The Influence of Changes in Marital Status on Developmental Trajectories of Alcohol Use in Young Adults*

PATRICK J. CURRAN, PH.D., BENGT O. MUTHÉN, PH.D.,† AND THOMAS C. HARFORD, PH.D.†

Department of Psychology, Duke University, Durham, North Carolina 27708-0085

ABSTRACT. *Objective.* Multiple group latent curve analysis was used to assess the impact of changes in marital status on alcohol use trajectories in young adults and to test if these effects varied across ethnicity and gender. *Method:* Four years of data were obtained from a sample of young adults (N = 4,052; 54% male) drawn from the National Longitudinal Survey of Youth. Alcohol use and marital status were assessed once per year and covariates included age, gender, education and ethnicity. *Results:* Latent curve models indicated that there was an overall nonlinear negative alcohol use trajectory across the four time points and that becoming married was reliably associated with an added downturn to this trajectory. Multiple group models indicated that there was an interaction between ethnicity and marital status in the prediction of alcohol growth trajectories, but there was no interaction with gender. *Conclusions:* Becoming married for the first time exerted a unique effect on the overall developmental trajectory of alcohol use over time. This effect held for both ethnic groups but was reliably stronger for white compared to black respondents. This interaction may be attributable to lower levels of alcohol use reported by black respondents, or may be related to individual differences in reactivity to social influences by blacks relative to whites.(*J. Stud. Alcohol* **59:** 647-658, 1998)

Epidemiological studies have suggested that alcohol use tends to follow a developmental growth trajectory throughout the lifespan (Fillmore, 1988; Johnston et al., 1995; Muthén and Muthén, 1995). Initial experimentation tends to start in the early teens, more regular use develops throughout the middle and late teens, regular use tends to peak in the early twenties followed by a gradual decrease in use during the mid-twenties, and finally a stable level of regular use emerges in the late twenties (Johnston et al., 1995; Muthén and Muthén, 1995). Of course, there is tremendous group and individual variability in all aspects of this life course trajectory. For example, women report similar levels of overall alcohol use compared to men but women report less heavy alcohol use (Johnston et al., 1995). Blacks tend to report later onset of initial alcohol use, less steep acceleration into regular use, and that they peak at lower levels and at a later age compared to whites (Johnston et al., 1995; Muthén and Muthén, 1995). In addition to group differences in alcohol use trajectories, individual differences such as impaired parenting (Chassin et al., 1996), stress and negative affect (Swaim et al., 1989), deviant peer group affiliation (Curran et al., 1997) and cognitive alcohol expectancies (Smith et al., 1995) have all been associated with earlier initiation and steeper accelerations into regular alcohol use. However, much less is known about specific factors associated with decreases in alcohol use trajectories over time. One influence that has been shown to have a consistently strong relation to decreases in alcohol use is moving from being single to married.

A large number of high quality empirical studies have found support for the relation between becoming married and subsequent decreases in alcohol use for adults. For example, Harford et al. (1994) found that married men and women reported lower alcohol use compared to any other category of marital status. Temple et al. (1991) performed a meta-analysis of 12 longitudinal studies and found that moving in status from single to married was associated with a significant decrease in alcohol use between two time points, and this marital effect was evident across both gender and age. Miller-Tutzauer et al. (1991) examined 3 years of data from the National Longitudinal Survey of Youth (NLSY) using repeated measures MANCOVAs and found support for the hypothesis that moving from single to married was associated with a decrease in alcohol use at the following time point. They also found that there was evidence for an anticipatory effect: becoming married in 1 year was associated with a decrease in alcohol use in the preceding year. Bachman et al. (1997) presented a largely descriptive analysis of data from the Monitoring the Future project and showed consistent evidence that change in marital status was associated with lower rates of alcohol and drug use compared to remaining single. They also found evidence that suggested an anticipatory effect of marriage on alcohol use as well as

Received: October 31, 1996. Revision: May 28, 1997.

*This study was partially funded by National Institute on Alcohol Abuse and Alcoholism fellowship F32-AA05402 awarded to the first author and grant K02-AA00230 awarded to the second author.

†Bengt O. Muthén is with the Graduate School of Education and Information Sciences, University of California-Los Angeles, Los Angeles, CA. Thomas C. Harford is with the Social and Behavioral Sciences Department, Boston University School of Public Health, Boston, MA.

modest support for a stronger marriage effect for women compared to men. Several other studies have found evidence to support the influence of becoming married on decreases in alcohol use (Clark and Midanik, 1982; Hilton, 1991; Power and Estaugh, 1990).

There is thus rather strong evidence that individuals who are married are at a lower risk for alcohol use relative to comparable individuals who remain single. There is also less consistent evidence that the strength of the relation between marital status and alcohol use may vary as a function of gender and ethnicity. However, nearly all of the studies described above focused on the relation between marital status and alcohol use either within a single time point or between just two time points. Several of these studies did incorporate more than two time periods, but nearly all compared differences in alcohol use between time adjacent periods (e.g., Time 1 vs Time 2; Time 2 vs Time 3, etc.). Further, subjects are typically divided into discrete groups based on their marital status at two time points (e.g., single-single, single-married, married-married, etc.), and the average alcohol use is compared across the various subgroups. This technique allows for the examination of important questions that are related to time specific comparisons of alcohol use as a function of marital group membership.

However, this approach becomes somewhat limiting given both theoretical and empirical evidence that suggests there is a systematic developmental growth trajectory of alcohol use across the lifespan (Johnston et al., 1995; Zucker et al., 1995). It is known that studying time specific changes in the presence of systematic growth can limit the types of question we can ask, or can even result in misleading conclusions about the observed data (Rogosa, 1987, 1988; Rogosa and Willett, 1985; Willett, 1990). It is also both theoretically and analytically important to differentiate between influences that alter normative developmental trajectories and influences that affect time specific measures of individual standing relative to the group (Curran and Muthén, in press; McArdle, 1991). Thus, although these time specific analytic techniques allow for the assessment of certain types of important research questions, they are less well suited for the assessment of other types of significant questions. Instead, new analytic methods are needed to augment existing techniques so that a more complete understanding can be gained of individual differences in alcohol use throughout the lifecourse.

