al., 2001; Kaufman & Rousseeuw, 1990; Romesberg, 1984). Similarity is a function of the proximity measure and clustering method used to define the mathematical distance between individuals and groups across specified variables of interest. Thus, hierarchical clustering methods require the analyst to choose the proximity measure and clustering method thought best to recover the underlying group structure in the data and, in determining the appropriate number of clusters, to partition the data at some meaningful point in the agglomeration process.

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Stata requires the variables entered into a cluster analysis to be either binary or continuous (StataCorp, 2003). Thus, 20 binary drug and crime measures – including the 16 indicators of substance involvement (adolescent onset, recent use, dependence, and treatment need for alcohol, marijuana, crack/cocaine, and heroin/opiates) and four crime type measures (violent, property, drug, public order) – were used as variables in the cluster analyses. Pearson's phi binary coefficient (StataCorp, 2003) was used as the proximity measure because zero-zero matches were thought to be informative. That is, we considered the coabsence of specific drug and crime attributes to be as important as their co-occurrence in comparing individuals for grouping purposes, and Pearson's phi accommodates this level of matching. Weighted average linkage was used as the clustering method (Everitt et al., 2001). Weighted (as opposed to unweighted) clustering was used to ensure that larger a priori groups (e.g., drug vs. public-order offenders) did not distort the cluster solution. Average linkage was used because it is relatively robust and avoids the chaining (too few clusters) and dilatation (too many clusters) that often result with single and complete linkage methods, respectively (Everitt et al., 2001; Kaufman & Rousseeuw, 1990).

[p. v2-218 ↓]

Both graphical and statistical methods were used to aid selection of the optimum number of clusters. Dendrograms, or tree diagrams, provide a useful visual aid in the data-partitioning process. They display the underlying structure of the cluster solution by revealing which objects fuse together and in what sequence. In addition, the Calinski-Harabasz pseudo-F index was applied as a statistical stopping rule (StataCorp, 2003). When specified for a plausible range of cluster groups (e.g., 2–10), the greatest value of the statistic suggests the ideal number of clusters in the data.

For purposes of cluster validation, post hoc comparisons between clusters were conducted using chi-square analysis and ANOVA (Blashfield, Aldenderfer, & Morey, 1982; Jain & Dubes, 1988). Comparisons were performed on both the cluster analysis and supplementary descriptive variables. Following significant ANOVA F tests, unplanned comparisons were conducted using the Scheffe test, a conservative procedure that does not assume equal group size (Sheskin, 2003).

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Results

Arrestee Characteristics

Table 1: Sociodemographic characteristics of Pennsylvania arrestees by crime type and gender

Characteristic	Violent		Property		Drug		Public order	
	M	F	M	F	M	F	M	F
Age (M)	33.3	30.8	31.0	31.1	29.2	31.7	32.4	31.8
White (%)	54.2	50.0	41.5	57.9	21.9	70.0	59.5	60.0
High school graduate or graduate equivalency degree (%)	72.3	92.9	71.3	78.9	63.8	70.0	81.1	33.3
Currently married (%)	24.1	21.4	19.1	5.3	5.7	0.0	8.1	6.7
n	83	14	94	19	105	10	37	15

Note: M = male; F = female.

Table 1 shows the sociodemographic characteristics of the sample stratified by crime type and gender. The mean age of the arrestees is fairly uniform (around 31–32 years old) across crime type and gender, with a one-way ANOVA revealing no significant differences, $F(7, 369) = 1.28$, *ns.* Significant racial differences were found across crime type and gender, $\chi^2(7, N = 377) = 34.19$, $p < .001$, with non-Whites overrepresented among male drug and property offenders and underrepresented among their female counterparts. There is a significant association between education and crime-gender groups, $\chi^2(7, N = 377) = 18.18$, $p < .05$, with violent female offenders most likely to have a high school or GED and female public-order offenders the least likely. Finally, martial status is significantly associated with crime type and gender, **[p. v2-219 ↓]** $\chi^2(7, N = 377) = 20.54$, $p < .01$, as marriage was more common among violent offenders and least common among drug offenders.

