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Typologies of substance use and illegal behaviors: A comparison of emerging adults with histories of foster care and the general population

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Abstract

This study used latent class analysis (LCA) to explore whether patterns of substance use and illegal behaviors among emerging adults, 18 to 28 years old, differ depending on whether they have a prior history in foster care. The study sample, consisting of 316 respondents who had previously been in foster care and 14,301 respondents without a foster care history, was drawn from the third wave of the National Longitudinal Study of Adolescent Health. A multiple-group LCA compared former foster youth to their peers in the general population. The following four classes were identified: illegal behaviors, substance use, illegal behaviors with problematic substance use and normative behaviors. Most of the differences between the groups were not statistically significant. However, within the illegal behavior class former foster youth were less likely to have bought, sold, or held stolen goods; injured someone in a fight so that she or he needed medical attention; to have sold drugs; and to have been drunk at school or work. Additionally, in the illegal behaviors with problematic substance use class emerging adults in the general population were more likely to have used cocaine. Within the normative behaviors class, former foster youth were more likely to be current smokers, and to have injured someone in a fight so that he or she required medical attention. Within the substance use class, emerging adults from the general population were more likely to have taken place in a fight where one group fought another. Additional statistically significant, but very small differences were also identified.

Keywords

Latent class analysis; Foster care; Emerging adult; Substance use; Illegal behavior

1. Introduction

Emerging adults (18 to 28 years old) with histories in foster care experience disproportionate rates of substance abuse and criminal involvement. More specifically, emerging adults with

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histories in foster care have significantly higher lifetime rates of alcohol and drug dependence than the general population. For example, White, O'Brien, White, Pecora, and Phillips (2008) found that the rate of drug dependence was more than four times higher for emerging adults who were in foster care compared to the general population. In addition, several studies have found that approximately a third of former foster care youth have been arrested after leaving foster care (Barth, 1990; Courtney et al., 2005; Havalchak, White, & O'Brien, 2008). Using data from the Midwest Study (n=728), Cusick, Havlicek, and Courtney (2012) found that among young adults transitioning out of foster care, arrests were evenly distributed among violent, property and drug offenses.

Beyond arrests, former foster youth are over-represented among prison populations. A 2008 survey of California prisoners found that 14% had been in foster care (McCarthy & Gladstone, 2011). Data from the 1997 Survey of Inmates in Adult State and Federal Correctional Facilities indicate that of the prison population under 30 years old, approximately 20% had been in foster care (Bureau of Justice Statistics, 1997; Doyle, 2008). These numbers are especially disconcerting considering that less than 1% of youth in the United States are in foster care (Howden & Meyer, 2011; U.S. Department of Health & Human Services, 2011). The incidence of illegal behaviors is probably much higher than what is indicated by either prison populations or arrest rates because these numbers only represent the individuals who were caught. Even though the substance abuse, arrest and incarceration rates of former foster youth are higher than in the general population, the co-occurrence of substance use and illegal behaviors remains largely unexamined.

Foster care exists to provide safe substitute care after a child protection agency determines that parents either have maltreated their children or have become unable to care for their children. Most reports of child abuse or maltreatment do not result in children being placed in foster care. For example, during the 2010 fiscal year approximately 3.3 million referrals involving 5.9 million children were made to child protection agencies across the United States. Of these referrals, approximately 2 million (60.7%) were screened for an investigation, and of those investigated, only 436,321 were substantiated as child maltreatment. As a result of referrals substantiated as maltreatment 254,375 children entered the foster care system during 2010 fiscal year (U.S. Department of Health & Human Services, 2011; U.S. Department of Health and Human Services & Administration on Children, 2011).

Of the 408,425 children in foster care on September 30, 2010, slightly over half (52%) were male and the average age of these children was 9.4 years old. The mean length of stay of children in foster care at that time was 25.3 months, and the median length of stay was 14 months. The largest group of children in foster care (48%, n=194,900) was placed in non-relative foster homes. Other placements included: relative care (26%, n=103,943), institutions (9%, n=36,607), group homes (6%, n=25,066), trail home visits (5%, n=21,340), pre-adoptive homes (4%, n=14,886), and supervised independent living (1% n=4050). Additionally, 2% (n=6563) had run away from their placement. Just over half of children exiting foster care in fiscal year 2010 (51%, n=128,913) were reunified with their parents or principal caretakers. Eleven percent of children who exited foster care in 2010 were

emancipated either as minors or because they aged out of the foster care system between ages 18 and 21 depending on state policy (Child Welfare Information Gateway, 2012).

Even though the majority of maltreated children do not enter foster care, and the majority of those that do enter foster care reunify with their parents, the costs associated with addressing child maltreatment are immense. Several sources indicate that the annual cost of providing child welfare services exceeds $20 billion (Children's Defense Fund, 2010; Goldhaber-Fiebert, Snowden, Wulczyn, Landsverk, & Horwitz, 2011; Scarcella, Bess, Zielewski, & Geen, 2006). Using 2010 dollars, Fang, Brown, Florence, and Mercy (2012) estimate that the average lifetime cost to the government for each victim of nonfatal child maltreatment is $210,012.

In addition to the economic costs, societal costs associated with foster care also include former foster youths' elevated risk of problematic outcomes, such as illegal behaviors, and substance abuse during emerging adulthood (Courtney et al., 2005; Cusick & Courtney, 2007). In order to understand what makes foster youth vulnerable during the transition to adulthood it is imperative to understand what the developmental process between 18 and 28 years old entails.

