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Role transitions and substance use among Hispanic emerging adults: A longitudinal study using coarsened exact matching

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Abstract

Introduction—Emerging adulthood (ages 18 to 25) is characterized by changes in relationships, education, work, and viewpoints on life. The prevalence of substance use also peaks during this period. Among emerging adults, Hispanics have a unique substance use profile, and have been described as a priority population for substance use prevention. Cross-sectional studies among Hispanics have shown that specific role transitions (e.g., starting or ending romantic relationships) were associated with substance use. Negative affect from uncertainty/stress that accompany role transitions in emerging adulthood may lead to substance use as a maladaptive coping mechanism. Longitudinal studies are needed to gain a more complete understanding of these associations.

Methods—Participants completed surveys for Project RED, a longitudinal study of substance use among Hispanics in Southern California. This study used Coarsened Exact Matching to overcome the methodological limitations of previous studies. Participants were matched on pretreatment variables including age, gender, substance use behavior in high school, and depressive symptoms. Past-month cigarette use, binge drinking, marijuana use, and hard drug use were the outcomes of interest. After matching, each outcome was regressed on each individual role transition in year one of emerging adulthood with this process repeated in year two of emerging adulthood.

Results—Role transitions in romance and work were positively associated with multiple categories of substance use.

Conclusions—Prevention programs should teach emerging adults ways to cope with the stress from role transitions. Individual role transitions may be used to screen for subgroups of emerging adults at high risk for substance use.

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1. Introduction

Emerging adulthood (ages 18 to 25) is characterized by changes in relationships, education, work, and viewpoints on life (Arnett, 2011). The prevalence of substance use also peaks during this developmental stage (Substance Abuse and Mental Health Services Administration, 2013). Circumstances unique to emerging adulthood may play a prominent part in substance use (Sussman & Arnett, 2014). Arnett (2005) hypothesized, "substance use in emerging adulthood will rise after specific instability events, i.e., in the weeks following a transition in residence, love, school, or work." Negative affect from uncertainty/stress that accompany role transitions in emerging adulthood may lead to substance use as a maladaptive coping mechanism (Khantzian, 1997; Sinha, 2008).

Substance use varies by racial/ethnic group, (Substance Abuse and Mental Health Services Administration, 2013) with Hispanic emerging adults described as a priority population for substance use prevention (Stone, Becker, Huber, & Catalano, 2012). Hispanics are unique as their obligations grow toward scholastics and work, as well as toward their immediate and extended families in emerging adulthood (Arnett, 2003). Cross-sectional studies have shown that specific role transitions (e.g., starting or ending romantic relationships) were associated with tobacco use (Allem, Soto, Baezconde-Garbanati, & Unger, 2013; Allem, Forster, Neiberger, & Unger, 2015), marijuana use and binge drinking (Allem, Lisha, Soto, Baezconde-Garbanati, & Unger, 2013), as well as hard drug (e.g., cocaine, methamphetamines, ecstasy, hallucinogens, or inhalants) use among Hispanic emerging adults (Allem, Soto, Baezconde-Garbanati, & Unger, 2015). These cross-sectional studies are a part of the growing literature on role transitions and substance use among emerging adults (Fleming, White, Oesterle, Haggerty, & Catalano, 2010; Staff et al., 2010; Huh, Huang, Liao, Pentz & Chou, 2013; Cohen, Kasen, Chen, Hartmak, and Gordon, 2003). However, to gain a more complete understanding of these associations, longitudinal studies are needed that include measures of substance use behaviors in high school.

This study applied Coarsened Exact Matching (CEM) to longitudinal data from Hispanic emerging adults. CEM helped overcome the methodological limitations of prior research (e.g., results sensitive to model specification), and longitudinal data allowed for measures of substance use behaviors in high school to be included in analyses to eliminate the alternative hypothesis that those who use substances in high school are more likely to experience (or not experience) certain transitions in emerging adulthood. This study focused on the transitions that have been hypothesized to be associated with substance use e.g., transitions in residence, love, school, and work (Arnett, 2005). Findings have the potential to inform intervention and prevention programs for Hispanic emerging adults. Programs may need to teach emerging adults positive ways to cope with the stress from role transitions. Individual role transitions may be useful in screening for subgroups of emerging adults at high risk for substance use in the future.