Male Arrestee Cluster Analysis

The male arrestee cluster analysis supported a five-cluster solution. Listwise deletion of cases for missing data resulted in a final male sample size of 317. Table 2 displays the cluster groups across cluster analysis and supplementary variables. Bolded numbers

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indicate values that are above the overall mean for a particular variable, facilitating visual inspection of dominant group characteristics. The clusters are well differentiated across both cluster analysis and supplementary variables, as indicated by the χ^2 and ANOVA test results (see Table 2). Each cluster is described in greater detail below.

Violent Alcoholics.

Individuals in this group are characterized by their alcohol involvement and violent behavior. All were arrested for a violent crime, and nearly two thirds reported recent alcohol use. Violent alcoholics also had greater-than-average rates of alcohol dependence (39%) and unmet treatment need (25%). By all indicators, illicit drug use was uncommon among this group. Demographically, violent alcoholics had a proportionately larger number of individuals who were married (26%), White (57%), and employed full-time (47%), and they also tended to be older ($M = 34$) on average than the other groups.

Nuisance Inebriates.

This group typifies the public-nuisance drinker. All were arrested for a public-order offense, such as disturbing the peace or resisting arrest. Nuisance inebriates had the highest rate of recent alcohol use (67%) but slightly lower rates of alcohol dependence (36%) and treatment need (24%) than the violent alcoholics. Illicit drug use was also uncommon among this group. Of all the groups, nuisance inebriates had the largest percentage of Whites (64%) and those gainfully employed, with more than three quarters reporting full- or part-time work as their main income source. However, the remainder were either on welfare or unemployed, which was also the largest respective percentage across all groups. Notably, fewer than 1 in 10 was married.

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Marijuana-Using Dealers.

Marijuana-using dealers are characterized by their heavy involvement with marijuana and violation of the drug laws. All were arrested either for drug sales or possession, and the group had the highest rates of adolescent onset (77%), recent use (55%), dependence (24%), and treatment need (19%) involving marijuana. Demographically, marijuana-using dealers were on average the youngest ($M = 27$) and least White (19%) of the groups. Although not statistically significant, this group had a relatively smaller number of high school graduates (62%) and full- or part-time workers (54%).

[p. v2-220 ↓]

Table 2: Description of male arrestee clusters by cluster and supplementary variables