Arnett (2000a,b, 2007a,b), and Arnett and Tanner (2006) popularized the term "emerging adulthood" to describe the developmental stage that follows adolescence and precedes adulthood. Emerging adulthood typically lasts from 18 to 25 year old, but can extend into the late twenties. Dramatic cultural changes over the past 60 years have been the impetus for recognizing emerging adulthood as a distinct developmental stage in industrialized countries. In particular, more emerging adults are attending college, delaying marriage and waiting to have children. Without the responsibilities that accompany being married or having children, emerging adults undergo many changes and explore many possibilities regarding their futures and their identities. As part of these explorations, emerging adults often engage in risky behaviors, including illegal behaviors and substance use. According to the 2010 National Survey on Drug Use and Health, emerging adults experience more alcohol-related problems and abuse more illicit drugs (e.g., marijuana, cocaine, heroin) than any other age group (Substance Abuse and Mental Health Services Administration [SAMHSA], 2011). One reason risk behaviors are prevalent during emerging adulthood is that this developmental period lacks the parental monitoring that accompanied adolescence (Arnett, 2000a, 2005). Simultaneously, emerging adults report feeling that they are not yet adults, but also no longer feel like teenagers (Arnett, 2000a, 2001). Despite the risk behaviors and uncertainty that emerging adults experience, this developmental period also produces positive outcomes. For example, many emerging adults experience reductions in depression and increases in self-esteem (Galambos, Barker, & Krahn, 2006).

Beyond the social changes that are indicative of emerging adulthood biological changes also occur. Studies using brain mapping have found that the prefrontal cortex continues developing through late adolescence or early adulthood. The prefrontal cortex facilitates processes such as forming judgments, having foresight, and decision-making (Federle & Skendelas, 2009).

Given all of the negative outcomes associated with former foster youth during emerging adulthood it is not surprising that child welfare policymakers and scholars recognize that foster youth need additional support during early adulthood. Accordingly, during the past 25 years the Social Security Act has been amended three times to address the needs of youth who are "*aging out*" of foster care, or leaving care upon reaching the age of majority, most often 18 (Courtney, 2010). The most recent amendment, the Fostering Connections to Success and Increasing Adoptions Act of 2008, provides federal funding to states that expand foster care to cover youth until they are 21 (Public Law No: 110–351). It is noteworthy that many of these policies have been isolated to youth transitioning out of foster care and have not considered the outcomes of youth who have at one time been in foster care despite evidence that a history in foster care functions as a risk factor for many individuals. For example, Pecora, White, Jackson, and Wiggins (2009) explain that when youth enter foster care they experience the loss of their parents, their extended family and the familiar surroundings of their communities for the duration of their time in foster care. In addition, foster care may compound any emotional or behavioral problems a child may have because foster parents or siblings may reject the child, or the child may have felt stigmatized by being in care (Pecora et al., 2009). In turn, a history of having been in foster care at one time may have long-term effects on behavioral outcomes including substance use and illegal behaviors.

2. Literature review

The rationale for focusing on former foster youth rather than youth who experienced childhood maltreatment is that the effect of foster care can exceed the effect of being maltreated alone. Doyle (2008) matched Illinois child abuse investigation data from July 1, 1990 to June 30, 2003 with administrative data that recorded all arrests in Illinois between 2000 and 2005. The exclusionary criteria for this study were child sexual abuse cases, cases from Cook County, cases that were not included in the Public Assistance Database, and youth had to be at least 18 in 2005, a sample that included of 23,254 individuals. Doyle's analysis focused on marginal cases where-in workers could disagree about whether or not to remove a child and place him or her in foster care. Doyle found that for youth who were on the margin of being taken into protective custody, placing children in foster care was associated with a three times greater risk of arrest, conviction and imprisonment compared to similar children who remained in the care of their parents. This suggests that placement in foster care has negative effects, above and beyond the effect of experiencing child maltreatment.

Spending time in foster care may affect emerging adults' patterns of illegal behaviors and substance use for the following reasons: First, emerging adults who experienced foster care also endured the traumatic experience of abuse, neglect or parental incapacity that was the impetus for being taken into protective custody. Second, the very nature of foster care means that youth have been removed from their parent or caregiver. Third, most children in foster care experience multiple placements (Davis, 2009).

Another explanation for the association between illegal behavior as an adult and having spent time in foster care is the "cycle of violence" hypothesis. This hypothesis posits that

experiencing childhood physical abuse elevates the risk of adult violent behavior. Widom's (1989) seminal piece entitled "The Cycle of Violence" matched 908 adults with a history of substantiated child abuse reports (ages 16 to 33) with 667 individuals from the general population to test whether differential rates of criminal behavior existed. The study participants resided in the Midwest and were similar with regard to race, sex, and socioeconomic status. Criminal offenses were measured using federal, state and local adult arrest records; while cases of substantiated maltreatment were identified using court records from between 1967 and 1971. Widom found that 28.6% of those with substantiated child maltreatment cases had adult criminal records compared to 21.1% of the general population (χ^2=11.38, p<0.001). She also found that the relationship between substantiated child maltreatment and adult offending extended beyond physical abuse to include neglect. In a subsequent study Widom and Maxfield (2001) reexamined the criminal records of their original sample in 1994 (six years after the initial data collection) to look for additional arrests. In this second analysis, Windom and Maxfield found that being placed in foster care was not associated with greater or lesser risk of arrest, compared to adults with a history of childhood maltreatment but no history of foster care. Although both phases of this study make important contributions, relying on arrest rates to determine criminal involvement only captures those who were caught, rather than those who engaged in illegal behaviors. In addition, a great deal of time has passed since these studies began, and drastic changes have taken place in child welfare policies and practices. Lastly, Widom and colleagues' work does not examine illegal behaviors and substance use patterns.

