



## Measuring alcohol use across the transition to adulthood: Racial/ethnic, sexual identity, and educational differences



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### HIGHLIGHTS

- The measurement invariance of alcohol use varied across key demographic groups.
- Models were more invariant across groups during adolescence than adulthood.
- The alcohol use measure operated differently for youth and young adults.
- Most longitudinal comparisons were scalar non-invariant; half were metric invariant.
- Alcohol use measures that are non-invariant across groups or time may bias results.

### ARTICLE INFO

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### ABSTRACT

**Background:** Patterns of alcohol use change from adolescence to adulthood and may differ based on race/ethnicity, sexual identity, and education. If alcohol use measures do not operate consistently across groups and developmental periods, parameter estimates and conclusions may be biased.

**Objectives:** To test the measurement invariance of a multi-item alcohol use measure across groups defined by race/ethnicity, sexual identity, and college education during the transition to adulthood.

**Methods:** Using three waves from the National Longitudinal Study of Adolescent to Adult Health, we tested configural, metric, and scalar invariance of a 3-item alcohol use measure for groups defined by race/ethnicity, sexual identity, and college education at three points during the transition to adulthood. We then assessed longitudinal measurement invariance to test the feasibility of modeling developmental changes in alcohol use within groups defined by these characteristics.

**Results:** Overall, findings confirm notable variability in the construct reliability of a multi-item alcohol use measure during the transition to adulthood. The alcohol use measure failed tests of metric and scalar invariance, increasingly across ages, both between- and within-groups defined by race/ethnicity, sexual identity, and college education, particularly among females.

**Conclusions:** Measurement testing is a critical step when utilizing multi-item measures of alcohol use. Studies that do not account for the effects of group or longitudinal measurement non-invariance may be statistically biased, such that recommendations for risk and prevention efforts could be misguided.

### 1. Introduction

Given knowledge on the progression of alcohol use across the transition to adulthood (Britton, Ben-Shlomo, Benzeval, Kuh, & Bell, 2015; Schulenberg, Johnston, O'Malley, Bachman, Miech, & Patrick, 2017; Maggs & Schulenberg, 2004; Schulenberg, Masklowky, & Jager, 2017), researchers are focused on groups that demonstrate risky

drinking and greater susceptibility for alcohol use disorders (AUDs; Brown et al., 2008; Larimer & Arroyo, 2016; National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2009). Vulnerable groups include racial and ethnic minorities (Delker, Brown, & Hasin, 2016; Chen & Jacobsen, 2012; Whitbrodt, Mulia, Zemore, & Kerr, 2014), sexual minorities (gay/lesbian or bisexual [LGB] people; Hughes et al., 2016; Talley et al., 2016), and college attendees (Chen & Jacobsen,

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2013; Merrill & Carey, 2016; Schulenberg & Patrick, 2012; White & Hingson, 2014). Notably, these groups also display differences in alcohol consumption relative to their respective reference groups at different points in the lifespan (Schulenberg et al., 2017; Chen & Jacobsen, 2012, 2013; Fish & Pasley, 2015), thus alcohol use measures may vary not only across groups but also across time or developmental periods.

Studies typically test group differences and trajectories in alcohol use without confirming the equivalence, reliability, or validity of alcohol consumption measures across groups or time (Fish, Pollitt, Schulenberg, & Russell, 2017; c.f., Bullers, Cooper, & Russell, 2001; Corbin, Iwamoto, & Fromme, 2011; Johnson & Chen, 2015; Sher, Wood, Wood, & Raskin, 1996), an oversight that can bias results and inferences drawn from findings (Little, 2013; Little, Card, Preacher, & McConnell, 2009; Widaman, Ferrer, & Conger, 2010). Given the research documenting maturational shifts in (Brown et al., 2008; Schulenberg et al., 2014) and differential risk for (Chen & Jacobson, 2012, 2013; Marshal et al., 2009) alcohol consumption, it is concerning that measurement invariance testing is not fundamental to studies examining the patterns, antecedents, and consequences of alcohol use from adolescence to adulthood—a critical transition for alcohol use behavior and later health and well-being (Institute of Medicine [IOM], 2015). We briefly discuss research that highlights developmental differences in alcohol use by race/ethnicity, sexual identity, and college education, and then review implications for measurement and measurement invariance testing procedures. Given established differences in alcohol use measurement by gender (see Fish et al., 2017) we conceptualize measurement differences for males and females separately.

