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Latent Classes among Recipients of a Brief Alcohol Intervention: A Replication Analysis

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Abstract

The purpose of this study was to identify differential improvement in alcohol use among injured patients following brief intervention. Latent class analysis was conducted to identify patient profiles based on alcohol-related risk from two clinical trials (Texas: N=737; Maryland: N=250) conducted in Level-1 trauma centers. Drinking was analyzed to detect improvements at six and 12 months. The four classes that emerged from Maryland participants were similar to four of the five classes from Texas. Increases in both studies for days abstinent were reported by classes characterized by multiple risks and minimal risks. Decreases in volume consumed for both studies were also reported by classes characterized by multiple risks and minimal risks. By classifying patients according to alcohol-related risk, providers may be able to build on positive prognoses for drinking improvements or adapt interventions to better serve those likely to improve less.

Keywords

Screening and brief intervention; injury; at-risk alcohol use; latent class analysis

Introduction

Screening and brief intervention (SBI) is a method to help patients who drink at or above risk levels (i.e. men: 5 drinks/day or 15 drinks/week; women: 4 drinks/day or 8 drinks/week;¹ to reduce use and to prevent alcohol-related behaviors that often precede injury.^{2,3} SBI includes screening patients for risk-level alcohol use followed by a 15–30 minute conversation wherein providers help those who screen positive for risky drinking to explore their interest and motivation to reduce alcohol use and other risk behaviors.⁴ As part of the

accreditation standards for Level-1 trauma centers, the American College of Surgeons requires that all patients be screened for at-risk alcohol use, and if positive, receive brief interventions.⁵ In spite of this requirement for service, SBI in trauma centers is not reimbursed in most states.⁶ The expense for delivering SBI is about \$55 per patient,⁷ and considering that up to 50% or more of trauma patients have been observed to use alcohol at risk-levels,⁸ the costs for SBI have the potential to mount as trauma centers typically rely heavily on governmental resources to remain solvent.^{9,10} Furthermore, health care reform will do little to offset the costs of SBI provided in trauma centers as its focus is on the integration of behavioral health into primary care and medical home settings,¹¹ with little to no discussion regarding the expansion of these reimbursements to trauma care settings. These challenges for SBI in trauma centers are compounded by the fact that SBI trials and systematic and meta-analytic reviews indicate that evidence for providing brief intervention to injured patients is mixed.^{2,3,12} Altogether, lack of provider reimbursement and the unclear empirical support produce a challenging environment for delivering brief alcohol interventions to injured patients in Level-1 trauma centers.

One approach to address these shortcomings would be to target brief intervention services to those who are most likely to change their behaviors or to tailor services to meet individual patients' needs. It is not clear from the literature, however, which patients change and which patients do not following injury, SBI, and discharge from the trauma center.¹² Researchers have identified risky alcohol use,¹³ drinking and driving^{14,15} and alcohol-related violence^{16–18} as major predictors of injury and subsequent care in emergency departments and trauma centers. Similarly, ethnicity,¹⁹ gender,²⁰ adverse driving events,²¹ high levels of drinking and alcohol-related risks,²² violence perpetration,²³ and causal attribution (believing one's drinking is the cause of the injury^{24,25} have been identified as possible factors associated with response to SBI. What has not been captured is how these antecedents of injury and the factors associated with SBI response influence one another to identify which patients make the greatest changes and which patients make the fewest changes following an injury, SBI, and discharge.

The Replication

We recently reported the results of a latent class analysis (LCA) of past injury-related risks and consequences of alcohol use reported by participants in the Multidisciplinary Approach to Reducing Injury and Alcohol study (MARIA; NCT00132262; recruitment completed in 2005;²⁶ The original MARIA project was a SBI clinical trial conducted in a Texas Level-1 trauma center. Our latent class analysis project (referred to as the MARIA LCA hereafter) was a secondary analysis of data from the MARIA study. The results of the MARIA LCA identified five subclasses of individuals among those who received the brief intervention. These five classes were labeled: (1) *multiple risks and consequences*, (2) *drunk driving foolish risk*, 3) *fighting foolish risks*, (4) *accidents and injury history*, and (5) *minimal risk and consequences*. Results from the MARIA LCA also showed that the *multiple risks and consequences* and the *accidents and injury history* classes reported the largest improvements in drinking, and the *minimal risk and consequences* class showed some improvement following discharge. Recommendations from the MARIA LCA suggested that, given the fact that some subgroups of patients experienced greater changes than others, brief

interventions could be targeted to those patients most likely to change their behaviors, or tailored to meet the individual needs of those who were less responsive.