2. Methods

Participants completed surveys for Project RED, a longitudinal study of acculturation and substance use among Hispanics in Southern California (Unger, Ritt-Olson, Wagner, Soto, & Baezconde-Garbanati, 2009). Originally, participants joined the study as adolescents, while attending one of seven high schools in the Los Angeles area. Schools were invited to participate if 70% or more of their student body comprised Hispanics, as indicated by data from the California Board of Education. The present study used data from 11th grade, the last year of high school when data were gathered (average age was 16, 44% were male), as well as the time when substance use becomes prominent among adolescents (Kessler, Berglund, Demler, Jin, Merikangas, & Walters, 2005). For the high school survey, data collectors distributed surveys to all students who had provided parental consent and student assent. The university's Institutional Review Board approved all procedures.

Participants from the original high school cohort, who self-identified as Hispanic, were contacted to participate in the survey in emerging adulthood. Research assistants sent letters to participants' last known addresses, and invited them to call a toll-free phone number or visit a website to participate in the study. All emerging adults provided verbal consent over the phone, or read the consent script online, and clicked a button to indicate consent, and participated in the survey. If participants could not be contacted with the information they had provided in high school, staff searched for them online using social networking sites, and publicly available search engines. There were 2,151 Hispanic 11th graders in project RED of whom 1,416 (%66) filled out surveys in year one of emerging adulthood in the present study. In year two 1,406 participants completed surveys. Data gathered from 2011 to 2013 served as year one in emerging adulthood (average was age 22, 41% were male), and data gathered from 2013 to 2014 served as year two in emerging adulthood (average age was 23, 41% were male) in the present study. In emerging adulthood, each participant was invited to participate in the survey in a 12-month time span from when they were previously surveyed. Those lost to follow-up from high school to emerging adulthood were more likely to be male, report binge drinking, marijuana use, and hard drug use in high school (p < .05), but did not differ on age or smoking status in high school.

2.1 *Measures*

Data collected from 11th grade were used to create measures of substance use that occurred prior to emerging adulthood. Past-month cigarette use, binge drinking (five or more drinks of alcohol in a row, within a couple of hours), marijuana use, and hard drug use (e.g., cocaine, methamphetamines, ecstasy, hallucinogens, or inhalants) were measured. Each item was coded "Yes" = 1 and "No" = 0 where a 1 indicated any use of the substance in the past-month.

Role transitions were measured at each time point in emerging adulthood. Items were prefaced with "Has this happened to you in the last year?" and coded "Yes" = 1 or "No" = 0. The items were, "Started a romantic relationship," "Broke up with boyfriend or girlfriend," "Got a new job," and "Started college or new school or classes." Transition in residence was measured by the question "How often have you moved in the last 12 months?" Responses

were coded 1 if the participant moved, or 0 if the participant did not move in the past 12 months.

Negative affect could also confound the relationship between role transitions and substance use. The Boston short-form CES-D (developed by Kohout et al. (1993) and validated among Hispanics by Grzywacz and colleagues (2006)), was used to measure depressive symptoms in emerging adulthood. This measure contains 10 items from the CES-D (Radloff, 1977), assessing specific depressive symptoms. Response options were "Less than 1 day or never" coded as 1, "1-2 days" coded as 2, "3-4 days" coded as 3, and "5-7 days" coded as 4. For each of the ten items, participants who reported either a 0 or 1 were then recoded to 0 and those who reported a 2, 3 or 4, were recoded to 1 to approximate the yes/no response sequence described by Kohout and colleagues (1993). Responses to the ten items were then summed (Cronbach's alpha =. 84). Age and gender were also measured.