	Violent alcoholics	Nuisance inebriates	Marijuana-using dealers	Alcohol and cocaine dependent hustlers	Illegal income-generating opiate addicts	χ^2 or (F statistic)
n (% of total)	72 (22.7)	33 (10.4)	85 (26.8)	38 (12.0)	89 (28.1)	
Cluster analysis variables						
Offense type						776.28***
Violent (%)	**100.0**	0.0	0.0	18.4	4.5	
Property (%)	0.0	0.0	0.0	42.1	87.6	
Drug (%)	0.0	0.0	**100.0**	28.9	7.9	
Public order (%)	0.0	**100.0**	0.0	10.5	0.0	
Alcohol measures						
Adolescent onset (%)	76.4	**78.8**	**82.4**	73.7	73.0	2.47
Recent use (%)	**63.9**	**66.7**	48.2	**57.9**	37.1	15.86**
Dependence (%)	**38.9**	**36.4**	25.9	**44.7**	31.5	5.56
Treatment need (%)	**25.0**	24.2	14.1	**44.7**	**25.8**	13.42**
Marijuana measures						
Adolescent onset (%)	55.6	60.6	**76.5**	52.6	**69.7**	11.46*
Recent use (%)	22.2	24.2	**55.3**	15.8	25.8	31.62***
Dependence (%)	6.9	9.1	**23.5**	13.2	11.2	10.87*
Treatment need (%)	4.2	3.0	**18.8**	2.6	7.9	15.78**
Cocaine measures						
Adolescent onset (%)	13.9	12.1	12.9	**34.2**	**20.2**	10.26*
Recent use (%)	8.3	3.0	20.0	**92.1**	14.6	123.69***
Dependence (%)	2.8	6.1	14.1	**89.5**	12.4	141.01***
Treatment need (%)	1.4	3.0	18.8	**81.6**	14.6	115.16***
Opiate measures						
Adolescent onset (%)	4.2	**9.1**	3.5	10.5	**13.5**	7.86
Recent use (%)	0.0	3.0	2.4	5.3	**22.5**	37.24***
Dependence (%)	0.0	0.0	3.5	0.0	**25.8**	52.03***
Treatment need (%)	0.0	0.0	1.2	2.6	**28.1**	61.10***
Supplementary descriptive variables						
Age (M)	33.5^a	31.2	26.9^{ab}	36.1^b	30.9	(7.56***)
White (%)	**56.9**	**63.6**	18.8	39.5	40.5	31.95***
High school graduate or graduate equivalency degree (%)	**72.2**	**84.9**	62.4	**76.3**	69.7	6.75
Currently married (%)	**26.4**	9.1	5.9	2.6	**21.4**	21.34***
Main financial support						25.37
Full-time work (%)	**47.2**	**48.5**	23.5	31.6	31.5	
Part-time work (%)	23.6	27.3	**30.6**	21.1	**33.7**	
Welfare/supplemental security income (%)	9.7	**18.2**	11.8	**13.2**	10.1	
Other legal (%)	**8.3**	0.0	**10.6**	7.9	7.9	
Unemployed (%)	4.2	6.1	**9.4**	**7.9**	5.6	
Illegal activities (%)	6.9	0.0	**14.1**	**18.4**	11.2	
Past month illegal income (M)	$516	$9	**$600**	**$732**	**$582**	(0.67)
Typical weekly personal drug expenditure (M)	$9^a	$30^b	$134^c	$409^{abc}	$190	(6.13***)
Inject past 6 months (%)	0.0	3.0	3.5	**7.9**	**19.1**	25.77***

Note: Bold indicates values that are above the overall mean value or percentage for each measure. Superscripts indicate the specific ANOVA post hoc comparisons that are significant at the $p < .05$ level (Scheffe test).
*$p < .05$. **$p < .01$. ***$p < .001$.

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Alcohol- and Cocaine-Dependent Hustlers.

This group was the least criminally homogeneous of the five groups, comprising individuals arrested for property (42%), drug (29%), violent (18%), and public-order (11%) offenses. Alcohol- and cocaine-dependent hustlers had the highest rates of alcohol dependence (45%) and need for alcohol treatment (45%), and they were the most seriously cocaine-involved group with respect to adolescent onset (34%), recent use (92%), dependence (90%), and unmet treatment need (82%). Members of this group spent the most per week on average for their personal drug use (M = $409) and, though statistically insignificant, were the highest past-month illegal income earners (M = $732) and had the greatest share of their income derived primarily from illegal sources (18%). Demographically, members of this group were on average the oldest (M = 36) and tended not to be married (3%).

Illegal Income-Generating Opiate Addicts.

This group typifies the heroin/opiate addict who steals to support his habit. Indeed, a sizable majority (88%) were arrested for a property crime. Illegal income-generating opiate addicts also had the highest rates of adolescent onset (14%), recent use (23%), dependence (26%), and unmet treatment need (28%) involving heroin/opiates, as well as the greatest percentage (19%) of past 6-month drug injectors. Interestingly, only violent alcoholics had a proportionately larger share of married individuals (26% vs. 21%).

Female Arrestee Cluster Analysis

The female arrestee cluster analysis also supported a five-cluster solution. Listwise deletion of cases for missing data resulted in a final female sample size of 57.[3] Table 3 displays the cluster groups across cluster analysis and supplementary variables, with

bolded numbers indicating values that are above the overall mean. The clusters are fairly well differentiated across both cluster analysis and supplementary descriptive variables, although marijuana involvement clearly does not distinguish between groups (see Table 3). Each cluster is described in greater detail below.