The broad class of *random coefficients models* provides a powerful tool for analyzing predictors and correlates of individual differences in change over time. One such random coefficients model is latent curve analysis. Latent curve analysis combines elements of confirmatory factor analysis, repeated measures MANOVA and structural modeling to study individual differences in change over time. Examples of the statistical aspects of latent curve analysis include Browne and DuToit (1991), McArdle (1986, 1988, 1991), McArdle and Epstein (1987), Meredith and Tisak, (1984, 1990) and Muthén (1991, 1993, 1995). Examples of substantive applications of latent curve analysis include Aber and McArdle (1991), Curran et al. (1996, 1997), Duncan et al. (1994, 1996), McArdle (1989), Stoolmiller (1994) and Stoolmiller et al. (1993).

In addition to these techniques, Muthén (in preparation) recently proposed a general framework to allow for the examination of time specific influences of single or multiple measures of status change together with the estimation of the normative growth trajectory of a given construct over time. This approach shares certain similarities with existing growth modeling methods for incorporating so-called "time varying covariates" (e.g., Bryk and Raudenbush, 1992; Stoolmiller, 1994), including incorporation of covariates that are allowed to change over time and ability to examine cross-sectional or prospective effects between the covariates and the outcome measure of interest. However, unlike these techniques, Muthén's (in preparation) method allows for several important extensions, including the ability to model random intercept and slope components for the covariates themselves, and provides a mechanism in which to formally test interactions between the covariates and other grouping variables (e.g., gender, ethnicity). Muthén's (in preparation) method will be used in the current context to examine the influence of changes in marital status on the developmental growth trajectory of alcohol use as a function of the subject's gender and ethnicity.

There are three primary questions that are the focus of the current article. First, although previous research has identified rather strong effects of marital status on time specific or time adjacent levels of alcohol use, the question remains as to whether changes in marital status affect the continuous developmental trajectory of alcohol use over time. If marital status is indeed related to alcohol use growth trajectories, the second question is whether this relation is moderated by gender, ethnicity or both. The third question is whether there is evidence to support an anticipatory effect of marriage on alcohol use, or whether this effect is manifested only during and following the year of the marriage. A secondary goal of this article is to present a step-by-step application of Muthén's (in preparation) proposed method in hopes that other alcohol researchers might consider this general analytic technique for inclusion in their own empirical examinations of alcohol use over time.

Method

Subjects

The data for the current study were drawn from the National Longitudinal Survey of Youth (NLSY) of Labor Market Experience in Youth, a study initiated in 1979 by the United States Department of Labor in order to study the transition of young people into the labor force. The NLSY is a multistage, stratified, clustered probability sample of hous-

ing units drawn to be representative of the noninstitutionalized U.S. population of young people aged 14-21 as of January 1, 1979, with supplemental samples of persons in the same age cohort who were serving in the military, Hispanics, blacks, and economically disadvantaged nonblack, non-Hispanic youth. The 1979 panel had 12,686 respondents, 92% of whom remained in the study as of the 1985 annual interview. Information from years 1982, 1983, 1984 and 1985 were used for the current study (and will subsequently be referred to as Time 1, Time 2, Time 3 and Time 4, respectively).

The subjects selected for the current analyses were required to meet several selection criteria. The first was that all subjects be at least 21 years of age in 1982 (Time 1 in the current analyses). This ensured that all subjects were of legal drinking age at the first time of measurement and also controlled for the curvilinear drinking trajectories due to increases in drinking prior to about 21 years of age and decreasing trajectories after about 21 years of age (see, e.g., Johnston et al., 1995). An added advantage of using the older subjects was the avoidance of the difficulty of making inferences based on low instances of marriage in the younger cohort. The second selection criteria required that all subjects be single in 1981 (or Time 0, the year before the first time period considered in the current analyses). This allowed for a comparison of a new onset of marriage relative to subjects who had never been married. Divorced subjects were not included in the current analyses because of the low incidence of divorce among those who were single at Time 0 (less than 1% of the sample were single at Time 0, married between Times 1 and 3 and divorced by Time 4). These selection criteria resulted in a final sample of $N = 4{,}052$ subjects with complete data across all 4 years of measure. Of these subjects, 54% were male; 14% were Hispanic, 30% were black, 56% were white; and age ranged from 21 to 25 years at Time 1 with an average ($\pm$SD) of 22.7 $\pm$ 1.38 years.[1]

Measures

Age was measured in years since birth. *Gender* was assessed using a dichotomous measure (0 = female, 1 = male). *Education* was measured by a single item reflecting the highest grade completed by the respondent at Time 1 (1982). Education ranged from 0 to 18 with a mean ($\pm$SD) of 12.72 $\pm$ 2.02. *Ethnicity* was assessed using two vectors to reflect membership in one of three distinct ethnic groups. The first vector compared blacks to whites and the second vector compared Hispanics to whites.

Marital status was assessed within each of the 4 years of measure. A dichotomous measure was defined such that a score of 0 reflected being single within that given year and a score of 1 reflected becoming married within that given year. All subjects considered in the current analyses had never been married at Time 0. Of these 4,052 subjects, 8% ($n = 326$) were newly married at Time 1, 7.8% ($n = 316$) were married at Time 2, 7.7% ($n = 311$) were married at Time 3 and 7.1% ($n = 287$) were married at Time 4. Thus, whereas all subjects ($N = 4{,}052$) were single at Time 0, 30.6% ($n = 1{,}240$) were married by Time 4.

Alcohol use was assessed using a composite measure of three items that measured the total number of cans or bottles of beer, glasses of wine and drinks of distilled spirits consumed over the week preceding the interview. These three items were summed and divided by seven to represent average daily alcohol use over the previous 7 days.[2] The average daily alcohol use was 0.92 $\pm$ 1.68 drinks per day at Time 1, 0.76 $\pm$ 1.35 at Time 2, 0.73 $\pm$ 1.26 at Time 3 and 0.62 $\pm$ 1.08 at Time 4 (see Table 1). It can be seen that both the mean level and standard deviation of daily alcohol use were decreasing over time. This is consistent with the normative decreasing alcohol use trajectories observed among this age group (Johnston et al., 1995; Muthén and Muthén, 1995).

