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Brief Report: Growth in Polysubstance Use Among Youth in the Child Welfare System¹

Lisa M. Yarnell^a, Dorian E. Traube^b, and Sheree M. Schrager^{b,c}

Lisa M. Yarnell: lyarnell@air.org; Dorian E. Traube: traube@usc.edu; Sheree M. Schrager: sschrager@chla.usc.edu

^aAmerican Institutes for Research, 1000 Thomas Jefferson St., NW, Office 3263, Washington, DC 20007-3835

^bSchool of Social Work, University of Southern California, 669 W. 34th St., Los Angeles, CA 90089-0411

^cDivision of Hospital Medicine, Children's Hospital Los Angeles, 4650 Sunset Blvd, MS #94, Los Angeles, CA 90027

Abstract

Purpose—This paper establishes foundational knowledge on development of polysubstance use among adolescents in the U.S. child welfare system (CWS).

Method—Data on U.S. CWS adolescents from the National Study of Child and Adolescent Well-Being were examined for rates of alcohol, marijuana, and hard drug use; and change in use over time.

Results—Past 30-day absolute use was highest for alcohol, but daily/near-daily use highest for marijuana. Marijuana use increased at later time points. A correlated growth model suggested covariation in use of the substances. A curve-of-factors model suggested that higher-order factors explain most variation in substance use, except at the last time point. Those with lower use changed the most across time.

Conclusions—Subsequent research among CWS adolescents in the U.S. should consider substances jointly. Prevention should focus on marijuana, and later periods of adolescence and CWS involvement. Youth not thought of as at great risk upon entering the CWS may be most vulnerable.

Keywords

latent growth modeling; child welfare; substance use

¹Full-length report is available upon request from the authors.

Correspondence to: Lisa M. Yarnell, lyarnell@air.org.

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Preadolescence has been identified as a risky period for the initiation and development of substance use among general population adolescents. Knowledge is limited on youth in the U.S. child welfare system (CWS), who may be at greater risk (Aarons et al., 2008; Aarons, Brown, Hough, Garland, & Wood, 2001; Courtney & Dworsky, 2006; Pilowsky & Wu, 2006; Vaughn, Ollie, McMillen, Scott, & Munson, 2007; Wall & Kohl, 2007; Schuck & Widom, 2001). The U.S. Department of Health and Human Services has stated that between one-third and two-thirds of CWS youth in the U.S. are affected by substance abuse (USDHHS, 1999), the only federally documented statistic on substance use in this population to date.

Risk factors for substance use among CWS youth include gender, age, history of abuse, and mental health difficulties (Vaughn et al., 2007; Aarons et al., 2008); lower levels of caregiver monitoring (Wall & Kohl, 2007); and deviant peer networks (Thompson & Auslander, 2007). Table 1 shows the varied prevalence estimates of substance misuse for this population, which depend on how use is measured as well as sample age and location (Young, Boles, & Otero, 2007). Despite evidence of elevated risk, there remains a need for more systematic study of patterns of substance use in this population across development, given their unique social context. Developing a suitable model of levels and growth in use of multiple substances over time among CWS youth is an important first step in targeting a particularly risky age, or particular substances.

Research and theory on general population adolescents have suggested the value in studying use of substances jointly rather than in isolation (Duncan et al., 1998; Donovan, 2005; Jessor & Jessor, 1977; Odgers et al., 2008). Polysubstance-using youth may have a pronounced risk for negative adult outcomes (Odgers et al., 2008), highlighting the importance of studying variation in the joint development of substance use. The current study addresses this gap by examining the joint development of use of alcohol, marijuana, and hard drugs in a national sample of U.S. CWS youth across adolescence using latent growth modeling (LGM).

Method

We utilized data from the first National Study for Child and Adolescent Well-Being (NSCAW I), collected in 1999 through 2002 as a stratified national probability sample of U.S. CWS-investigated cases (NSCAW Research Group, 2002; baseline $N=5,501$). This analysis includes baseline and 18- and 36-month follow-ups. We restricted the sample to those at least 11 years old at baseline, since younger participants were not administered substance use items, and removed one participant who was incapable of completing the interview. Of our final analytic sample of $N=1,178$ youth who completed a full or partial interview at baseline, 83% participated at 18 months, and 82% participated at 36 months. Missingness at 18 months was not significantly related to baseline age, gender, ethnicity, residential status, exposure to violence, or trauma. Being White was negatively associated with missingness at 36 months ($p<.001$). We considered the data to be missing at random (MAR) for analytic purposes.

At baseline, the sample was 12.72 years old on average ($SD=1.279$; range from 11–16); 43% male; and 49% White, 28% Black, 16% Hispanic, 3% Asian, and 4% Native American.

Twelve percent resided outside of the home at baseline. The majority of caregivers (47%) were 35–44 years old at baseline, with the most common education being a high school degree (40%). Proportions in each gender and ethnic group were relatively stable across the waves, suggesting minimal differences in attrition. Proportion living outside of the home also remained stable.