Violent Alcoholics.

Individuals in this group are characterized by their alcohol involvement and violent offending. All were arrested for a violent crime, and as a whole, the group had above-average rates of alcohol involvement. About 9 in 10 began drinking as adolescents, 6 in 10 recently drank alcohol, and nearly half were dependent on alcohol and in need of treatment. Notably, violent alcoholics were employed full-time at more than twice the rate of the next highest group (54% vs. 21%), and none reported being unemployed or earning money by illegal means. Demographically, this group had the largest percentage of married individuals (23%), and all its members either graduated from high school or received a GED.

[p. v2-222 ↓]

Table 3: Description of female arrestee clusters by cluster and supplementary variables

	Violent alcoholics	Alcohol- and cocaine-dependent down-and-outs	Marijuana-using hustlers	Alcohol- and cocaine-dependent sex workers	Illegal income-generating opiate addicts	χ^2 or (F Statistic)
n (% of total)	13 (22.8)	7 (12.3)	19 (33.3)	10 (17.5)	8 (14.0)	
Cluster analysis variables						
Offense type						95.01***
Violent (%)	100.0	14.3	0.0	0.0	0.0	
Property (%)	0.0	42.9	68.4	0.0	37.5	
Drug (%)	0.0	42.9	15.8	0.0	50.0	
Public order (%)	0.0	0.0	15.8	100.0	12.5	
Alcohol measures						
Adolescent onset (%)	92.3	42.9	84.2	90.0	37.5	14.15**
Recent use (%)	61.3	85.7	57.9	40.0	12.5	9.51*
Dependence (%)	46.2	71.4	26.3	80.0	0.0	16.21***
Treatment need (%)	46.2	28.6	5.3	80.0	25.0	17.82***
Marijuana measures						
Adolescent onset (%)	61.5	28.6	73.7	80.0	75.0	6.20
Recent use (%)	30.8	0.0	36.8	0.0	12.5	8.47
Dependence (%)	7.7	0.0	15.8	10.0	25.0	2.70
Treatment need (%)	7.7	0.0	5.3	10.0	0.0	1.44
Cocaine measures						
Adolescent onset (%)	23.1	0.0	31.6	30.0	37.5	3.43
Recent use (%)	0.0	100.0	15.8	70.0	50.0	28.52***
Dependence (%)	0.0	100.0	15.8	50.0	37.5	25.06***
Treatment need (%)	7.7	71.4	10.5	90.0	25.0	27.57***
Opiate measures						
Adolescent onset (%)	7.7	0.0	0.0	20.0	50.0	15.01**
Recent use (%)	15.4	14.3	0.0	0.0	100.0	40.63***
Dependence (%)	7.7	0.0	0.0	10.0	62.5	22.67***
Treatment need (%)	7.7	0.0	0.0	10.0	87.5	36.71***
Supplementary descriptive variables						
Age (M)	31.2	33.7	27.3	33.9	35.1	(2.40)
White (%)	53.9	14.3	68.4	50.0	87.5	9.54*
High school graduate or graduate equivalency degree (%)	100.0	14.3	84.2	30.0	87.5	26.62***
Currently married (%)	23.1	0.0	0.0	10.0	12.5	5.98
Main financial support						31.34
Full-time work (%)	53.9	14.3	21.1	0.0	0.0	
Part-time work (%)	7.7	14.3	26.3	10.0	12.5	
Welfare/supplemental security income (%)	38.5	57.1	15.8	40.0	37.5	
Other legal (%)	0.0	0.0	10.5	10.0	0.0	
Unemployed (%)	0.0	0.0	5.3	0.0	25.0	
Illegal activities (%)	0.0	14.3	21.1	40.0	25.0	
Past month illegal income (M)	$54	$86	$405	$1,645	$1,629#	(2.17)
Typical weekly personal drug expenditure (M)	$29	$168	$167	$440	$566	(2.34)
Inject past 6 months (%)	7.7	14.3	5.3	10.0	75.0	21.55***

Note: Bold indicates values that are above the overall mean value or percentage for each measure; the number sign (#) excludes one outlier.
*$p < .05$. **$p < .01$. ***$p < .001$.