### 1.1. Race and ethnicity

Differences in alcohol use and the associated consequences across the life course for racial/ethnic groups are exceedingly complex (Kerr, Greenfield, Bond, Ye, & Rehm, 2011; Delker et al., 2016; Witbrodt et al., 2014). Studies of youth demonstrate that White adolescents drink more than their Black peers (Jackson, Sher, Cooper, & Wood, 2002; Paschall, Freisthler, & Lipton, 2005; Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2017), with mixed findings when comparing non-Hispanic White to Hispanic adolescents (Johnston et al., 2017; Wahl & Eitle, 2010). These differences, however, do not hold over time. In one longitudinal comparison, Hispanic youth demonstrated higher rates of alcohol use during early adolescence but were surpassed by White, non-Hispanic youth by mid-adolescence (Chen & Jacobsen, 2012; see also, Haberstick et al., 2014). Relative to comparisons during adolescence, alcohol related vulnerabilities among Black adults appear later in the lifespan due to the persistence and acceleration of frequent or heavy alcohol consumption across the 20s and 30s (Chen & Jacobsen, 2012; Muthén & Muthén, 2000), which elevates risk for problems associated with alcohol use and AUDs as they age (Mulia et al., 2009; Vasilenko, Evans-Polce, & Lanza, 2017).

### 1.2. Sexual identity

Research on youth and adults consistently demonstrate alcohol-related disparities between sexual minorities and heterosexuals (IOM, 2011; Marshal et al., 2008; McCabe et al., 2009; Tally et al., 2016). Sexual minorities, particularly sexual minority women (Hughes et al., 2016), drink more often, in higher quantities, and have more consequences related to drinking than heterosexuals (Bos et al., 2016; Case et al., 2004; Rosario et al., 2014; Russell, Driscoll, & Truong, 2002; Talley et al., 2010, 2014). Longitudinal studies also document differences in alcohol use trajectories for sexual minorities compared to heterosexuals during the transition to adulthood (Fish & Pasley, 2015; Hatzenbuehler, Corbin, & Fromme, 2008; Marshal et al., 2009, 2012) and sexual minority women, compared to heterosexual women, may be more likely to continue heavy alcohol use as they age (Dermody et al., 2014; Needham, 2012).

### 1.3. College education

College students are at greater risk for excessive alcohol use and AUDs during early adulthood compared to those who do not enroll, but risk varies by age (Blanco et al., 2008; Schulenberg et al., 2017; Slutske, 2005). Prior to attending, college-bound youth are less likely to drink to excess compared to those unenrolled (Schulenberg et al., 2017; Timberlake et al., 2007). Youth who matriculate, however, quickly surpass same-aged unenrolled peers, reporting higher rates of heavy drinking during college (Chen & Jacobsen, 2013; Paschal, Flewelling, & Faulkner, 2000; Schulenberg & Patrick, 2012). College students also drink differently than their unenrolled counterparts: Those not attending college consume alcohol more frequently but in lower quantities than attenders, although this difference is narrowing (Schulenberg et al., 2017). Researchers also find differences post-graduation. Compared to degree recipients, adults without a degree drink more heavily during their late 20s and early 30s, particularly those who attended college but withdrew before conferring a degree (Merline, O'Malley, Schulenberg, Bachman, & Johnston, 2004; Chen & Jacobsen, 2013).

### 1.4. Implications for measurement

The veracity of these subgroup differences partly depends on whether measures are equivalent across subgroups. If the meaning of measures differs across groups, findings may reflect measurement differences or measurement error rather than true mean differences (Little, 2013; Little et al., 2009; Widaman et al., 2010). Latent variable modeling (i.e., structural equation modeling) is a flexible analytic framework that allows researchers to model complex research questions in ways that minimize the influence of measurement error (Kline, 2016; Little, 2013). Additional benefits of latent variable modeling include testing the reliability and operation of measures across groups of interest or for people over time via tests of measurement invariance.

To summarize briefly, assessments of measurement invariance test whether observable items consistently reflect an underlying latent construct for different groups within a population or for individuals over time. In commonly used scales, for example, individual items may have different meaning or may carry different weight across groups with respect to the underlying construct. If measurement invariance is not confirmed, parameter estimates may be biased (Little, 2013; Little, Card, Preacher, & McConnell, 2009; Kern, McBride, Laxman, Dyer, Santos, & Jeans, 2016). Importantly, issues of measurement invariance extend beyond latent variable frameworks: Use of observed measures (i.e., summed or averaged scores across items) can also reflect bias if unexamined (Meredith, 1964; Widaman & Reise, 1997).

Measurement invariance assessments typically occur in four steps, with each step imposing increasing restrictions to examine whether parameter equality constraints degrade the quality of model fit, and thus, reveal model differences across groups or time. First, an unconstrained or configural model is estimated to assess whether the factor structure (i.e., the number and pattern of factor loadings) is equivalent across groups or time. Second, for metric invariance, the factor loadings are constrained to be equal across comparison conditions. If metric invariant, the expected change for each indicator item is the same across groups for every 1-unit change in the latent construct. Third, for scalar invariance testing, equality constraints are imposed on the intercepts of observed indicator variables (along with factor loadings). If scalar invariant, results suggest that mean level differences in the latent variance similarly characterize change in the observed indicators across groups or time. The fourth step, which tests the equivalence of item-specific and random error, is not assessed here given that it is theoretically and empirically unlikely that random error would be equivalent across groups or time (see Little, 2013).

Research documenting developmental differences in alcohol use across groups of interest has challenged assumptions of measurement

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