**Latent Growth Curve Model Write-up**

Filenames:

For comparison between BT&MI treatments: rural tlhs lgcm dum12.out

For comparison between BT&TT treatments: rural tlhs lgcm dum13.out

**Analysis Plan**

In order to examine participants’ response to treatment we ran a series of latent growth curve models (LGCMs; Curran & Hussong, 2003) using Mplus version 7.2 (Muthén & Muthén, 1998-2012). LGCMs are constructed in a structural equation modeling framework where a latent intercept and slope are derived from repeated measures of observed variables. The latent intercept variables reflect the initial level of growth curve. In the current analyses, the intercept represented the intake value for heavy drinking days. The latent slope was created to reflect the rate of change in heavy drinking days examined across the 12 months of data collection. There are a variety of ways to specify rate of change with the slope parameter (e.g., linear, quadratic, log). In the current analyses, we chose to fit linear growth models to the data. Specifying linear growth is the most common approach used in LGCMs, in part because of a lack of theoretical justification for non-linear growth and for ease of interpretation. Employing LGCMs to model change overtime allows us to examine treatment effects on the rate of change in number of heavy drinking days, as well as to test for any initial differences among the treatment conditions.

There were a few statistical considerations we needed to address when running LGCMs. First, because there are three treatment conditions we created dummy codes to examine treatment effects on the rate of change and to test for initial differences among treatment conditions. The use of dummy codes necessitates running each LGCM twice to gain access to all pairwise comparisons among the treatment conditions. Second, heavy drinking days was not normally distributed, had floor effects, and was appropriately modeled in the LGCMs as censored from below. Censored variables are semicontinuous with a portion of responses equal to a single value (e.g., the floor or ceiling value) and a continuous, often skewed, distribution among the remaining values (Olsen & Schafer, 2001). Censored regression can be thought of as a two-part regression model with a probability of giving a response at the censored value and a conditional linear model for the mean response given it is nonzero (Olsen & Schafer, 2001). Censored regression models have long been applied to alcohol use data (cf. Hansen & Graham, 1991).

Since the model included censored variables, we utilized maximum likelihood estimation with robust standard errors and chi-square (MLR). The MLR estimator is recommended over the default maximum likelihood (ML) estimator when data are both missing at random and non-normally distributed because ML estimation tends to produce low standard errors and inflated model rejection rates with non-normal data (Enders, 2001; Muthén, & Asparouhov, 2002; Schafer & Graham, 2002). Overall model fit is not available for LGCMs run with censored variables. MLR with censored variables relies on raw data rather than means, variances, and covariances, which precludes the estimation of typical tests of overall model fit (Simons et al., 2014).

**Results**

*Figure 1* presents changes heavy drinking days over the course of the study, by treatment condition.

*Overall model fit.* Overall model fit was not available for the model due to the censored distribution of the data.

*Intercept and slope.* The intercept and slope parameter estimates, standard errors, and p-values are presented in Table 1. The intercept for heavy drinking days was positive but not statistically significant (b = 1.55, SE = 1.17, p =.19). Interpretation of this intercepts reveals that participants reported 1.55 heavy drinking days at the first assessment. The slopes was negative and statistically significant (b = -1.41, SE = .35, p <.001) suggesting that heavy drinking days reduced over the course of the study.

Treatment condition. Treatment condition did not predict either the intercept or slope parameters in any of the models. This suggests that the treatment group reported similar levels of heavy drinking days.

**Discussion**

The rural problem drinking men and women in this study overall exhibited small sized decreases in heavy drinking days from before to after participation in these secondary prevention intervention conditions focused on drinking reduction. Further, these changes in drinking continued to improve over the course of a 12-month follow-up period. Specifically, participants continued to decrease heavy days linearly across the 12-month follow-up period. These reductions are consistent with previous research showing that secondary prevention interventions with persons not severely dependent on alcohol can be beneficially applied in service of reducing alcohol consumption (e.g., Apodaca & Miller, 2003; van Amsterdam & van den Brink, 2013), including to persons living in rural areas.

The results did not suggest that the addition of a telephone motivational interview or a telephone motivational interview combined with biweekly telephone sessions over the 12-week intervention period overall provided further benefit to the participants. For the outcome variable assessed, the initial levels and changes across time did not vary as a function of the respective treatment conditions. Indeed, participants who only received the self-directed manual did as well as those who in addition received the treatment enhancements. It is not known why the enhancements did not provide the anticipated additional benefit. Perhaps the most plausible reason is that this group of self-referred individuals, responding to an advertisement for the project and initiating the process of their participation, already were sufficiently engaged and motivated to pursue the process of changing their drinking through use of the self-directed manual. This possibility would be consistent with past research on the use of bibliotherapy interventions with problem drinkers that has shown benefit (Apodaca & Miller, 2003).