Results

Random coefficients latent curve models were used to test the proposed hypotheses. The latent curve models for the current article were built upon in a hierarchy of increasing complexity. First, an unconditional growth model was estimated to examine overall group growth trajectories and to test for individual variability in change over time. This model was then extended to include the main effects of age, gender, education and ethnicity, as well as the inclusion of additional latent factors to test for differential changes in later alcohol use associated with earlier changes in marital status. Finally, the sample was divided into four subgroups, and the growth model was simultaneously estimated across all four groups to assess for potential interactions between gender and ethnicity in the relation between changes in marital status and changes in alcohol use. All models were estimated using LISCOMP (Muthén, 1987)[3] based on the observed variance-covariance matrix and mean vector (see Table 2). Model fit was evaluated using the maximum likelihood ratio test statistic (χ^2) and the root mean squared error of approximation (RMSEA; Steiger and Lind, 1980) augmented with a 95% confidence interval computed using the computer program FITMOD (Browne, 1992). The RMSEA is bounded between zero and infinity, and values falling below 0.05 are thought to reflect "close" model fit (Browne and Cudeck, 1993).

Model 1. The first model was a four-indicator, two-factor unconditional growth model of alcohol use over the four time points (see Figure 1). The four repeated measures of alcohol use were defined as multiple indicators on the two unobserved latent growth factors. The factor loadings for the four alcohol use measures on the latent intercept factor were fixed to 1.0 to represent the initial starting point of the alcohol use growth trajectory. The first two factor loadings for the four alcohol use measures on the latent slope factor were fixed to 0 and 1, and the second two were freely estimated from the data.[4] The slope factor thus represents the overall shape of

TABLE 1. Means (SDs) of alcohol use and marital status as a function of gender and ethnicity

Group	Time 1 alcohol use	Time 2 alcohol use	Time 3 alcohol use	Time 4 alcohol use	Time 1 marital status	Time 2 marital status	Time 3 marital status	Time 4 marital status
Total	0.92	0.76	0.73	0.62	.08	.08	.08	.07
(N = 4,052)	(1.68)	(1.35)	(1.26)	(1.08)	(.27)	(.27)	(.27)	(.26)
Female	0.50	0.41	0.38	0.31	.09	.08	.08	.07
(n = 1,869)	(0.94)	(0.83)	(0.77)	(0.61)	(.29)	(.27)	(.28)	(.26)
Male	1.28	1.05	1.02	0.89	.07	.08	.07	.07
(n = 2,183)	(2.05)	(1.61)	(1.50)	(1.31)	(.25)	(.27)	(.25)	(.25)
Black	0.56	0.46	0.49	0.43	.05	.05	.05	.04
(n = 1,232)	(1.15)	(0.98)	(0.99)	(0.85)	(.21)	(.21)	(.21)	(.20)
Hispanic	0.81	0.71	0.64	0.61	.09	.09	.06	.06
(n = 562)	(1.69)	(1.30)	(1.15)	(1.21)	(.28)	(.28)	(.24)	(.24)
White	1.14	0.93	0.88	0.73	.09	.09	.09	.08
(n = 2,258)	(1.87)	(1.49)	(1.39)	(1.15)	(.29)	(.29)	(.29)	(.28)
Black female	0.24	0.20	0.23	0.20	.05	.05	.05	.05
(n = 581)	(0.55)	(0.49)	(0.48)	(0.47)	(.22)	(.22)	(.22)	(.22)
White female	0.68	0.56	0.50	0.40	.11	.10	.11	.09
(n = 1,057)	(1.11)	(0.99)	(0.92)	(0.69)	(.31)	(.30)	(.31)	(.29)
Black male	0.84	0.69	0.73	0.63	.04	.04	.05	.04
(n = 651)	(1.43)	(1.22)	(1.25)	(1.04)	(.20)	(.20)	(.22)	(.20)
White male	1.55	1.26	1.20	1.02	.09	.09	.08	.09
(n = 1,201)	(2.27)	(1.76)	(1.63)	(1.37)	(.28)	(.28)	(.27)	(.28)

the alcohol use growth trajectory over time. Finally, the latent intercept and slope factors were freely correlated. This model was estimated and fit the data well (χ^2 = 11.8, 3 df, N = 4,052, p = .01; RMSEA = .027, 95% CI = .008 $\leftrightarrow$ .047). Examination of the residual and derivative matrices suggested that no post hoc model modifications were required.

The significant mean of the intercept factor (μ = .89, $p < .05$) reflected that the overall group reported an average starting point of the growth trajectory of 0.89 drinks per day and the significant variance of the intercept factor (Ψ = 1.40) reflected meaningful individual variability around this group average. The significant mean of the slope factor ($\mu = -.11$) suggested that, on average, the group was decreasing in alcohol use over the four time periods and the significant variance of the slope factor (Ψ = .11) reflected meaningful individual variability in change in alcohol use over time. The final factor loadings on the growth factor were 0, 1, 1.54 and 2.46 (where the first two values were fixed and the second two values were estimated from the data and significant at $p < .01$). This represented a slightly nonlinear growth trajectory which decreased at a decelerated rate (or at a slower than linear rate) over the four time points. Finally, the significant correlation between the intercept and slope factors (r = −.71) indicated that subjects who reported higher initial levels of drinking tended to decrease in alcohol use more rapidly over time compared to subjects who reported lower levels of initial drinking. In sum, the group re-

TABLE 2. Correlations, means and standard deviations of the measure for combined full sample (N = 4,052) measures of alcohol use, marital status and all covariates

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Time 1 alcohol use	1.000												
2. Time 2 alcohol use	0.494	1.000											
3. Time 3 alcohol use	0.440	0.519	1.000										
4. Time 4 alcohol use	0.382	0.471	0.510	1.000									
5. Time 1 marital status	−0.074	−0.068	−0.062	−0.035	1.000								
6. Time 2 marital status	−0.023	−0.048	−0.057	−0.055	−0.086	1.000							
7. Time 3 marital status	0.009	−0.003	−0.036	−0.039	−0.085	−0.083	1.000						
8. Time 4 marital status	0.043	0.025	0.011	−0.022	−0.081	−0.080	−0.079	1.000					
9. Age	0.032	0.020	−0.005	0.010	0.050	0.028	0.007	0.028	1.000				
10. Gender	0.231	0.238	0.252	0.264	−0.048	−0.005	−0.028	−0.003	0.011	1.000			
11. Black	−0.142	−0.146	−0.120	−0.118	−0.085	−0.080	−0.067	−0.071	−0.014	−0.013	1.000		
12. Hispanic	−0.025	−0.014	−0.028	−0.001	0.012	0.019	−0.021	−0.013	−0.023	0.040	−0.265	1.000	
13. Education	0.012	−0.005	−0.021	−0.018	0.006	0.006	0.009	0.049	0.222	−0.110	−0.149	−0.125	1.000
Mean	0.92	0.76	0.73	0.62	0.08	0.08	0.08	0.07	22.69	0.54	0.30	0.14	12.72
Standard deviation	1.68	1.35	1.26	1.08	0.27	0.27	0.27	0.26	1.38	0.49	0.46	0.35	2.02