[p. v2-223 ↓]

Alcohol- and Cocaine-Dependent Down-and-Outs.

This group is characterized by a pattern of pervasive alcohol and cocaine involvement and severe socio-economic disadvantage. Arrested mainly for property (43%) and drug (43%) crimes, the individuals in this group near-universally reported recent use of both alcohol (86%) and cocaine (100%), and the majority were dependent on these two substances as well (71% and 100%, respectively). Notably, however, the group acknowledged considerably less unmet treatment need for alcohol than for cocaine (29% vs. 71%). Indicative of their disadvantaged socioeconomic status, individuals

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in this group tended to be non-White (86%), high school dropouts (86%), unmarried (100%), and on welfare (57%).

Marijuana-Using Hustlers.

Marijuana-using hustlers are characterized most distinctly by the co-occurrence of recent marijuana use (37%) and property offending (68%), which are the highest respective rates across all groups. This group also had an above-average rate of marijuana dependence (16%) but, at the same time, below-average unmet treatment need for marijuana (5%). About 1 in 5 earned income primarily through illegal means. Demographically, this group was composed of a proportionately large number of Whites (68%), high school graduates (84%), and unmarried individuals (100%), and they also tended to be younger ($M = 27$) on average than the other groups.

Alcohol- and Cocaine-Dependent Sex Workers.

This group is characterized by a pervasive pattern of alcohol and cocaine involvement and arrest for a public-order offense, most commonly prostitution (70%). Indicative of their involvement in prostitution, members of this group supported themselves primarily through illegal activities (40%), earning the highest mean illegal income among all groups in the month before arrest ($M = \$1,645$). In addition to being relatively early initiators of all substances, alcohol- and cocaine-dependent sex workers reported the highest rates of alcohol dependence (80%) and unmet need for alcohol treatment (80%) and ranked among the top two with respect to recent use (70%), dependence (50%), and unmet need for treatment (90%) involving cocaine. Demographically, this group was on average older ($M = 34$) and less educated (30% graduation rate) than the other groups.

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Illegal Income-Generating Opiate Addicts.

Individuals in this group are characterized by a pattern of serious heroin/opiate addiction and drug and property offending in support of their habit. Illegal income-generating opiate addicts had the highest rates of adolescent onset (50%), recent use (100%), dependence (63%), and unmet treatment need (88%) involving heroin/opiates, with three quarters reporting past 6-month drug injection behavior. This group also had above-average illegal earnings (M = $1,629, excluding an outlier of $60,000) and reported the highest average weekly expenditures on illicit drugs (M = $566). Demographically, this group is relatively older (M = 35), more White (88%), and high school educated (88%).

[p. v2-224 ↓]

Comparing Male and Female Clusters

Both the male and female cluster analyses supported five cluster solutions. Several of the cross-gender groups were qualitatively distinct (e.g., alcohol- and cocaine-dependent sex workers, nuisance inebriates). However, we found commonalities with respect to violent alcoholics and illegal income-generating opiate addicts, so we tested whether these groups differed across gender in their levels of alcohol and heroin/opiate involvement, respectively. Although female violent alcoholics reported higher rates of adolescent onset, dependence, and treatment need for alcohol than men did, these differences were not statistically significant. However, female illegal income-generating opiate addicts had significantly higher rates of adolescent onset, $\chi^2(1, n = 97) = 7.11$, $p < .01$; recent use, $\chi^2(1, n = 97) = 21.49$, $p < .001$; dependence, $\chi^2(1, n = 97) = 4.80$, $p < .05$; and treatment need, $\chi^2(1, n = 97) = 11.72$, $p < .001$, for heroin/opiates than their male counterparts did. These findings indicate that despite the qualitatively similar drug-crime profiles for both male and female illegal income-generating opiate addicts, the overall level of risks and needs surrounding heroin/opiates was much greater for women than for men. In contrast, no significant cross-gender differences were observed for the violent alcoholics.