Data from each year in emerging adulthood were used to create measures of substance use, which served as the outcomes of interest. Past-month cigarette use, binge drinking (e.g., five or more drinks of alcohol in a row, that is, within a couple of hours), marijuana use, and hard drug use (e.g., cocaine, methamphetamines, ecstasy, hallucinogens, or inhalants) were the outcomes of interest. Each outcome was coded "Yes" = 1 and "No" = 0 where a 1 indicated any use of the substance in the past month.

2.2 *Analytical approach*

A common approach to improving inference in observational research is to employ matching methods (Stuart, 2010; Ho, Imai, King, & Stuart, 2007). Matching is a nonparametric, non-model based approach that, when used appropriately, can make parametric models work better rather than substitute for them (Imai, King, & Stuart, 2008). The overall idea of matching is to uncover the potential experiment within observational data. In other words, the matching process systematically removes observations in order to establish treatment and control groups akin to those found in an experiment. If each treated unit (primary explanatory variable coded 1) exactly matches a control unit (primary explanatory variable coded 0) with respect to the control variables, then the treated and control groups are identical, the control variables are no longer confounders, and the functional form of the model is not a concern. If treated and control groups are better balanced (e.g., covariates are similar across treated and control units) due to a reduction in data, model dependence is reduced. If reducing data is a function of the primary explanatory variable and the control variables, but not the outcome variable of interest, no bias is introduced. In other words, reducing data as a result of matching does not bias inferences because the procedure does not predetermine the outcome of interest (King, Keohane, & Verba, 1994).

CEM was developed in response to the problems often found in popular matching methods (King & Nielsen, 2014). CEM allows the balance between the treatment and control groups to be chosen before estimation rather than being revealed through the iterative process of checking after estimation, modifying the method, and more estimation (Iacus, King, & Porro, 2009). This method guarantees that adjusting the imbalance on one variable has no

effect on the balance of any other e.g., monotonic imbalance (Iacus, King, & Porro, 2012; Blackwell, Stefano, Iacus, King, & Porro, 2009).

The present study's analytical approach began with processing the data to reduce imbalance. The global imbalance statistic (GI) as described by Iacus, King, and Porro (2008) was reported to demonstrate how much imbalance was reduced as a result of matching. Perfect global balance is indicated by a GI = 0 and larger values indicate larger imbalance between the treatment and control groups, with a maximum GI = 1.0. The first step of matching involved identifying the primary explanatory variable. Herein the primary explanatory variable was coded 1 for participants who experienced the specified role transition (e.g., "Got a new job"), and coded 0 for participants who did not experience the role transition in the specified time period. Data were then reduced so that imbalance was reduced between values of the primary explanatory variable by the CEM algorithm (Blackwell et al, 2009).

Initially, the pretreatment variables (control variables that were matched on) included cigarette use, binge drinking, marijuana use, and hard drug use in high school, as well as age, gender, and depressive symptoms at year one in emerging adulthood. Each substance use outcome was then regressed on each primary explanatory variable.

The pretreatment variables then included one role transition from year one in emerging adulthood in addition to the pretreatment variables mentioned above. In other words, if the primary explanatory variable was "Got a new job" in year two in emerging adulthood, "Got a new job" from year one in emerging adulthood was included as a pretreatment control variable, and was matched on along with the other control variables. This process was repeated for each role transition. Each substance use outcome from year two in emerging adulthood was then regressed on each role transition from year two in emerging adulthood. This analysis demonstrated whether experiencing a transition was associated with substance use after considering whether or not an individual had experienced this transition in the prior year.

CEM attempts to use as much of the data as possible, which results in strata with different numbers of treated and control units. To compensate for the differential strata sizes, CEM returns weights to be used in subsequent analyses. Statistical significance was determined by $p<.05$.

3. Results

In 11th grade, 23% reported past-month binge drinking, 17% reported past-month marijuana use, 9% reported past-month cigarette use, and 9% reported past-month hard drug use. The prevalence of substance use increased by emerging adulthood. In year one of emerging adulthood, 45% of participants reported past-month binge drinking, 23% reported past-month marijuana use, 22% reported past-month cigarette use, and 5% reported past-month hard drug use. In year two of emerging adulthood, 44% of participants reported past-month binge drinking, 25% reported past-month marijuana use, 21% reported past-month cigarette use, and 7% reported past-month hard drug use.