The MARIA LCA was based on an individual dataset and is the only study of its kind to be conducted to date given the relatively new application of latent class analysis to clinical research studies. Because a central tenet of the scientific method is to conduct research that can be replicated in order to increase the objectivity, accuracy, and generalizability of results, a model replicating the MARIA LCA would provide added support for: (1) the existence of injury-related risks and consequences classes among injured patients, (2) the identification of specific changes in drinking behaviors among those classes, and (3) the recommendations for targeted or tailored SBI services. The current paper reports a partial replication of the results of the MARIA LCA utilizing data from the Delta Project (NIAAA, 5R01 AA09050; recruitment completed in 2002²⁷). Delta Project was a similar yet separate SBI clinical trial conducted in a Maryland Level-1 trauma center.

Methods

Sample

The MARIA LCA relied on data from a large-scale SBI clinical trial conducted in a Dallas, Texas, Level-1 trauma center. The MARIA project recruited adult (≥ 18 years) injured patients who had: (1) a clinical indication of intoxication upon admission to the trauma center (but not intoxicated at the time of recruitment), (2) reported drinking six hours before the injury event, (3) reported drinking at NIAAA risk levels in the past year (NIAAA, 2007), or (4) were positive on one or more items of the CAGE. The MARIA project did not limit recruitment based on alcohol use severity. MARIA participants were randomized to receive a brief motivational intervention or information only. The MARIA dataset contains 1,493 cases with baseline, six-, and 12-month alcohol use and alcohol risk information on 1,231 men and 262 women, of whom 668 are White, 288 are Black, and 537 are Hispanic. Follow up rates in the MARIA study were 77% at 6 months and 66% at 12 months, with the only difference being that Hispanics were less likely to complete the 6 month follow up assessment ($p < 0.05$).¹⁹

To determine if the MARIA LCA results would replicate, the current study utilized data from the Delta Project, a SBI clinical trial conducted in a Baltimore, Maryland, Level-1 trauma department. Delta Project recruited adult (≥ 18 years) injured patients who screened positive on two successive screening assessments. To be positive on the first screening, a patient had to report one or more of the following: (1) drinking 24 hours previous to their current injury, (2) consuming three or more drinks on a typical drinking day, (3) drinking alcohol on four or more days in the week prior to the screen, or (4) currently or regularly using illicit drugs. Meeting any of these criteria, a second screen was administered. To be positive on the second screen, patients had to report any of the following: (1) one positive item of the CAGE, (2) drinking two or more times per week with a weekly total of 15 or more drinks for men and eight or more for women, (3) drinking two to four occasions each month with a typical consumption level of five or more drinks for men and four or more drinks for women, or (4) consuming six or more drinks on one occasion, weekly, daily, or almost daily. Delta project, unlike MARIA, did not include those with the most severe

alcohol problems.²⁷ Delta Project participants were randomized to receive a brief personalized motivational intervention and follow-up or information-based advice. The Delta dataset contains 497 cases, with baseline, six-, and 12-month alcohol use and alcohol risk information on 423 men and 74 women, of whom 311 are White, 175 are Black, and 11 are from other races. Follow up rates in this study were 63% at 6 months and 50% at 12 months, with the only differences being non-Whites and participants with penetrating injuries (e.g., gunshot, stabbing) were less likely to complete follow ups assessments ($p<0.05$).²⁷

The MARIA LCA project and the current replication included only the brief intervention groups because these studies were intended to identify if latent classes existed among those who received SBI, and if so, to provide descriptive analyses of the variability in changes for post-discharge drinking among risk/consequence latent classes. That is to say, the MARIA LCA study and the current Delta LCA replication sought to determine if participants could be classified into subgroups and which group had the greatest or the least improvement in drinking behaviors after discharge. Therefore, main effects for treatment have not been included herein as those relationships are beyond the scope of these projects and have been reported previously.

Variables

The literature identifies injury-related risks and consequences of at-risk alcohol use as specific factors that drive individuals to seek emergency and trauma care.^{14,15,17,20,27} The variables selected for analysis in the MARIA LCA and the current Delta replication, therefore, were items from the Short Inventory of Problems (SIP) plus six²⁷ that capture injury-related risks and consequences of alcohol use. The SIP plus six is a 21 item measure that asks participants to indicate whether or not (yes/no) they had engaged in the behaviors or experienced consequences from their drinking. The items selected were: (1) I have driven a motor vehicle after having three or more drinks; (2) I have taken foolish risks when I have been drinking; (3) I have gotten into a physical fight while drinking; (4) I have been arrested for driving under the influence of alcohol; (5) I have had an accident while drinking or intoxicated; (6) While drinking or intoxicated, I have been physically hurt, injured or burned, and (7) While drinking or intoxicated, I have injured someone else.