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Discussion

Recent drug-crime scholarship underscores the importance of conducting disaggregated research that focuses on the consistencies and variations between subcategories of drug misuse and criminal activity and, further, how these associations may vary across sociodemographic and cultural boundaries (Bennett & Holloway, 2005a, 2005b; Farabee et al., 2001). Nationwide, there is a clear need for increasing access to quality substance abuse services for offenders in jails and detention centers and those under community supervision (Taxman, Perdoni, & Harrison, 2007). Meeting that need with responsive interventions geared to the particular risks and needs of offenders offers the best chance of breaking enmeshed cycles of drug and crime involvement.

This study contributes to this agenda by conducting cluster analyses that identify gender-specific drug-crime subtypes among recent Pennsylvania arrestees. Although not meant to be a definitive typology, these results underscore the need for criminal justice policies and programming that match rehabilitative services to the different types of drug-involved offenders. In the context of the RNR model discussed above (Andrews et al., 1990), this means developing and targeting responsive interventions that address the unique risk and need profiles of offenders. This study, in particular, points to the need for gender-responsive criminal justice programming. Bloom, Owen, and Covington's (2004) comprehensive review of women offenders specifies **[p. v2-225 ↓]** a blueprint for such programming that emphasizes differences in male-female entry-ways into the criminal justice system; public safety and institutional risks; and experiences of substance abuse, trauma, parenting, and employment. Specific implications for gender-responsive programming are discussed later in the context of the study's empirical findings.

The results of this study reveal both important differences and similarities in the drug-crime typologies of male and female arrestees. Although a possible artifact of undersampling serious male felons, a similar percentage (23%) of both male and female arrestees were violent alcoholics, which supports research indicating that the association between alcohol abuse and violent crime is not solely a male phenomenon (Martin & Bryant, 2001; Spunt, Goldstein, Bellucci, & Miller, 1990). Although it is

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generally recognized that men are involved in violent crimes at a much greater rate and frequency than women are, this research suggests a clear need for criminal justice programming that addresses female and male issues surrounding alcohol abuse and interpersonal violence.

In contrast to violent alcoholics, nuisance inebriates were found only among male arrestees. Thus, the combination of recent alcohol abuse and public-disorder offending highlights a chiefly male pathway into the criminal justice system. This result is consistent with aggregate multicity arrestee data showing that male-female differences in the prevalence of recent alcohol use and intoxication were larger for public-order arrestees than for violent arrestees (Martin, Bryant, & Fitzgerald, 2001). Male-centered programs geared toward managing public drunkenness and nuisance behaviors seem particularly valuable in this light. Notably, about half the nuisance inebriates were employed full-time, so referral to employee assistance programs may be a particularly amenable intervention for these offenders. However, the remainder were either employed less than full-time, on welfare, or unemployed, so referral to public-sponsored treatment might be the only available option for many public-nuisance offenders.

Illegal income-generating opiate addicts were common across gender, supporting the extensive literature on the pervasiveness of heroin-crime connections (Maher, Dixon, Hall, & Lynskey, 2002; White & Gorman, 2000). It is noteworthy, however, that the rates of heroin/opiate use and dependence were significantly higher among female arrestees than among male arrestees. This finding supports research that shows that heroin abuse and addiction is often more severe and has greater consequences for female offenders (Lo, 2005; Pelissier & Jones, 2005). As one indicator of this, we found that female illegal income-generating opiate addicts were much more likely than their male counterparts to have injected heroin/opiates in the previous 6 months (75% vs. 19%), so gender-responsive interventions would need to address the drug injection and other risky drug-using practices that are more prevalent among female offenders.