When "started a romantic relationship" was defined as the primary explanatory variable, the measure of imbalance for the set of control variables was GI = .24 prior to matching, and was GI = 4.80×10^{-16} after matching, suggesting almost perfect balance was achieved. Similar reductions in imbalance occurred for each role transition defined as the primary explanatory variable (Table 1). The transition "started a romantic relationship" was positively and significantly associated with past-month cigarette use, binge drinking, and marijuana use in year one of emerging adulthood. The transition "broke up with boyfriend or girlfriend" was positively and significantly associated with past-month binge drinking, marijuana use, and hard drug use in year one of emerging adulthood. The transition "got a new job" was positively and significantly associated with past-month binge drinking and marijuana use in year one of emerging adulthood.

When "started a romantic relationship" was defined as the primary explanatory variable in year two of emerging adulthood the measure of imbalance for the set of control variables was GI = .47 prior to matching, and was GI = 3.385×10^{-15} after matching (Table 2). This transition was positively and significantly associated with past-month cigarette use and binge drinking in year two of emerging adulthood. The transition "broke up with boyfriend or girlfriend" was positively and significantly associated with past-month cigarette use, binge drinking, and marijuana use in year two of emerging adulthood. The transition "got a new job" was positively and significantly associated with past-month binge drinking and marijuana use in year two of emerging adulthood. Transitions in residence were positively and significantly associated with past-month binge drinking in year two of emerging adulthood.

4. Discussion

This study identified specific role transitions that were associated with substance use among Hispanic emerging adults. These findings advance the literature on role transitions and substance use among emerging adults in several ways. The longitudinal data utilized in this study allowed for the inclusion of substance use behaviors in high school. Including such characteristics in analyses assured that these findings were not simply describing the associations between role transitions and substance use among previous substance users. Prior studies' data collection were conducted after high school, and were unable to rule out substance use in high school as a potential confounder (Fleming, White, Oesterle, Haggerty, & Catalano, 2010; Staff et al., 2010). CEM reduced model dependence, assuring that this study's findings represented an empirical picture of the data. This approach is superior to earlier studies that employed methods sensitive to model specification and/or captured idiosyncratic characteristics of the data (Huh, Huang, Liao, Pentz & Chou, 2013; Cohen, Kasen, Chen, Hartmak, and Gordon, 2003).

Starting a new romantic relationship was associated with increased cigarette use, binge drinking, and marijuana use, similar to findings from previous cross-sectional (Allem et al., 2013; Allem et al., 2013a; Allem et al., 2015), and longitudinal studies (Fleming et al., 2010; Staff et al., 2010), among emerging adults. Starting a romantic relationship was associated with increased cigarette use and binge drinking after taking into account those who already experienced this transition in the prior year. Emerging adults may not become desensitized

to role transitions by virtue of experiencing them multiple times. The more transitions emerging adults experience, the fewer psychological and social resources they may have left to handle the next one. They might rely on substance use to cope with negative affect from uncertainty and stress that accompanies transitions in love. These patterns may persist until the individual learns more adaptive coping strategies.

Experiencing a breakup was associated with increased binge drinking, marijuana use, and hard drug use, consistent with prior research (Allem et al., 2015; Allem et al., 2013a; Allem et al., 2013). Experiencing a breakup was associated with increased cigarette use, binge drinking, and marijuana use after taking into account those who already experienced this transition in the prior year. Romantic relationships -starting and stopping- may be one of the most salient role transitions experienced by emerging adults causing feelings of anxiety during the initial stages of the relationship, and causing feelings of distress at the dissolution of the relationship.