Substance use was measured by three items capturing past 30-day self-reported use of alcohol, marijuana, and hard drugs on a scale ranging from 0 (not in the past 30 days) to 6 (20+ days). Hard drugs included cocaine, methamphetamines, heroine, glue, ecstasy, steroids, and injection drugs. These variables showed excess of zeros, and were characterized with a zero-inflated Poisson (ZIP) distribution in growth models, appropriate when all covariate groups adhere to the same general pattern of zero-inflation (Min & Agresti, 2005).

We generated basic descriptive statistics using Stata Version 13, then estimated single-order and higher-order LGMs using Mplus Version 7.0 (Muthén & Muthén, 1998–2012), using Full Information Maximum Likelihood estimation and weights appropriate for longitudinal modeling. Other weights are available for data analysis restricted to a single wave. The weights are probability weights for the national sample of children aged 0–14 and their families referred for child welfare services in a 15-month period beginning in 1999, reflecting stratification by state strata and PSUs defined by child protective service agencies serving single counties or two or more contiguous counties (NSCAW Research Group, 2002). The single-order LGM was a correlated growth model and the higher-order LGM was a curve-of-factors model (see McArdle, 1988; Duncan et al., 1998; and Figure 1). We do not consider predictors or covariates of levels and growth in polysubstance use in these models given the primary goal of discerning a suitable growth model, as well as what variance in use exists, as a basis for explaining this variance in next steps.

Results

Table 2 shows that absolute use was highest for alcohol (15% at baseline to 25% at 36 months), intermediate for marijuana (10% to 18%), and lowest for hard drugs (3% to 4%). Rates of daily/near-daily use also increased across the waves, and were higher at all waves for marijuana (2% at baseline, 4% at 36 months) than for alcohol (<1% at baseline, 1% at 36 months). Daily/near-daily use of hard drugs was rare. Paired *t*-tests on mean use (not shown) revealed that rates of alcohol and marijuana use did not differ at any time point, but both were used more frequently than hard drugs (all $p < .001$). Average use increased for alcohol between baseline and 18 months ($p < .01$), and 18 and 36 months ($p < .05$). Average use of marijuana did not change between baseline and 18 months ($p = .16$), but increased significantly between 18 and 36 months ($p < .05$). Use of hard drugs did not change across any two time points ($p = .07$ and $p = .17$).

Results from the correlated growth model (not shown) revealed significant variance for all substances' intercept and slope factors (range from $p < .01$ to $p < .001$). These factors correlated negatively for each substance ($r = -.22$, $p < .05$ for alcohol; $r = -.37$, $p < .01$ for marijuana; $r = -.36$, $p = .08$ for hard drugs). The negative associations suggest that youth with

lower overall levels of use varied more in level across time. However, between-substance factor correlations revealed considerable overlap across the three intercept factors (range from $r=.88$ to $r=.98$) and the three slope factors ($r=.88$ to $r=.99$), suggesting that use of the substances covaries to a large degree in this population, highlighting the benefit of the curve-of-factors model. AIC for this model was 9772.1, BIC was 9969.7, and adjusted BIC was 9845.8. Loglikelihood was -4847.1 . Given zero-inflated count indicators and MLR estimation, other fit indices such as CFI and RMSEA are not available. Variance explained is not available since residual variance is undefined for count indicators (Muthén & Muthén, 1998–2012).

Results of the curve-of-factors model (Table 3) revealed that the higher-order Intercept and Slope factors accounted for the majority of variance in lower-order substance use, yet significant variance remained at 36 months. Details on setup and available fit indices are shown in Table 3. The two LGMs are non-nested and cannot be compared using relative fit indices, but the latter is more parsimonious at 26 versus 36 estimated parameters, given that primary substance use factors summarize use of all three substances conjointly.

Discussion

This study provided one of the first comprehensive examinations of polysubstance use among youth, across adolescence and across involvement in CWS in the U.S. Although rates of lifetime use in our sample were highest for alcohol, rates of daily or near-daily use were highest for marijuana, and there was no difference in average use of alcohol versus marijuana at any time point. This is in contrast to the general finding that alcohol is the most common substance used among general population adolescents in the U.S. and elsewhere (Hibell et al., 2004; Odgers et al., 2008; CDC, 2013), though higher daily use of marijuana relative to alcohol corresponds with findings seen in recent years among general population youth in the U.S. (Johnston et al., 2015). We also observed a significant increase in rates of marijuana use between 18 and 36 months. Follow-up studies may identify factors that help explain variation in marijuana use among CWS youth, including what factors may increase this use with age, or across CWS involvement.

Our higher-order LGM was beneficial in summarizing variation in levels and growth for each substance. The curve-of-factors model, which acknowledges what the substances have in common at each point in time rather than modeling each separately, is a strong option for future research exploring the time-invariant and time-varying covariates that may explain variation in levels and growth in polysubstance use. The models showed negative associations between levels and growth in use of substances, suggesting that youth with lower levels of use show the greatest change in use over time. Thus, youth who are not frequent users upon entering the CWS may be at greater risk for increasing to more severe use, as opposed to problematic use being exacerbated.