Cusick, Courtney, Havlicek, and Hess (2011) conducted latent class analysis on survey responses from 438 participants in the Midwest Study who completed interviews in Waves I, II and III, and had no missing values on the criminal behavior items. The Midwest Study is a longitudinal panel study that follows foster youth from the ages of 17 through 21 years old. All of the participants resided in Illinois, Iowa, or Wisconsin in out of home care at age 17 when the study began. For each wave one binary variable was constructed to indicate whether respondents had engaged in one or more non-violent offenses, and a second binary variable was constructed to indicate one or more violent offenses. Cusick and colleagues found the following five classes: rare or non-offenders (34%), adolescent offenders (28%), desisting offenders (19%), chronic offenders (11%) and chronic non-violent offenders (8%). While it is useful to have a sense of patterns of illegal behaviors over time, this analysis did not provide a full picture of emerging adults' specific behavioral patterns. It also lacked any information about substance use or abuse.

Vaughn, Shook, and McMillen (2008) analyzed survey responses from 325 emerging adults (19 years old) who were referred to the study by the Missouri Division of Family Services (MDFS). Latent class analysis was used to form typologies of illegal and substance use behaviors among youth in foster care. To assess involvement in illegal activities emerging adults were asked dichotomous questions about whether they had been arrested, sold drugs, illegally made money, carried a gun, assaulted another person, sold stolen property, or prostituted themselves. Vaughn et al. (2008) found the following four distinct patterns of illegal behaviors: low-risk, moderate-risk, high-risk externalizing psychopathology, and high-risk drug culture groups. Although this study is informative about the patterns of behaviors, it was limited to 19 year old youth in Missouri who were in the foster care

system, limiting its generalizability and precluding comparisons to emerging adults who had not been in the foster care system. In addition, the measure “illegally made money” is ambiguous and may have been more difficult for a youth to respond to than a question that targets specific illegal behaviors, such as selling stolen property or selling drugs.

It is important to note that for many youth foster care is an essential intervention that ensures their safety and well-being. Although much of the literature raises concerns about the child welfare system generally and foster care specifically, there are scholars who emphasize the important role of foster care in preventing delinquency. As an example, Jonson-Reid (2004) used results from existing literature to argue that foster care serves to prevent future maltreatment, to change children’s environments and to leverage resources and systems that serve youth. Likewise, Hines, Merdinger, and Wyatt (2005) conducted in-depth qualitative interviews of 14 (4 male, 10 female) former foster youth who were attending a 4-year university. Hines and colleagues found that entering foster care was life-changing in very positive ways. Because of their placements in foster care, youth formed new friendships, found positive adult role models and they were exposed to better educational opportunities. While the generalizability of Hines and colleagues’ findings are limited, they do show that for at least some youth, foster care is a positive experience above and beyond its role in keeping them safe physically.

2.1. Purpose of study

The purpose of the study is to explore patterns of property offenses, violent offenses, and substance use among emerging adults between ages 18 and 28, and to test whether having a history of being in foster care affects these patterns. To date no study has compared patterns of illegal and substance use behaviors in emerging adults with and without a history of foster care. Moreover, the bulk of literature regarding illegal behavior, substance use and foster care focuses on youth who are currently in care (c.f. Jonson-Reid & Barth, 2000; Ryan & Testa, 2005; Traube, James, Zhang, & Landsverk, 2012).

This study’s research questions are:

1. What patterns of substance use and delinquency exist among young adults who have histories in foster care?
2. Do these patterns differ from young adults who are in the general population?

Based on the existing literature we expect to find at least four distinct patterns of illegal and substance use behaviors. Thus, we have the following three hypotheses:

Hypothesis 1. At least four distinguishable patterns (i.e. classes) of illegal and substance use behavior will exist among emerging adults.

Hypothesis 2. The class structure (i.e. patterns) of illegal and substance abuse behavior will not differ between emerging adults with a history of foster care and those in the general population.

Hypothesis 3. Emerging adults with a history of foster care will have a higher probability than their general population peers of being placed in a class associated with higher rates of illegal and substance use behaviors.

2.1.1. Methods

2.1.1.1. Study design and sample: The study utilizes existing data on 18 to 28 year old respondents from Wave III (2002) of the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a nationally representative sample of adolescents that was designed to ascertain adolescents' health status and behaviors (Udry, 1998). Add Health used a complex sampling design with unequal probability of selection in order to yield a sample that was both representative of the United States with regards to region, urbanacity, ethnic/racial composition, school size and school type and had sufficient numbers of respondents for analysis of specific population groups. All analyses presented account for the complex sampling design using the supplied wave 3 cross-sectional weights, as well as strata and primary sampling unit variables.

Although Wave III of Add Health surveyed 15,197 adults (ages 18–28) between August 2001 and April 2002 (Harris et al., 2009), cases without a wave 3 cross-sectional weight were excluded from the analysis, leaving 14,322 participants. Respondents were also excluded if they did not respond to the question that asked whether they had been in foster care (n=15), and if they had missing values on all of the substance use and illegal behavior questions used in this study (n=6). Of the 14,301 respondents used in this analysis, 316 youth reported a foster care history and 13,985 youth did not.

2.2. Measures

2.2.1. Illegal behaviors—This study includes a range of illegal and substance use behaviors. Four survey questions assess the extent that respondents engaged in the following property-related offenses over the past 12 months: (1) deliberately damaged property that didn't belong to you; stole something worth less than $50; (3) *stole something worth over $50*; and (4) *bought, sold, or held stolen property*. Two questions explore the extent to which respondents engaged in violent behaviors over the past 12 months: (1) how often did you take part in a physical fight where a group of your friends was against another group; and (2) how often did you hurt someone badly enough that he or she needed medical treatment by a doctor or nurse after a fight? Additionally, one question asked respondents how often they had *sold marijuana or other drugs*. All items were dichotomized in the current study due to small cell sizes in the ordinal versions. A value of 1 indicates the respondent reported engaging in a given behavior at least once in the past 12 months, while a 0 indicates the respondent reported not engaging in a given behavior in the same time period.