Starting a new job was associated with increased binge drinking and marijuana use. These relationships persisted after taking into account those who already experienced starting a new job in the prior year. These findings departed from earlier research that reported substance use was not associated with the acquisition of full-time work among emerging adults (Staff et al., 2010). An earlier study reported that obtaining fulltime employment after college was associated with reduced drinking among emerging adults (Gotham, Sher, & Wood, 1997). These discrepancies may be a result of differences in conceptualization and operationalization of transitions in employment. This study captured "got a new job" in the past 12 months, whereas previous studies captured, what some may say is, a milestone of emerging adulthood--fulltime employment after college. This study may have described the relationship between changes in jobs and substance use among individuals who did not consider their job as a long-term commitment or a stable/reliable source of income. Participants in this study may be particularly sensitive to employment and the subsequent stress from new employment as they grew up in a time of economic turmoil e.g., the Great Recession. As such, new employment may be perceived as a source of stress that leads to substance use until perceptions of job security are solidified, or positive coping strategies are developed.

Transitions in education/schooling were not associated with substance use in either year of emerging adulthood. The present study asked participants about starting college or new school or classes whereas previous studies measured completion of schooling (Staff et al., 2010). Staff and colleagues (2010) found that cigarette, marijuana, and cocaine use declined after the receipt of a baccalaureate degree, but alcohol use increased. Future research should examine the commencement and completion of education, as well as the time in between, and how these events pertain to substance use among emerging adults. Samples of emerging adults that are comprised of both those who attend and don't attend universities are necessary in order to better understand the relationship between transitions in education and substance use. Tentatively, we might infer that the demands of new schooling may be perceived as inconsistent with any type of substance use among Hispanic emerging adults.

Transitions in residence were not associated with substance use outcomes in year one of emerging adulthood, but were associated with binge drinking in year two. Prior research on college students has shown that as they moved out of their parents' homes into off campus housing or dormitories their binge drinking increased (Harford & Muthén, 2001; White, McMorris, Catalano, Fleming, Haggerty, & Abbott, 2006; Fromme, Corbin, & Kruse, 2008). Future research should examine the context of this transition. Emerging adults not enrolled at major universities may move for a variety of reasons including money issues, start of a new job, to help a family member, or because of romantic relationships. These nuances may be important to better understanding the relationship between transitions in residence and substance use.

4.1 *Limitations*

The role transitions examined herein may not reflect all the important role transitions in emerging adulthood that are associated with substance use. This study, however, used the role transitions previously hypothesized to be associated with substance use among emerging adults (Arnett, 2005). This study showed which specific role transitions were associated with substance use; however, did not demonstrate whether or not the accumulated number of role transitions experienced in a short period of time were associated with substance use. Demonstrating a possible dose response relationship using matching techniques like the one proposed herein is, however, computationally complicated, and lacks theoretical support. The measure of hard drug use did not include all known hard drugs (e.g., heroin), but did include 5 substances. All substance use outcomes were dichotomous limiting the understanding of frequency of use. Although role transitions were assessed over the past year and substance use was assessed over the past month, suggesting that the transitions preceded substance use, it is plausible that the substance use occurred before the transition. This study matched on levels of depression but could not match on other mental health measures such as levels of anxiety. This study did not measure the number of romantic relationships, the types of employment, or the types of living situations. These findings may not generalize to other racial/ethnic groups.

4.2 *Conclusion*

Notwithstanding these limitations, findings from this study may inform intervention and prevention programs aimed at reducing substance use and substance use related disparities among Hispanic emerging adults. It is crucial to know which role transitions are associated with substance use among emerging adults in order to design tailored prevention and intervention programs. Previous intervention programs for Hispanics have not discerned between emerging adults and other age groups (Webb, Rodríguez-Esquivel, & Baker, 2010). In other words, previous intervention programs have not focused on the unique characteristics taking place in their participants' lives, with the exception of pregnancy (Fitzgerald, 2012; Simmons, Cruz, Brandon, & Quinn, 2011; Pollak et al., 2010), and how these characteristics may drive the prevalence of substance use. Intervention planners should consider the findings described herein as a point of departure in the creation of such programs for Hispanic emerging adults.