From these findings are several points for future research and intervention design. First, it is valuable to consider CWS youths' use of substances jointly rather than in isolation. Second, marijuana should be given careful attention in prevention efforts among CWS youth. Longitudinal modeling may help determine predictors and consequences of this use. Third,

greater attention may be given to later segments of adolescence or CWS involvement, given increase in marijuana use at later points in time, and the unexplained variation in general substance use at later points in time. This implies that consistent monitoring is critical for workers involved with a youth over a period of years. Last, attention should be given to youth who may not be thought of as at great risk upon entering the system because they may be particularly vulnerable to increase in use.

Limitations include that the data were collected in 1999 through 2002, and patterns of use may have since shifted. Though subsequent NSCAW studies have been undertaken, these did not measure past 30-day use of most illicit substances. Second, the substance use data were self-reported, such that actual rates may be higher. However, participants were assured that responses would remain confidential. Although NSCAW does collect data from multiple respondents, data from caregivers and caseworkers provide only markers of treatment, not estimates of use.

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Figure 1. Alternative LGMs for Alcohol, Marijuana, and Hard Drug Use

Note: Item and factor loadings are in accord with Duncan et al. (1998)'s models of polysubstance use among general population adolescents, and are described in the notes for Table 3. Abbreviations for factors are: Int=Intercept. Slp=Slope. Abbreviations for substances are: Alc=alcohol. Mar=marijuana. Hdr=hard drugs.

Table 1

Estimates of Substance Misuse Among Child Welfare Involved Youth in the U.S.

Population	Time Period	Estimate	Date	Author
Teens in San Diego, CA	Past year	11% substance disorder	2001	Aarons, Brown, Hough, Garland, & Wood
Teens in San Diego, CA	Lifetime	19.2% substance disorder	2001	Aarons, Brown, Hough, Garland, & Wood
17 year olds in Midwest	Lifetime	7.3% drug abuse/dependence 14.0% alcohol abuse/dependence	2004	Courtney, Terao, & Bost
17 year olds in Missouri	Past 6 months	35% substance misuse	2007	Vaughn, Ollie, McMillen, Scott, & Munson
11–15 year olds nationally	Past 30 days	9% substance misuse	2007	Wall & Kohl
12–17 year olds nationally	Lifetime	2.0% drug abuse 3.3% alcohol abuse	2007	Vaughn, Ollie, McMillen, Scott, & Munson

Table 2

Proportions for Substance Use, Past 30 Days and Daily/Near Daily Use in Past 30 Days

	Baseline	18 months	36 months
Substance Use, Past 30 days			
Alcohol Use	15%	19%	25%
Marijuana Use	10%	13%	18%
Hard Drug Use	3%	3%	4%
Substance Use, Daily/near daily			
Alcohol Use	< 1%	< 1%	1%
Marijuana Use	2%	2%	4%
Hard Drug Use	< 1%	< 1%	< 1%

Note. N=1178. Survey weighting not available for tabulations. Substance use scale measures days used in past 30 days. Scale values were: 0=not in the past 30 days, 1=1 day, 2=2 days, 3=3 to 5 days, 4=6 to 11 days, 5=10 to 19 days, 6=20 days or more.

Table 3**Primary- and Secondary-order Parameters in Curve-of-Factors Model**

	Unstandardized Parameter	Standardized Parameter
Primary Order		
Residual Variances (σ^2)		
Substance Use, Baseline	.00 (.00)	.00
Substance Use, 18 months	.00 (.00)	.00
Substance Use, 36 months	.77* (.35)	.47
Secondary Order		
Loadings onto Intercept (λ)		
Substance Use, Baseline	1.00	.77
Substance Use, 18 months	1.00	1.00
Substance Use, 36 months	1.00	.96
Loadings onto Slope (λ)		
Substance Use, Baseline	-1.50	-.28
Substance Use, 18 months	0	.00
Substance Use, 36 months	1.50	.35
Variances (σ^2)		
Intercept	1.49*** (.17)	1.00
Slope	.09*** (.03)	1.00
Covariance, Intercept and Slope (σ)	-.28*** (.05)	-.77
Model Fit		
Estimated Parameters	26	
AIC/BIC/Adjusted BIC	9921.0/10052.7/9970.1	
Loglikelihood	-4934.5	

Note. $N=1178$. Measurement invariance over time assumed via equivalent loadings of substance use items onto the three primary-order factors (not shown). In the second-order model, loadings onto Intercept are set at unity. In this model and in the correlated growth model, loadings onto Slope are specified according to time points of the study (-1.50, 0, and 1.50). Anchoring at the midpoint of the study allows examination of change about average levels of substance use across years in the CWS, given that not all participants were the same age at baseline. Loadings at baseline and 36 months express deviations from the anchoring time point in years and partial years. Standardized covariance is a Pearson's correlation. Adjusted BIC corrects for sample size as $(n^*-(n+2)/24)$ (Muthén & Muthén, 1998–2012). Significance shown for unstandardized parameters only.

† $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$. (two-tailed tests)