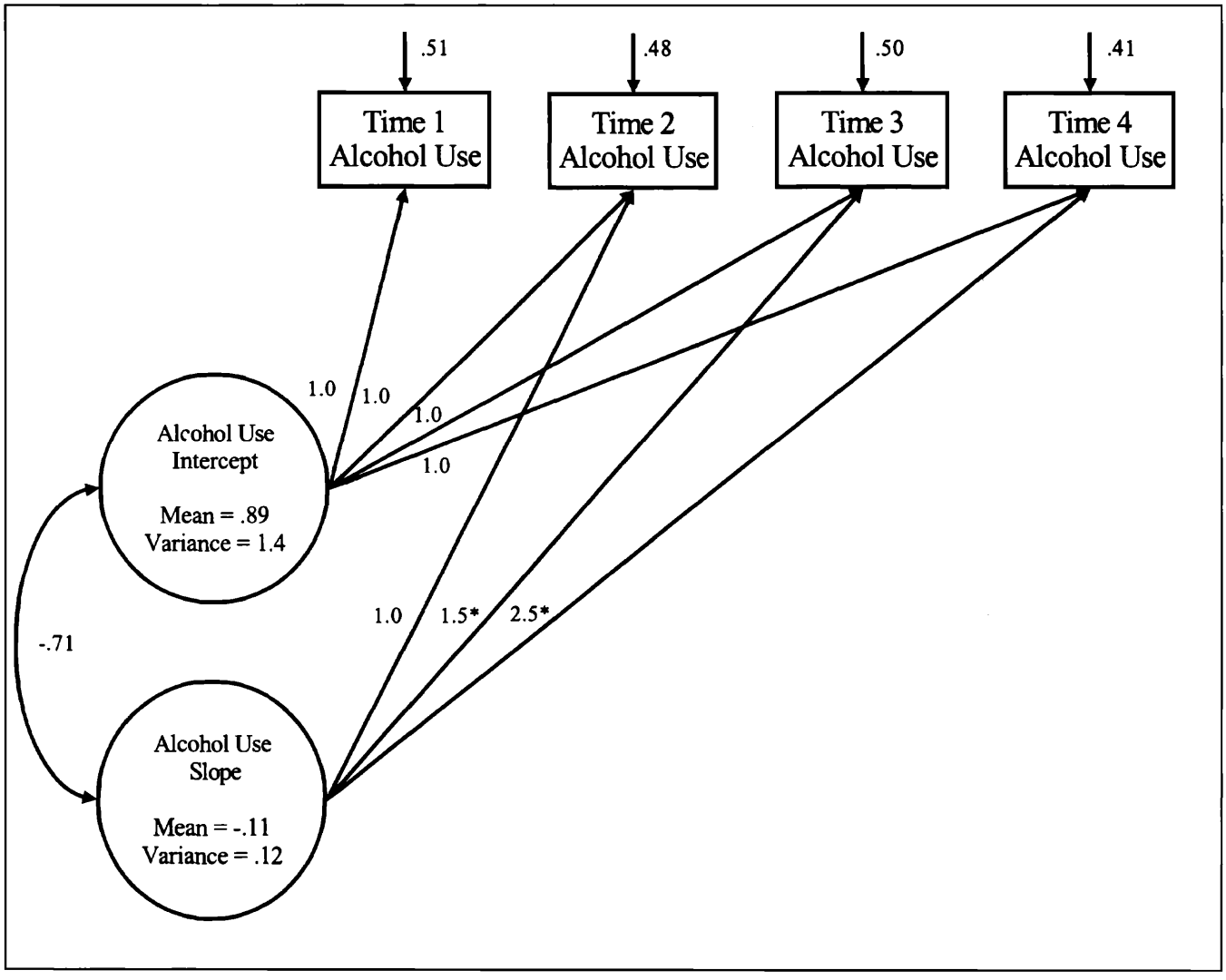

FIGURE 1. Unconditional growth model of alcohol use for all subjects (N = 4,052). Factor loadings without asterisks were fixed values and factor loadings with asterisks were estimated from the data ($p < .01$); the factor means and variances are in raw metric; the interfactor correlation and the error variances of the repeated measures are in standardized metric.

ported significant nonlinear decreases in alcohol use over the four time points, and there was meaningful individual variability in both the starting point and rate of change over time.

Model 2. Model 1 was extended to include the main effects of age, gender, education, ethnicity and time specific changes in marital status (see Figure 2). The intercept and slope factors defined in Model 1 were regressed on the age, gender, education and ethnicity measures to assess for potential group differences in the means of the two growth factors. The relation between changes in drinking trajectories and changes in marital status was modeled using techniques developed in Muthén (in preparation). First, four additional latent intercept factors were defined to represent changes in marital status within each of the four time periods, and these latent factors were regressed on binary indicators representing change in marital status within each given time point. The factor-loading matrix of the repeated alcohol use measures was defined so that each latent intercept factor was determined by the measure within that given time period and all subsequent time periods. For example, the added intercept factor for Time 2 was only related to the Time 2, 3 and 4 alcohol use measures, but not the Time 1 alcohol use measure. This model parameterization allows for a formal assessment of the influence of each new instance of marital status change on the developmental alcohol use trajectory relative to the stably single group. Thus, the magnitude of the regression parameter between the added latent factor and the binary status indicator captures the extent to which the developmental growth trajectory of alcohol use over time was altered due to the onset of a new marriage.