Acknowledgments

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Highlights

- A novel matching method was used with longitudinal data among Hispanics.

- High school substance use behavior was included in this study.

- Transitions in romance and work were associated with substance use.

- Transitions occurring in consecutive years had similar influences on substance use.

Table 1

Role transitions and past-month substance use in year one of emerging adulthood.

	Cigarettes[a]	Binge drinking[a]	Marijuana[a]	Hard drugs[a]	GI before matching[b]	GI after matching[b]
Started romance	1.75 (1.32, 2.32) n=1,192	1.49 (1.17, 1.89) n=1,188	1.35 (1.02, 1.79) n=1,185	0.95 (0.53, 1.71) n=1,197	.24	.00
Experienced breakup	1.30 (0.97, 1.74) n=1,201	1.70 (1.31, 2.22) n=1,195	1.83 (1.36, 2.45) n=1,193	1.78 (1.06, 3.00) n=1,203	.29	.00
Started job	1.25 (0.95, 1.64) n=1,219	1.26 (1.01, 1.60) n=1,215	1.35 (1.03, 1.76) n=1,212	1.29 (0.75, 2.22) n=1,222	.22	.00
Started school	1.00 (0.76, 1.33) n=1,218	1.03 (0.82, 1.29) n=1,212	1.19 (0.91, 1.59) n=1,209	0.91 (0.52, 1.62) n=1,220	.22	.00
Moved residences	1.03 (0.76, 1.40) n=1,195	1.03 (0.81, 1.32) n=1,190	1.19 (0.90, 1.60) n=1,189	0.99 (0.57, 1.75) n=1,199	.25	.00

[a] Numbers in cells are odds ratios with 95% confidence intervals and useful sample size. An individual cell describes the relationship between a role transition and an outcome of interest after coarsened exact matching was used to reduce imbalance. Participants were matched on substance use in high school, gender, levels of depression, and age measured in year one of emerging adulthood.

[b] Global Imbalance (GI) is a measure of imbalance. Perfect global balance is indicated by a GI = 0 and larger values indicate larger imbalance between treatment and control groups, with a maximum GI = 1.0.

Table 2

Role transitions and past-month substance use in year two emerging adulthood.

	Cigarettes[a]	Binge drinking[a]	Marijuana[a]	Hard drugs[a]	GI before matching[b]	GI after matching[b]
Started romance	1.40 (1.01, 1.94) n=1,043	1.37 (1.06, 1.79) n=1,038	0.80 (0.59, 1.09) n=1,032	1.16 (0.69, 1.97) n=1,039	.47	.00
Experienced breakup	1.66 (1.18, 2.35) n=1,042	1.50 (1.13, 2.00) n=1,038	1.44 (1.04, 2.00) n=1,033	1.50 (0.90, 2.49) n=1,038	.45	.00
Started job	1.16 (0.85, 1.58) n=1,124	1.71 (1.35, 2.18) n=1,119	1.34 (1.01, 1.78) n=1,114	0.98 (0.59, 1.65) n=1,120	.36	.00
Started school	1.00 (0.72, 1.39) n=1,084	0.82 (0.64, 1.04) n=1,079	1.04 (0.78, 1.40) n=1,075	1.24 (0.73, 2.12) n=1,080	.47	.00
Moved residences	1.12 (0.78, 1.58) n=1,068	1.34 (1.03, 1.74) n=1,065	0.94 (0.69, 1.27) n=1,057	1.50 (0.85, 2.64) n=1,064	.53	.00

[a] Numbers in columns are odds ratios with 95% confidence intervals and useful sample size. An individual cell describes the relationship between a role transition and an outcome of interest after coarsened exact matching was used to reduce imbalance. Participants were matched on substance use in high school, gender, levels of depression, age, and a prior role transition measured in year one of emerging adulthood.

[b] Global Imbalance (GI) is a measure of imbalance. Perfect global balance is indicated by a GI = 0 and larger values indicate larger imbalance between treatment and control groups, with a maximum GI = 1.0.