2.2.1.1. Substance use: Substance use related questions asked whether respondents (1) *had regularly smoked cigarettes in the past month*, and whether they had done the following in the past 12 months (2) *drank alcohol*, (3) *used marijuana*, and (4) *used cocaine*. While the recall period is different for the available smoking item, 98% of respondents who reported ever smoking regularly reported smoking in the past month. Because alcohol consumption is relatively normative in the U.S. and does not necessarily indicate problematic behavior,

respondents were asked five questions to capture the extent to which alcohol consumption has been problematic. Respondents were asked how often in the previous 12 months they had (1) *been drunk at school or work*, (2) *had problems at school or work because of alcohol*, (3) *had problems with friends because of alcohol*, and (4) *had problems dating because of alcohol*. Due to relatively small cell sizes for some categories, these variables were dichotomized so that 0 indicates never in the past 12 months, and 1 indicates one or more times in the past 12 months. Additionally, respondents were asked whether they had (5) *driven while drunk* since June 1995 (about six years prior to data collection), which was scored so that 1 indicates that the respondent reported driving drunk, and 0 indicates that they did not.

2.3. Statistical analysis

This study used a two-group latent class analysis (LCA) to compare patterns of illegal and substance use behaviors among emerging adults with and without a history in foster care. LCA is a person-centered analytic approach that generates empirically based typologies by identifying patterns (i.e. classes) of responses within the data—generalizing information to classes of persons described by sets of variables (Lanza, Flaherty, & Collins, 2003). Traditional generalized linear model (GLM) approaches obscure these patterns (von Eye & Bergman, 2003). More specifically, LCA identifies patterns of responses, known as classes, which are defined by item probabilities, that is, the estimated probability that an individual in a given class will have engaged in a given behavior. In a fully unconstrained model, each item (i.e. behavior) has a potentially different probability of being endorsed in each class. In a fully unconstrained two-group model (e.g. foster care vs. general population), each item has a potentially different probability in each class and each group.

To compare groups we began by running the models separately by group (i.e., those with a foster care history and the general population) to assess whether the same number of classes provided reasonable fit in both groups (Collins & Lanza, 2010). After deciding that a four-class model provided reasonable fit, we compared the item probabilities in the foster care and general population groups and found that the classes in each group were substantively similar. We then estimated a multiple-group model to allow for comparisons across groups, including testing measurement invariance. As a first step to establishing measurement invariance, we compared a model that allowed item probabilities to vary freely across groups and classes, to a model in which item probabilities were freely estimated across classes, but constrained to equality across the foster care and general population groups (Collins & Lanza, 2010). This allowed us to test for significant difference in fit when the item probabilities are assumed to be the same across groups, versus when they are allowed to differ. After establishing that the model in which item probabilities were allowed to vary across groups fit significantly better than the model with all item probabilities fixed across groups, we explored the possibility of partial measurement invariance by testing whether individual coefficients could be constrained to equality without a significant decline model fit (Collins & Lanza, 2010). We began with model in which all of the item probabilities were unconstrained across groups and classes, following this model, Wald tests were used to test whether item probabilities differed significantly between emerging adults with a history of foster care and emerging adults in the general population. Constraints were added one at a

time, starting with the item with the smallest test statistic. After each constraint was added, the model was then rerun and the process repeated until all of the remaining free coefficients were statistically significant at the 0.05 level. An alternative approach would have been to start with a model in which all item probabilities were constrained to equality, and used modification indices along with other measures of model fit to identify items for which the cross-group constraints significantly harmed model fit. However, the software used for this analysis (Mplus 7.0) does not provide modification indices for multiple-group latent class models, so we were unable to implement this approach.

All models presented here were estimated using multiple random starts because latent class models commonly have local maxima, which can result in incorrect solutions when single random or non-random starts are used. Because larger numbers of random starts quickly become computationally intensive, the Wald tests were typically run using 200 initial stage random starts and 50 final stage optimizations, with additional random starts if the model failed to replicate the best log-likelihood. The final model presented in this paper was run using 2000 initial stage random starts and 500 final stage optimizations, the results of this model are consistent with previous models using fewer random starts. The residuals from the final model suggest a departure from the local independence assumption. A lack of local independence is sometimes indicative of an insufficient number of classes, however, in this case, residuals from models with additional classes also failed to meet the local independence assumption.

2.4. Missing data

As discussed above, twenty-one cases with valid Wave III weights were dropped because respondents did not indicate whether they had a foster care history, or the all of the substance use and illegal behavior variables were missing. For the rest of the cases, when data were missing from the illegal behavior or substance use variables used to form class structure Mplus employs full information maximum likelihood estimation (FIML) to estimate models. FIML assumes that the data are missing at random, that is, that the non-missing values in the model are able to predict the probability of missingness (Muthén & Asparouhov, 2003).

3. Results

Table 1 presents the prevalence of engaging in each illegal and substance use behavior in the year prior to the survey, with two exceptions: the regular smoking question asks about smoking in the month prior to the interview, and the drunk driving item, which was asked about approximately five years prior to data collection. The most common behavior for both emerging adults with a history of foster care and those in the general population was drinking alcohol—this is not surprising since drinking alcohol is probably the most normative of the behaviors. The least common behavior for both groups is stealing something worth more than $50.