Covariates estimated in the replication are also similar to those included in the MARIA LCA model; they were: (1) previous ED/hospital treatment for injury (yes/no); (2) believing the current injury was caused by alcohol consumption (i.e., causal attribution; yes/no); (3) gender (male/female), and (4) race (White/minority). The purpose of adding covariates to the model is to identify factors that influence class membership. Outcomes estimated were self-report quantity and frequency^{28,29} measures of alcohol use at baseline, six-, and 12-month follow-ups. Standard drinks were measured as 12 ounces of beer, five ounces of wine, or 1.5 ounces of distilled spirits.³⁰ Volume of alcohol use per week was calculated by multiplying quantity of drinks per occasion by frequency of drinking each week.³⁰ Percent days abstinent (PDA) estimations were based on individual participants' frequency of drinking. Percent days heavy drinking (PDHD) were calculated by dividing the frequency of having *five* or more drinks per drinking occasion in MARIA or having *six* or more drinks per

drinking occasion in Delta by participants' drinking frequency. One difference between datasets should be noted for the distal outcomes. Although changes in maximum amount consumed in the last year were reported in the MARIA LCA, they are not reported in the current replication project because maximum amount was not asked of Delta participants.

Current Analyses

Latent class analysis is a method for identifying distinct patterns of item endorsement for a response set among a group of individuals. The similar response patterns identified therefore constitute classes of study participants. The individual indicators selected for analysis in the current project were seven indicators from the SIP plus six. Although LCA models can be forced to have a specific number of classes, the replication LCA in the current paper followed a conventional model fitting procedure in order to determine the optimum number of classes that best fit the Delta data and to match the methods used in the MARIA LCA. LCA models are developed by testing an increasing number of classes; that is, a two-class solution is tested, then three, and so on, until an optimal number of classes is identified. The optimal number of classes is identified using fit criteria and likelihood ratio tests. In the current analysis, the Akaike Information Criterion (AIC), Adjusted Bayesian Information Criterion (ABIC), and Bootstrapped Likelihood Ratio Test (BLRT)^{31,32} were employed for establishing the number of classes. In terms of number of cases required to adequately power the models estimated, a common convention for latent variable modeling suggests approximately five to ten cases per parameter estimated.³³ In the MARIA LCA five-class solution, 39 parameters were estimated, necessitating a minimum of 195 cases. Therefore, the 250 patients in the Delta sample are more than sufficient cases to replicate a five-class solution.

Covariates and distal outcomes were also estimated. Covariate effects were estimated using the pseudo-class logistic regression method.³⁴ As noted above, the current replication of the MARIA LCA using the Delta data was partially limited. Minor changes in coding schemes for the covariate analyses were necessary in order to clearly show effects influencing class membership. The latent class reference group in the covariate analyses was changed from the *minimal risks* class, as was reported in Cochran et al.,²⁶ to the *accidents and injury history* class in order to more clearly report the predictors of class membership with more consistent change between studies. However, given the pseudo-class approach for covariate estimation, this change had no impact on the measurement model composition or distal outcomes. In terms of the individual items predicting membership within classes, the reference group for the binary race variable was also changed in the current analysis from White, as was reported in Cochran et al.,²⁶ to minorities to allow the covariates in the models to have similar coding schemes. Again, given the pseudo-class approach for covariate estimation, this change had no impact on the measurement model composition or distal outcomes.

Significant differences between means for the drinking outcomes were analyzed by conducting repeated ANOVA measures for individual classes based on most likely class membership. Partial eta squared (η_p^2) statistics were calculated to describe the magnitude of changes in means. Comparisons of similarities between the estimated LCA models in this

paper followed previously published approaches,³⁵ which included direct comparisons of models' conditional item probabilities and significance of covariates and drinking improvements. All analyses were conducted using Mplus 6³⁶ and IBM SPSS 20.³⁷

Altogether, the MARIA and Delta trials are comparable in most respects, with three exceptions: the number of Hispanic patients in MARIA, the restricted recruitment in Delta of patients with more severe alcohol use levels, and the absence of a maximum amount consumed outcome measure in Delta. Given these differences, we anticipated some limited comparisons in terms of the race covariate, baseline influences of alcohol use severity, and one metric of alcohol use. However, in spite of these anticipated differences, we judged the: (1) medical settings, (2) urban locations, (3) patient population (4) study design, (5) types/theoretical bases of interventions, and (6) measures more than adequate in terms of similarities to support a model replication.