The model depicted in Figure 2 was estimated and fit the data well (χ^2 = 49.08, 25 df, N = 4,052, p = .003; RMSEA = .015, 95% CI = .007 $\leftrightarrow$ .023). Examination of the residual and derivative matrices suggested no need for post

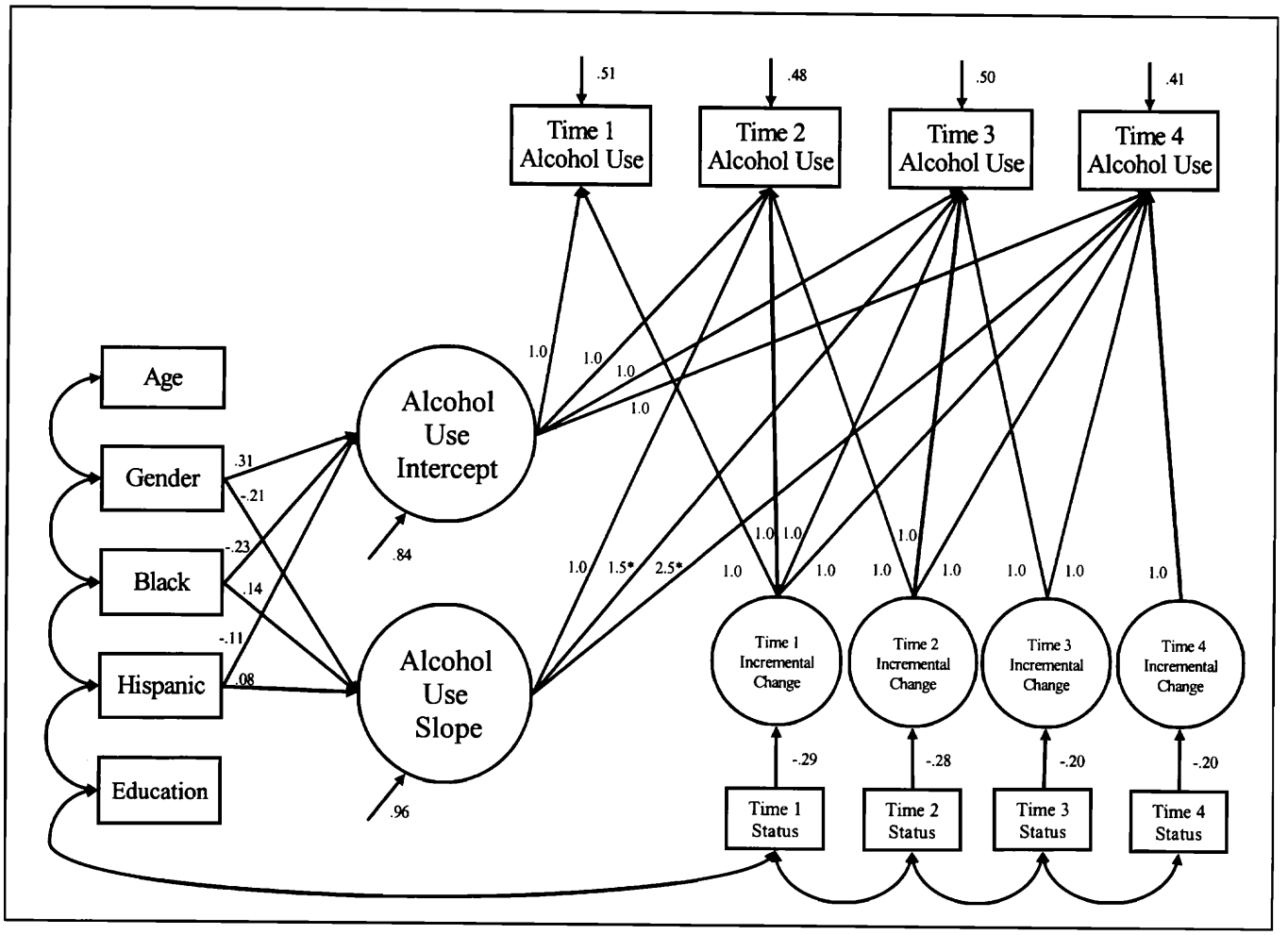

FIGURE 2. Conditional growth model of alcohol use including exogenous control variables and time specific measures of marital status for all subjects (N = 4,052). Solid lines indicate paths that were estimated and significant ($p < .05$); paths between age and education and the intercept and slope factors were estimated but nonsignificant ($p > .10$) and are not shown in the figure; all values are in standardized metric except for the factor loadings which are in raw metric; loadings without asterisks were fixed values and loadings with asterisks were estimated from the data.

hoc model modification. Age was not a significant predictor of either the intercept or slope factors. This was expected given the homogeneity in age due to the selection of subjects who where 21 years or older at Time 1. However, men reported significantly higher intercept scores (standardized $\beta = .31$) and larger rates of decrease in alcohol use ($\beta = -.12$) compared to women. Both blacks ($\beta = -.23$) and Hispanics ($\beta = -.11$) reported lower initial levels of alcohol use, as well as less steep rates of change over time ($\beta = .14$ and $\beta = .08$, respectively) compared to whites. Education was not related to either the starting point or rate of change of alcohol use over the four time periods. Of key interest was the finding that all four additional intercept factors (representing change in alcohol use course due to marriage) were significantly and negatively associated with changes in alcohol use over time (β's ranging from $-.20$ to $-.28$ over the four time periods, all $p < .01$). This suggests that, regardless of the time point at which an individual's marital status changed, there was a corresponding added decrement to the naturally decreasing alcohol use trajectory compared to those subjects who remained single at all four time points. This is consistent with the hypothesis that changes in marital status are associated with an accelerated decrease in the developmental growth trajectory of alcohol use over time.

It has also been hypothesized that there is an *anticipatory* effect of changes in marital status on alcohol use (Bachman et al., 1997; Miller-Tutzauer et al., 1991). That is, if an individual is married in Time 3, it has been hypothesized that there should be an accelerated decrease in alcohol use first manifested at Time 2. To test this hypothesis, Model 2 was re-estimated with the addition of the regression of the *earlier* alcohol use measure on the *later* marital status factor. For example, Time 2 alcohol use was regressed upon the Time 3 marital status factor. Three additional regression parameters were estimated (Time 1 alcohol use on Time 2 marital status, Time 2 alcohol use on Time 3 marital status and Time 3 alcohol use on Time 4 marital status). None of these three re-

gression parameters significantly differed from zero. This suggested that changes in marital status did not have an anticipatory effect upon changes in the alcohol use trajectory. Subjects who were married at a later time point were drinking at comparable rates to the stably single group prior to their marriage, but reported steeper decreases in alcohol use after their marriage.