Based on the findings of Nylund, Asparouhov, and Muthén (2007) we used the Bayesian information criterion (BIC; Schwarz, 1978), and the Lo–Mendell–Rubin (LMR; Lo, Mendell, & Rubin, 2001) likelihood ratio test as our primary measures of fit, along with

interpretability of the class solution to determine the number of classes. While the parametric bootstrapped likelihood ratio test has been found to perform better than the LMR test (Nylund et al., 2007), the former is unavailable for mixture models with complex sampling designs in Mplus version 7.0. Table 2 provides information on model fit for one- to seven-class solutions for emerging adults in the general population and those with a history of foster care. Reading left to right the number of classes are provided in the first column, followed by the log-likelihood, BIC, sample size adjusted BIC (SSA BIC), the test statistic and p-values for the LMR test, and finally entropy. Results for the foster care group are labeled FC, while results for the general population are labeled GP.

For the log-likelihood and the Bayesian information criterion (BIC), values closer to zero indicate better model fit. Using the BIC the lowest value is obtained for a four-class solution in the foster care group, while a seven-class solution produces the lowest BIC in the general population group. The LMR likelihood ratio test evaluates the null hypothesis that the current model does not fit better than a model with one fewer class. In the foster care group, the LMR test fails to reject the null hypothesis for two to seven classes. For the general population group, adding additional classes significantly improves model fit of the model for two- to four-class solutions, and is non-significant for solutions involving five to seven classes. The entropy score for each model is also shown in Table 2. Entropy is not a method of comparing solutions with differing numbers of classes; instead it provides a measure of how cleanly cases can be classified based on the model—entropy is bounded by 0 and 1, with higher values indicating more certainty in classification. In both groups (with and without a history of foster care) a seven-class model produced the highest entropy. The fit indices, LMR tests, and entropy did not suggest a consistent number of classes, that is, there was no consensus as to the “best” number of classes across measures of fit. Due to this lack of consensus among measures of model fit (which is not uncommon in latent class models) the number of classes was selected based on findings from previous research, as well as the interpretability of the classes (i.e. the patterns item probabilities). In this case we selected a four-class solution.

Examination of the item probabilities suggests that four classes identified for emerging adults with a history of foster were similar to the four classes identified in the general population: illegal behaviors with problematic substance use (IBPSU), normative, illegal behaviors, and substance use. The first two rows of Table 3 show the log-likelihood, number of estimated parameters, and scaling correction factor (discussed below) for a model in which all item probabilities are constrained across the foster care and general population groups (Constrained), followed by a model in which all item probabilities are allowed to vary across the same groups (Unconstrained). The difference in the fit of these two models provides a test of overall invariance of the item probabilities. A standard likelihood ratio test is not appropriate in this context because a robust estimator (MLR) was used to estimate these models, therefore an adjusted test statistic was calculated using the log-likelihoods and the scaling correction factors listed in Table 3 (MPLUS, n.d.). The unconstrained model fits significantly better than the constrained model (adj χ^2=137.54, df=64, p≤0.001), suggesting that at least some of the item probabilities differ between emerging adults with a history of foster care and their peers in the general population.

Although the omnibus test of equality of the item probabilities across groups rejected the null hypothesis of invariance across the item probabilities, because the patterns of item probabilities in the unconstrained model suggested a similar class structure across groups, we tested for partial measurement by examining individual item probabilities across groups. We began with a model with no cross group constraints, and tested for significant differences between the item probabilities across groups. Constraints were added one at a time, until the only unconstrained item probabilities were those that differed significantly across groups. The log-likelihood, number of estimated parameters, and scaling adjustment factor for the partially invariant model are shown in the final row of Table 3. The final partially invariant model fits significantly better than the model in which all item probabilities are fixed across groups (adj χ^2=104.9, df=16, p≤0.001), but does not fit significantly worse than the model in which all item probabilities are allowed to vary between groups (adj χ^2=63.61, df=48, p≤0.065).

Table 4 presents the results of the partially invariant latent class model. The header of Table 4 gives the class probabilities, that is, the estimated percent of cases that fall into each class in the foster care and general population groups. The body of Table 4 shows the item probabilities, that is, the probability that an individual in a given class will report having engaged in a given behavior at least once during the reference period for that item. The pairs of item probabilities displayed in bold are those that were allowed to vary across groups, while the remaining item probabilities were constrained to equality in the foster care and general population groups. Profile plots showing the item probabilities for the foster care and general population groups by class are shown in Fig. 1.

The largest class for both emerging adults in the general population and those with a history of foster care was the normative class (with an estimated 49% and 53% of the sample respectively). Overall, individuals in the normative class have a low probability of engaging in property or violent crime, selling or using drugs, and problematic drinking behaviors (see Fig. 1, Panel B). In Table 4, the item probabilities were separately estimated for 6 of the 16 items used to form the classes. The item probabilities for these six items were not constrained across the foster care and general population groups because the statistically significant Wald tests suggested that constraining these parameters to equality would significantly harm the fit of the overall model. Of these six varying item probabilities, four are for items with an estimated probability of 0 in one group, and an estimated probability is less than 0.01 in the other group, these items are: buying, selling, or holding stolen goods; selling drugs; problems with friends due to alcohol consumption; and using cocaine. While the differences in these coefficients may be statistically significant, it seems unlikely that they represent substantively important differences in the two populations. The remaining two items are having injured someone in a fight badly enough that he or she required the care of a doctor or a nurse, and currently being a regular smoker. The item probability for having injured someone in a fight is three times as high for emerging adults with a history of foster care as for those without (0.084 versus 0.027 respectively). Similarly the estimated item probability for former foster youth is almost twice as high as for their peers in the general population (0.37 versus 0.19, respectively). These differences suggest that while overall, the meaning of the “normative” class is similar across the FC and GP groups, there may be some differences in the class structure.