[p. v2-226 ↓]

The less criminally homogeneous groups to emerge from the cluster analyses that shared similar patterns of substance involvement across gender were the marijuana-using dealers/hustlers and the alcohol- and cocaine-dependent hustlers/sex workers/

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down-and-outs. The first assemblage was characterized by substantial marijuana involvement but differed in that male dealers were arrested solely for drug offenses, whereas female hustlers committed a variety of property, drug, and public-disorder crimes. Although research on gender roles in the drug economy has backed competing claims regarding the realities of female expansion into the drug trade (Maher & Daly, 1996; Sommers, Baskin, & Fagan, 1996), the present results suggest that, for marijuana markets at least, women persist in secondary selling-hustling roles. To the extent that women are introduced into these roles through male partners, gender-responsive programming would need to address issues of codependency and coping.

The second assemblage of clusters was characterized by a wide range of criminal activities perpetrated within a nexus of serious alcohol and cocaine dependence. The male hustlers engaged in a variety of income-generating crimes to support an expensive illicit drug habit (on average, earning $732 per month illegally and spending $409 per week on drugs). Among the female sex workers, the predominant income-generating activity was prostitution (on average, earning $1,645 per month illegally and spending $440 per week on drugs). In contrast, the female down-and-outs were involved in a variety of crimes that resulted in considerably less illegal earnings and expenditures (on average, earning $86 per month illegally and spending $168 per week on drugs). Thus, although these three groups demonstrated similar patterns of co-occurring alcohol and cocaine dependence, their criminal income-generating activities were highly variable and gender specific.

These results are consistent with research that finds that the crime repertoires of substance abusers often follow gendered trajectories (Brady & Randall, 1999; Cross, Johnson, Davis, & Liberty, 2001). The results also highlight the distinct socioeconomic disadvantage experienced by the female down-and-outs, which is illustrative of the "feminization of poverty" that often occurs within the context of drugs and crime (Moe, 2006). This latter point highlights the social and economic marginalization that is often characteristic of drug-involved women who enter the criminal justice system (Bloom, Owen, & Covington, 2004). Gender-responsive programming would need to address the disconnections from traditional work opportunities and viable sources of support that many criminally involved women experience.

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In summary, the major implication of this research is that responsive criminal justice programming and services can be matched to the distinct drug and crime profiles of offenders to reduce drug use and recidivism. To our knowledge, this study was the first to explore drug-crime typologies using a fully disaggregated and gendered approach, but it is not without its limitations. First, the study is based on self-report data, as we did not have access **[p. v2-227 ↓]** to the urinalysis results that were part of the original data collection. However, the data were collected via CAPI technology, which has been shown to improve data quality by flagging data entry errors and reducing respondent burden (Baker, 1992). Second, our typology may not be generalizable because our female subsample was relatively small and the male subsample was limited to misdemeanants and low-level felons. Finally, we focused on a single responsivity dimension – gender. Future research in this area should use validated measures whenever possible, utilize larger and more representative samples from different jurisdictions, and investigate other responsivity dimensions such as age and race/ethnicity.

Notes

1. Allegheny and Philadelphia counties are the two largest in the state by population, representing approximately 70% of total arrests. Westmoreland county is a large suburban county adjacent to Allegheny county.

2. Specifically, the 13 response options to this question were collapsed into six categories as follows: (1) full-time work ("working full-time"), (2) part-time work ("working part-time," "working odd jobs"), (3) welfare/supplemental security income ("welfare, SSI"), (4) other legal ("other legal"), (5) unemployed ("unemployed," "mainly in school," "in jail or prison," "housewife"), and (6) illegal activities ("prostitute," "dealing/drug sales," "other illegal").

3. This is a typical sample size for applications of cluster analysis. Indeed, Kettenring (2006) found that most published cluster analysis studies are of moderate sample sizes and notes, further, that "big *n"* problems are more pressing for cluster analysis applications.

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