Model 3. Model 1 suggested that there was significant individual variability in negative growth trajectories in alcohol use over time and Model 2 suggested that this individual variability was associated with gender, ethnicity and changes in marital status. Although there were rather large main effects of gender and ethnicity in the prediction of the intercept and slope factors, Model 2 did not allow a formal test of the potential interactive effects of gender and ethnicity. That is, Model 2 suggested that there were accelerated decreases in alcohol use associated with a first time marriage relative to remaining single, but it is of key theoretical interest to explore whether the strength of the effects of changes in marital status on changes in alcohol use varied as a function of gender or ethnicity.

To test this hypothesis, Model 2 was re-estimated as a multiple group latent curve model. The sample of 4,052 subjects was divided into four separate subsamples: black men (n = 651), white men (n = 1,201), black women (n = 581) and white women (n = 1,057), resulting in a total sample size of N = 3,490. Hispanic subjects could not be included in these multiple group analyses because of the small sample sizes that resulted from subdividing on both ethnicity and gender. Thus, testing the interaction between marital status and ethnicity considers only the comparison between black and white respondents. Model 2 was then simultaneously estimated across all four subsamples to test for potential interactions between gender (male and female), ethnicity (black and white) and marital status (single and married) in the prediction of changes in alcohol use over time.[5] Equality constraints were imposed hierarchically to probe these interactions and nested χ^2 tests were used to test the adequacy of the constraints (Bollen, 1989). A baseline model was first estimated in which all parameters were freely estimated across all four groups (χ^2 = 99.46, 76 df, N = 3,490, p = .04; RMSEA = .009, 95% CI = 0 $\leftrightarrow$ .014). Next, equality constraints were imposed upon the two factor loadings on the growth factor. These constraints did not lead to a significant decrement in model fit (χ^2_Δ = 12.0, 6 df, N = 3,490, p = .06) and were thus retained. This finding suggested that the shape (although not the magnitude) of the alcohol use growth trajectory was similar across all four groups.

Next, equality constraints were imposed on all four regression parameters, thus relating the added intercept factors to the marital status indicators both across time/within group (e.g., the regression parameters were equated across all four time points within the black male group, etc.) and across group/within time (e.g., the regression parameters were equated for Time 1 marital status across all four groups, etc.). This parameterization allowed for estimation of an overall grand mean effect across all four groups (χ^2 = 146.61, 97 df, N = 3,490, p = .001; RMSEA = .012, 95% CI = .007 $\leftrightarrow$ .017). This model was then probed to test for the interactive effects of gender and ethnicity. First, additional intercept factors were estimated within gender and equated across ethnicity (e.g., the factors were added to just the two female groups and equated across the two ethnic groups). This additional gender effect did not lead to a significant improvement in model fit (χ^2_Δ = 4.40, 4 df, N = 3,490, p = .41), suggesting that there were no gender differences in the magnitude of the overall negative effect of changes in marital status on later changes in alcohol use. That is, additional factors were not required to capture a gender effect above and beyond the overall grand effect. Next, second additional intercept factors were estimated within ethnicity and equated across gender (e.g., the factor was added to just the two white groups and equated across gender). Unlike gender, this additional ethnicity effect did lead to a significant improvement in model fit (χ^2_Δ = 14.91, 4 df, N = 3,490, p = .01), suggesting that the overall negative effect of marital status on later changes in alcohol use could not be pooled across the two ethnic groups; a unique ethnicity effect (pooled across gender) was required in addition to the overall grand mean effect. In classic ANOVA terms, this effect can be interpreted as a significant two-way interaction between ethnicity and marital status in the prediction of changes in alcohol use over time, but this effect did not vary as a function of gender.

Several additional equality constraints were then imposed prior to interpretation of the final model. Equality constraints were tested and retained across all four groups for the regression parameters between both age and education in the prediction of the alcohol use intercept and slope factors. Constraints were also added across all four groups on the mean of age which were retained, but the constraint did not hold for the mean of education and was thus rejected. Next, a series of nested comparisons were made on the estimated average of the marital status indicators across the four groups. These comparisons suggested that whites reported higher rates of marriage across all four time periods compared to blacks, but these differences did not vary as a function of gender. Finally, no equality constraints related to the means and variances of the alcohol growth trajectories nor the residual variances of the observed alcohol use measures were retained across any group. This finding suggested that there were significant differences in the initial status, rate of change and variability in growth across all four groups.

The final model (including all retained equality constraints described above) fit the observed data quite well (χ^2 = 158.77, 118 df, N = 3,490, p = .01; RMSEA = .010, 95% CI = .004 $\leftrightarrow$ .014). Although all four groups reported the same shape of alcohol use growth trajectory, all four groups also reported significant differences in initial status and rates of change over time. White men reported the highest rates of

initial use followed by black men, white women and black women. Neither age nor education were significantly related to either the starting point or rate of change over time for alcohol use in any group, although there were significant differences in the mean level of education across all four groups (see Table 1). Of greatest interest were the group differences found in the effects of changes in marital status on changes in subsequent alcohol use. Whereas the pooled model (Model 2) identified significant negative effects of marital status change on later alcohol use, the multiple group model (Model 3) reflected that, in addition to this overall effect, there was an added effect that was unique to the white sample compared to the black sample. That is, changes in marital status were significantly related to accelerated decreases in alcohol use over time for both ethnic groups, but this effect was significantly stronger for the white respondents. There were no added effects found as a function of gender.

Finally, the four-group model was re-estimated to test for the potential anticipatory effects of changes in marital status on alcohol use within each ethnic and gender subgroup. The additional regression parameters that were described in Model 2 were estimated within each gender and within each ethnicity in Model 3. None of these regression parameters significantly differed from zero within either gender or ethnic group. Consistent with the findings of Model 2, there was no evidence of anticipatory effects of changes in marital status for either gender or ethnic group.

Discussion

There were three questions that were of primary interest to the current study. First, was there a meaningful association between changes in marital status and subsequent changes in the developmental trajectory of alcohol use in young adults? Second, if there was a relation between changes in marital status and alcohol use trajectories, did this vary as a function of gender or ethnicity? Third, was there support for the hypothesis that the effects of changes in marital status were actually anticipatory such that alcohol use was affected prior to the year of actual marriage? The results of the latent curve models provided insight into each of these three questions.