The next most common class among emerging adults with and without a history of foster care was the substance use class, which includes an estimated 20% of youth with a history of foster care and 34% of the general population. As can be seen in Panel D of Fig. 1, the substance use class is characterized by relatively high item probabilities for the use of alcohol, cigarettes, and marijuana; moderate probabilities for problematic behaviors related to consuming alcohol, such as problems at school or work due to drinking; and low probabilities for items related to selling drugs, property crime, and fighting.Table 4 shows that in the final model, 4 of the 16 item probabilities used to form the class were allowed to vary across the foster care and general population groups because the results of the Wald tests suggested that doing so improved model fit. Of these four item probabilities, two are for items with an estimated probability of 0 in one group, and an estimated probability of less than 0.01 in the other group, specifically: stealing something worth more than $50; and buying, selling, or holding stolen goods. As before, while these coefficients were allowed to vary because they are different statistically, we do not think they reflect substantively important differences in the class structure for emerging adults with a history of foster care versus those in the general population. The remaining two items are having injured someone in a fight so that he or she required medical treatment, and having participated in a fight between two groups of people. In both cases, the estimated item probability for emerging adults with a history of foster care is 0, while the estimated item probabilities for injuring someone in a fight and participating in a group fight are 0.02 and 0.05 respectively. Overall, while there are some differences in the item probabilities across groups that may be large enough to substantially reduce model fit, the structure of the substance use class is similar for most items, and the differences that are observed are relatively small in magnitude.

The illegal behavior class contains an estimated 19% of emerging adults with histories of foster care and 7.9% of those in the general population. The illegal behavior class is characterized by relatively high item probabilities for the property crime, selling drugs, and fighting; as well as moderate to high levels of drinking, marijuana use, and cocaine use (see Fig. 1 Panel C). Probabilities for five of the 16 items used to form the classes were allowed to vary between emerging adults with and without histories in foster care in order to improve model fit. Among emerging adults with a history of foster care, the estimated probability of having problems in dating due to alcohol use was lower than for the general population group but the difference is small. The item probability for having been drunk at work or school is lower for the foster care group than in the general population by a somewhat wider margin. Larger differences in item probabilities between groups were observed for buying, selling, or holding stolen goods; injuring someone in a fight; and selling drugs. For selling drugs, the item probability for the general population is four times larger than that for the foster care group. For buying, selling, or holding stolen goods, and injuring someone in a fight the estimated item probabilities for the general population are approximately ten times those of the foster care group. The substantially lower item probabilities on these three illegal behaviors in the foster care group suggest that the structure of what we have termed the illegal behavior class may have a different substantive meaning for emerging adults with and without histories of foster care.

Finally, the illegal behavior with problematic substance use (IBPSU) class has high item probabilities across a variety of illegal behaviors, including property crime, fighting, and

selling drugs, as well as high rates of substance use and problematic behaviors related to consuming alcohol. The profile plot for the illegal behavior with problematic substance use class is shown in Panel A of Fig. 1. An estimated 7.4% of emerging adults with a history of foster care, along with 9.6% of their general population peers fall in to the illegal behavior with problematic substance use class. There was only one significant difference in item probabilities between emerging adults with and without a history of foster care; the item probability for cocaine use in the general population group was 0.39, compared to 0.07 in the foster care group.

Across all four classes, one quarter (16) of the 64 pairs of item probabilities were allowed to vary between emerging adults with and without a history of foster care because the results of Wald tests suggested that constraining the probabilities to equality would result in significantly worse model fit. Despite the seemingly large number of differences across groups, with the exception of the illegal behaviors class and to a lesser extent the normative class, the class structure does appear to be substantively similar. Despite this overall similarity, due to the differences in the structure of a subset of classes it does not necessarily make sense to test whether differences in the proportion of individuals in each class differ between emerging adults with a history of foster care and those in the general population.

4. Discussion

This study examined whether emerging adults who had histories in foster care had different patterns of illegal and substance use behaviors than emerging adults in the general population. Although other studies have used latent class analysis to explore patterns of substance use or illegal behaviors no prior study has compared patterns of illegal behaviors and substance use among individuals with and without a history in foster care. In addition, no prior study has explored how these behaviors co-occur using a national dataset.

While we hypothesized that we would have four or more classes, the fit statistics did not clearly indicate the “best” appropriate number of classes. Thus, we modeled four classes of illegal and substance use behaviors following the results of Vaughn et al.’s (2008) Missouri study. Similar to Vaughn et al. we found that the largest class for both groups included few risk behaviors. However, Vaughn et al.’s class with the fewest illegal and substance use behaviors accounted for 69% of the sample (all of whom had been in foster care), while in our study 49% of the general population and 53% of those with a history in foster care were in this class. One explanation for this disparity is that the behaviors used to form the classes in Vaughn et al.’s study were different from those used in our study. As an example, Vaughn et al. formed classes using severe measures such as “mugged or threatened to mug” and ambiguous measures such as “illegally made money.” Conversely, our violent measures were limited to more common behaviors such as group fights or injuring someone so that he or she required medical care after a fight. Additionally, we included specific measures that provided a fine grain understanding of property offenses such as property damage, stealing more than $50, stealing less than $50, and buying, selling or holding stolen property.