The effects of marital status on alcohol use trajectories

Consistent with previous epidemiological work (Johnston et al., 1995; Muthén and Muthén, 1995), the results of Model 1 reflected that the sample as a whole reported significant decreasing trajectories in alcohol use over the four time points, and there was meaningful individual variability in both the starting point and rate of change over time. This negative overall trajectory was a function of the rather homogenous sample of subjects who were at least 21 years of age at the first time of measure. Further, the results of Model 2 suggested that men reported higher starting points and steeper decreases over time compared to women, but there were no differences in rates of change as a function of age or years of education. In addition, blacks and Hispanics reported both lower starting points and smaller rates of change in alcohol use compared to whites. Of most importance to the first question of interest, the results of Model 2 suggested that the onset of marriage within any given time point was associated with a significantly accelerated decrease in alcohol use compared to subjects who remained single. That is, as a whole, singles reported decreasing levels of alcohol use over the four time points, but changing from single to married at any point during this time period was associated with an added influence that accelerated the downward trend of alcohol use over and above the natural trajectory over time.

The growth-modeling results provide compelling information that helps augment the existing knowledge about the relationship between marital status and changes in alcohol use. Many studies have suggested that married individuals drink less at a single time point or between two time points compared to those who remain single (Bachman et al., 1997; Harford et al., 1994; Miller-Tutzauer et al., 1991; Temple et al., 1991). The current results extend these findings by providing evidence not only that change in marital status is related to discrete time specific differences in alcohol use, but also that becoming married differentially affects the developmental trajectory of alcohol use over time. Further, whereas Miller-Tutzauer et al. (1991) concluded that the effects of marriage stabilized after the first year following marriage, we found that this marriage effect did not stabilize after the first year but extended throughout all of the time periods that were studied. Thus, the current results suggest that there is not a time specific drop in alcohol use that then stabilizes, but that there is an alteration of the developmental growth trajectory over time that is reliably related to the onset of a new marriage.

There are a number of potential reasons that might explain why becoming married accelerates the developmental downturn in alcohol use over time. For example, it might be that becoming married simply decreases the amount of free time available for drinking which thus decreases the amount of alcohol consumed. Bachman et al. (1997) argued against this possibility because of their evidence of an anticipatory effect which they interpreted as support for other more individualized influences, such as increased commitment and intimacy, the adoption of new social roles and the acquisition of a new adult identity. We did not find evidence of this anticipatory effect but do not believe our lack of support precludes Bachman et al.'s (1997) hypotheses concerning more complex processes than just decreased recreational time. More detailed data are necessary to better understand the specific mechanisms that underlie the relationship between onset of marriage and decreased alcohol use. We do know from epidemiological studies that alcohol use tends to follow a developmental growth trajectory that peaks and begins to descend, generally starting in young adulthood. The current evidence suggests that changes in marital status may be one

influence that is at least partially responsible for this decreasing trend in alcohol use over time. Of course, given that individuals who remain single are also following a decreasing trajectory (just not as steeply as those who become married), there are many factors other than marriage that influence this downward trajectory.

The moderating effects of ethnicity but not gender

The results of Model 3 suggested that the magnitude of the accelerated decrease in alcohol use associated with change in marital status did not vary as a function of gender, but did vary as a function of ethnicity (when comparing black and white respondents). The lack of a gender effect is consistent with some previous studies (Miller-Tutzauer et al., 1991; Temple et al., 1991) but not with others (Bachman et al., 1997; Harford et al., 1994). For example, Bachman et al. (1997) found descriptive evidence suggesting that there was a stronger effect of becoming married for women which they speculated was because marriage may serve as a more prepatory role for transition to parenthood for women compared to men. Similarly, Harford et al. (1994) found gender differences in the effects of marital status such that a marital effect was found for men but not for women. We did not find support for such a gender effect, but instead found that the magnitude of the relation between onset of marriage and later drinking was equal for men and women. One potential reason for this discrepancy is that both Bachman et al. (1997) and Harford et al. (1994) studied heavy drinking as the outcome of interest whereas we used a more normative measure of alcohol use. Further study is needed to ascertain whether the differences between normative and heavy alcohol use may be related to the presence or absence of an interaction between gender and marital status.

Although some researchers have hypothesized about the possibility of ethnic group differences in the effects of changes in marital status on later alcohol use (Temple et al., 1991), few empirical studies have found compelling support that such differences exist. In contrast, the current study found distinct differences in the strength of the marital effect as a function of ethnic group membership. There was an overall protective marital effect found for both black and white respondents, but this effect was stronger for the white subsample. One possible reason why ethnic group differences were identified in this study but have not been found in others might relate to the specific type of analyses used here. First, as discussed in the introduction, the growth models that were used here test a somewhat different question than that typically assessed by more traditional fixed-effects models. Whereas previous studies failed to identify ethnic group differences in time specific comparisons of alcohol use, the current analyses did find ethnic group differences in the overall growth trajectories of alcohol use. Thus, there may be individual differences in the developmental growth trajectories of alcohol use that are related to ethnic group membership, but these effects might be disguised and more difficult to detect when considering only one or two discrete points in time. It is also known that latent curve models have greater statistical power to detect differences in change over time compared to more traditional fixed-effects models based on the same data (Muthén and Curran, 1997). It would be of interest to re-examine existing data using a latent curve modeling approach to see if ethnic group differences are found when comparing overall rates of change instead of time specific mean levels of alcohol use.

Although the current data provide compelling evidence that the strength of the relation between changes in marital status and decreasing alcohol use growth trajectories varies as a function of ethnic group membership, there are few clues as to why this difference exists. This ethnic group difference remained above and beyond the inclusion of educational attainment, so the effect cannot be entirely attributed to ethnic group differences in socioeconomic status as measured by education. One indirect line of evidence that might help understand this effect stems from studies of peer influences in adolescent alcohol use. Farrell and Danish (1993) and Farrell (1994) found little or no support for the existence of peer influence mechanisms on adolescent alcohol and drug use in a large sample of predominantly black youth. In contrast, Curran et al. (1997) found consistent support for a peer influence mechanism on adolescent alcohol use in a large sample of predominantly white youth. Similarly, Brannock et al. (1990) found that the relationship between alcohol use and preferences for alcohol-using peers was stronger for white than for black youths, and whites reported that their drinking was influenced by peers significantly more often than did blacks. These findings, together with those of the current study, indicate that there might be a weaker relation between the influence of friends or romantic partners on alcohol use in black youths compared to white youths. This hypothesis is purely speculative at this time, and much more work is needed to better understand the differences found between the two ethnic groups.

Lack of support for an anticipatory effect of marriage

Finally, no evidence existed either within or across gender or ethnic group to support the hypothesis that there was an anticipatory effect of change in marital status on alcohol use. The only observed change occurred within and following the year of marriage, but not earlier. In contrast to our findings, both Bachman et al. (1997) and Miller-Tutzauer et al. (1991) have presented evidence suggesting the existence of an anticipatory effect such that changes in alcohol use were noted the year prior to the actual marriage. These conflicting conclusions may again be related to time specific comparisons of alcohol use versus the individual continuous growth trajectories over time. The current analyses suggest that the developmental alcohol use growth trajectory is not meaningfully altered until the actual onset of the new

marriage, and not before. Bachman et al. (1997) discuss the likely gradual nature of changes in alcohol use related to engagement and marriage, and this gradualness may not show a culminated effect on the developmental trajectory until the marriage actually occurs. Thus, our analyses indicate that the slopes of the alcohol trajectories do not differ over the year preceding marriage for individuals who are single and will remain single compared to those who are single but will become married.

Advantages of the multiple group growth modeling framework

A secondary goal of this article was to demonstrate an application of the general modeling approach proposed by Muthén (in preparation) to the study of alcohol use over time (see McArdle, 1989, and McArdle and Hamagami, 1996, for other examples of statistical development and substantive applications of multiple group latent curve models). Traditionally, it has been very difficult to analyze change in a particular construct as a function of change in status. For example, it is often of key theoretical interest to study the relation between a particular construct (e.g., alcohol use, depressive symptomatology, aggressive behavior, self-esteem, etc.) and changes in status such as marriage or divorce, parenthood, pregnancy, starting or ending school, and starting or ending a job. The latent growth modeling techniques applied here provide a very general method for testing questions about change in status on the growth trajectory of a construct that is itself changing over time, and this model can be extended in a variety of ways. For example, although the current article considered only the effects of an onset of new marriage on alcohol use, given adequate sample size it would be possible to simultaneously consider the effects of moving from married to divorced. The status change variables can be cumulative (e.g., once married always married) or time specific (e.g., moving in and out of unemployment over time). Also, whereas a single growth process was considered here, multiple growth processes could be estimated and changes in each growth trajectory could be examined as a function of status change (e.g., one growth process of alcohol use and one growth process for depressive symptomatology with repeated measures of employment status over time). Finally, these models could be extended to examine potential mediators of the effects of status change on alcohol use which would allow for a more detailed understanding of the specific effects of changes in status on later changes in alcohol use over time. We believe that these advantages combine to make this technique a promising analytic tool for the alcohol use researcher.

Study limitations and future directions

As with any study, there are a number of limitations that need be noted. First, alcohol use and marital status were assessed one time per year, and this large time lag may obscure the specifics of the relation between alcohol use and marital status (see, e.g., Gollob and Reichardt, 1987). Additional repeated measures of these constructs both before and after marriage would allow for a more sensitive and detailed understanding of this complex relation over time. Second, related limitation discussed earlier is that we used a 7-day measure of alcohol use obtained once every 12 months. Although a 7-day measure may not adequately sample normative levels of drinking that occurred over the entire 12-month period, the briefer time span may help increase reliability of recall. Our use of a 7-day measure should be closely considered when generalizing conclusions from the current findings. Third, because of sample size constraints we were not able to model the alcohol use growth processes within the Hispanic subsample, and testing interactions between marital status and ethnicity compared only black and white respondents. Future work is necessary to gain a better understanding of whether these marital effects are evident within this important ethnic group. Fourth, a time specific measure of education was used as a demographic control variable. However, education and socioeconomic status would be expected to change over time, and a more comprehensive understanding of these relations could be gained with the estimation of more complicated models that simultaneously examined changes in alcohol use, changes in education and changes in marital status.

Future research in this area would benefit from the consideration of additional influences that were not available in the current data. Examples include factors surrounding the individual's decision to marry at a given time, measures of the spouse's own drinking behavior and personality characteristics, and assessments of constructs that might serve to mediate the relation between an individual becoming married and subsequently altering his/her alcohol use. This additional information is critical for gaining an understanding as to specifically *why* becoming married is associated with an accelerated decrease in the developmental trajectory of alcohol use over time.

Acknowledgments

The authors would like to thank Andrea Hussong and Siek-Toon Khoo for their valuable suggestions and input.

Notes

1. Of the final sample of 4,052 respondents, 793 (19%) reported no alcohol use at any of the four time points. Chi-square analyses revealed no differences among the abstainers as a function of gender or ethnic status (χ^2 = .32, 2 df, p = .85). Further, the final growth models were estimated excluding the abstaining subgroup and no differences in any of the substantive findings were noted. The abstaining subgroup was thus included in all subsequent analyses.
2. It might be argued that the 7-day measure of alcohol use does not provide an adequate sampling of typical drinking behavior and that a 30-day measure might be more appropriate. The 7-day measure was selected for these analyses for several reasons. First, while a 7-day recall period may

not reflect an adequate sampling of typical drinking, it may promote more accurate recall of drinking and thus greater reliability of the measure. Second, the 7-day measure was available across 4 years in the NLSY whereas the 30-day measure was available only for 3 years. We felt that the addition of 1 year of measure offset the potential limitations of the 7-day recall. Finally, correlations between the 7-day and 30-day measures of alcohol use were quite high, ranging from .77 to .80 within each of the 3 years of assessment. In conclusion, we feel the 7-day assessment is an appropriate measure of typical alcohol use, but we note that caution is warranted when generalizing the results of the latent curve models.

3. Note that latent curve analysis can be estimated using any standard structural equation modeling software that can analyze both covariance and mean structures (e.g., Amos, CALIS, EQS, LISREL, Mx, etc.). All of these software packages would be expected to provide the same results as were derived using LISCOMP.
4. Freely estimating the last two loadings is consistent with the completely latent growth model described by McArdle (1989, 1991) that allows nonlinear trajectories to be captured in a single growth factor. This can be contrasted with the fixed parametric approach suggested by Willett and Sayer (1994) that captures nonlinearity using multiple growth factors. Freely estimating the loadings was selected here given the complexity of the multiple-group models and the desire to keep the latent growth structure maximally parsimonious. See McArdle (1989, 1991) for further details about these issues.
5. The mean vectors and covariance matrices for each of the four subgroups may be requested from the first author or downloaded directly from http://www.duke.edu/~curran.

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