Counter to our hypothesis that the patterns of illegal and substance use behaviors would be similar between emerging adults with a history of foster care and those in the general

population, we found some differences in the patterns of item probabilities between the two groups, at least some of which are large enough to be substantively important. Specifically, in the class we termed illegal behaviors we found that the general population had higher item probabilities for buying, selling, and holding stolen goods; injuring someone in a fight badly enough that they required medical care; and having sold drugs. In the largest class, which we termed the normative class, the partially invariant model included higher item probabilities for current smoking and injuring someone in a fight badly enough that they required medical care among emerging adults with a history of foster care. Our final model also included a higher item probability for cocaine use among the general population in the illegal behavior with problematic substance use class. These differences could reflect that emerging adults from the general population have greater difficulties adjusting to the lack of parental monitoring that occurs during emerging adulthood than former foster youth with otherwise similar patterns of behavior.

This study has several strengths. First, this study is the first to simultaneously explore patterns of illegal and substance use behaviors among emerging adults who have histories in foster care. Second, we compared patterns of illegal behaviors and substance among emerging adults with and without histories in foster care, allowing us to show that the patterns are largely similar. Third, we used measures that were clearly stated and captured a range of behaviors related to illegal behaviors and substance use.

Despite the study's strengths, there are also some limitations that future studies should address. One limitation of this study was the lack of additional variables related to foster care and substance use. Regarding foster care, it would have been helpful to have variables that describe the reason for foster care placement, the age at the time of removal from the home, length of time in foster care, and the outcome of the case (e.g., reunification with parents, adoption, or emancipation from care). Regarding substance use, it would have been helpful to have questions to assess alcohol and drug dependency. In addition, the illegal behaviors and substance use data were based on self-reports that are not corroborated through another source. Another limitation is that the current study analyzed data from a single time point, providing a temporally limited view of behavior that may change over time. Finally, despite the overall large sample size, the foster care group was somewhat small given the complexity of the model; this is expected given that the proportion of emerging adults with a history of foster care is quite low.

Even after accounting for our study's limitations, our results have important policy implications. Specifically, given the similar rates of illegal behaviors by both groups, policies are needed to provide resources to examine what characteristics distinguish former foster youth who are incarcerated as a means to understand the incarceration disparities.

This study has important practice and policy implications. First, professionals can use the findings from this study to better understand the similarities and differences of patterns of illegal and substance use among emerging adults. In particular, professionals should assess for substance abuse among emerging adults who have engaged in illegal behavior, and for illegal behaviors among emerging adults who abuse substances. Second, professionals should be aware that many foster youth enter care early and leave quickly, thus the

implications of foster care may not be as deleterious for individuals who entered care when they were younger. Professionals should also be aware that many former foster youth may develop better adaptive skills for independence that allow them to adjust better to reduced parental monitoring than their counterparts who have not been in foster care. In addition, when policy makers consider the latent classes policies that are more efficient and effective addressing illegal and substance use behaviors among emerging adults can be developed.

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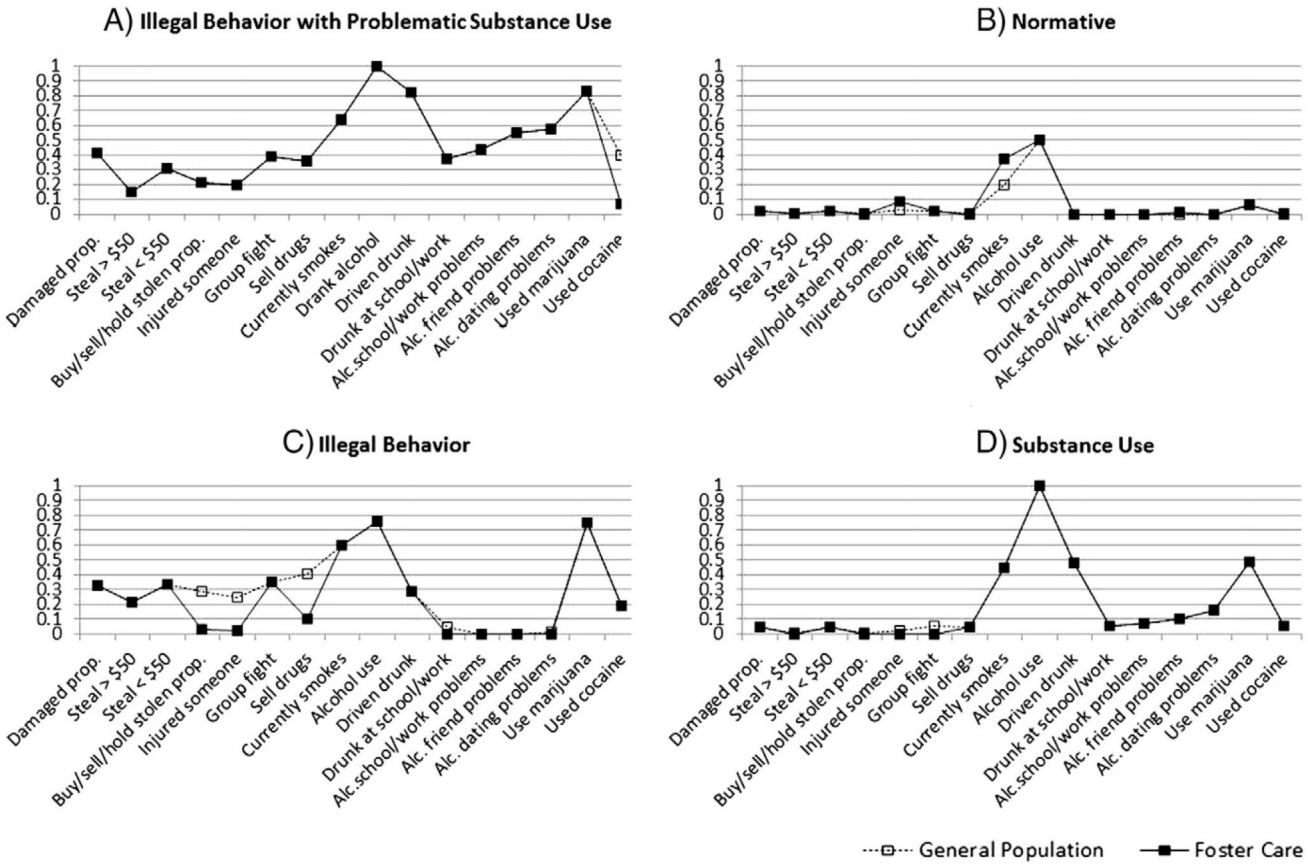

Fig. 1.

Profile plots of four latent classes: Foster care and general population.

Table 1

Number and percentage[a] of respondents indicating engagement in illegal and substance use behaviors in the past year.

	G.P.		F.C.	
	n	%	n	%
Damage property	1202	8.7%	30	9.6%
Steal >$50	460	3.3%	9	2.9%
Steal<$50	1021	7.3%	26	8.3%
Buy/sell/hold stolen property	618	4.5%	14	4.5%
Medical care needed after fight	778	5.7%	21	6.8%
Group fight	1162	8.4%	30	9.6%
Sell drugs	1017	7.4%	23	7.4%
Current Smoker	4480	32%	142	45%
Consumed alcohol	10,034	73%	211	68%
Driven drunk	3243	24%	68	22%
Drunk at school/work	692	5%	16	5.2%
Alcohol school/work problems	818	6%	17	5.5%
Alcohol friend problems	1095	8%	28	9%
Alcohol dating problems	1368	10%	28	9.1%
Used marijuana	4273	31%	101	33%
Used cocaine	857	6.2%	18	5.8%

[a]Values are based on the unweighted sample.

Table 2

Indicators of fit with one through seven latent classes.

#	FC Log-likelihood	GP Log-likelihood	FC BIC	GP BIC	FC SSA BIC	GP SSA BIC	FC LMR[1]	FC p-value	GP LMR[a]	GP p-value	FC entropy	GP entropy
1	−1563.74	−76336.3	3219.56	152825.32	3168.81	152774.48	n/a[2]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]
2	− 1440.22	− 67372.07	3070.37	135059.14	2965.71	134954.27	244.54	0.3439	17818.66	0.000	0.724	0.798
3	− 1385.98	− 65765.23	**3059.75**	132007.74	2901.16	131848.84	107.38	0.3550	3194.0	0.000	0.886	0.753
4	− 1346.83	− 64950.83	3079.29	130541.22	2866.78	130328.30	75.67	0.6240	1618.82	0.015	0.879	0.765
5	− 1317.99	− 64448.74	3119.45	129699.33	2853.03	129432.38	57.1	0.6657	998.02	0.113	0.906	0.733
6	−1289.71	−64012.33	3160.76	128988.77	2840.41	128667.80	55.34	0.4017	867.55	0.500	0.942	0.735
7	− 1267.67	− 63702.58	3214.37	**128531.55**	2840.11	128156.56	43.79	0.7614	614.75	0.223	0.946	0.766

Bold values indicate significance at $p<0.05$.

[a] Lo–Mendal–Rubin likelihood ratio test.

[b] Not applicable for single-class models.

Table 3

Fit statistics the two-group, four-class LCA with constrained, unconstrained, and partially invariant item probabilities across the foster care and general population groups.

Model	Log-likelihood[a]	Parameters	Scaling factor
Constrained	−67657.83	71	2.7916
Unconstrained	−67570.27	135	2.0718
Partially invariant	−67615.76	87	2.4257

[a]Note that these are rescaled log-likelihoods that cannot be directly compared.

Table 4

Item probabilities based on the partially invariant model.[a]

	IBPSU		Normative		Illegal behavior		Substance use	
	GP	FC	GP	FC	GP	FC	GP	FC
	9.6%	7.4%	49%	53%	7.9%	19%	34%	20%
Damage property	0.413	0.413	0.023	0.023	0.328	0.328	0.043	0.043
Steal >$50	0.145	0.145	0.003	0.003	0.216	0.216	**0.005**	**0.000**
Steal <$50	0.308	0.308	0.017	0.017	0.336	0.336	0.046	0.046
Buy/sell/hold stolen property	0.213	0.213	**0.005**	**0.000**	**0.283**	**0.030**	**0.007**	**0.000**
Medical care needed after fight	0.195	0.195	**0.027**	**0.084**	**0.243**	**0.021**	**0.022**	**0.000**
Group fight	0.389	0.389	0.022	0.022	0.348	0.348	**0.051**	**0.000**
Sell drugs	0.360	0.360	**0.005**	**0.000**	**0.406**	**0.098**	0.044	0.044
Current regular smoker	0.637	0.637	**0.194**	**0.374**	0.593	0.593	0.446	0.446
Consumed alcohol	1.000	1.000	0.501	0.501	0.755	0.755	1.000	1.000
Driven drunk	0.819	0.819	0.000	0.000	0.284	0.284	0.479	0.479
Drunk at school/work	0.371	0.371	0.000	0.000	**0.045**	**0.000**	0.051	0.051
Alcohol school/work problems	0.439	0.439	0.000	0.000	0.000	0.000	0.065	0.065
Alcohol friend problems	0.546	0.546	**0.000**	**0.009**	0.000	0.000	0.101	0.101
Alcohol dating problems	0.575	0.575	0.000	0.000	**0.013**	**0.000**	0.159	0.159
Used marijuana	0.829	0.829	0.061	0.061	0.749	0.749	0.481	0.481
Used cocaine	**0.394**	**0.071**	**0.001**	**0.000**	0.191	0.191	0.050	0.050

[a] Item probabilities in bold were allowed to vary across groups, all other item probabilities were constrained to equality across groups.