Results

A total of 250 participants were analyzed from the Delta Project (737 cases were included in the MARIA LCA). Table 1 reports demographic comparisons between baseline variables. There were a greater proportion of Whites and smaller proportion of minorities in the Delta sample. The Delta sample also reported having higher levels of academic achievement than those from MARIA, and Delta participants were also less likely to be married. Lastly, although baseline comparisons between Delta and MARIA for numbers of alcohol dependent participants cannot be calculated, MARIA participants reported significantly higher baseline percent days heavy drinking and percent days abstinent than those in the Delta sample.

As was reported in our previous work,²⁶ a five-class solution emerged from among MARIA study participants who received the intervention. In the current replication using the Delta Project dataset (n=250), a four-class solution best fit the data (see Table 2). A total of 31 parameters were estimated in this four-class model. The range of quality of classification for the Delta classes was 0.89 to 0.80. At first glance, one may conclude a four-class solution from the Delta Project indicates the replication model is not similar to that found within MARIA. However, model similarities become apparent when conditional item probabilities are plotted and compared (see Figure 1). With the exception of the class identified in MARIA by a high endorsement of drinking and driving and foolish risks, each of the classes in the LCA estimated using the Delta dataset had a corresponding class in the MARIA dataset.

Class Comparisons

The MARIA *multiple risks* class (n=134, 18.1%) and *Class A* (n=51, 20.4%) from Delta Project possess similar conditional item probabilities. The *fighting and foolish risk* class (n=24, 3.3%) from MARIA and *Class B* (n=21, 8.4%) from Delta also possess similar conditional item probabilities. The profiles for the MARIA *accidents and injury history* class (n=34, 4.6%) and *Class C* (n=103, 41.2%) from Delta are also similar. Lastly, the MARIA *minimal risk* class (n=298, 40.4%) and *Class D* (n=75, 30%) from Delta shared similar profiles. Given the similarities among the classes from each dataset, the classes from

both datasets are referred to hereafter as: *multiple risks*, *fighting and foolish risks*, *accidents and injury*, and *minimal risk*.

Covariates

Covariates were estimated for the Delta Project LCA and compared to the MARIA sample, with the *accidents and injury history* class used as the reference group (see Table 3). Model similarities include causal attribution reducing the odds of *fighting and foolish risk* class membership by 76% for the MARIA sample (OR=0.24, SE=0.62, $p=0.019$) and 78% for Delta participants (OR=0.22, SE=0.66, $p=0.02$). Similarly, reporting causal attribution decreased the odds for membership in the *minimal risks* class by 84% for MARIA participants (OR=0.16, SE=0.49, $p<0.001$) and by 72% for individuals in the Delta study (OR=0.28, SE=0.49, $p=0.011$).

Distal Outcomes

Distal outcomes were also calculated for the Delta LCA and compared to MARIA participants (see Table 4). The *multiple risks* classes in the MARIA (6 months $\eta_p^2=0.15$, 12 months $\eta_p^2=0.18$; $p<0.05$) and Delta studies (6 months $\eta_p^2=0.73$, 12 months $\eta_p^2=0.65$; $p<0.05$) both reported significant improvements in days abstinent. The *minimal risks* classes from both the MARIA (6 months $\eta_p^2=0.04$; $p<0.05$) and the Delta studies (6 months $\eta_p^2=0.58$, 12 months $\eta_p^2=0.41$; $p<0.05$) also reported significant improvements for days abstinent. In terms of volume of alcohol consumed, the *multiple risks* classes from the MARIA (6 months: $\eta_p^2=0.18$, 12 months: $\eta_p^2=0.13$; $p<0.05$) and Delta studies (6 months $\eta_p^2=0.46$, 12 months $\eta_p^2=0.73$; $p<0.05$) reported significant reductions. The *minimal risks* classes also reported significant decreases in volume consumed for MARIA (6 months $\eta_p^2=0.03$; $p<0.05$) and Delta participants (6 months $\eta_p^2=0.59$, 12 months $\eta_p^2=0.50$; $p<0.05$).

Discussion

Model Consistencies and Practice Implications

Marked similarities between the MARIA five-class solution and the Delta four-class solution can be observed when comparing conditional item probabilities, particularly the plotted probabilities. Model similarities can also be viewed when comparing some covariates and distal drinking outcomes. In specific terms, the *multiple risks* and the *minimal risk* classes appear to have made the most consistent improvements in both studies. Also, the *accidents and injury history* class for the Delta sample seems to also have made improvements in drinking; however, the *fighting and foolish risk* class appears to have improved less.

Improvements in drinking for the *multiple risk* classes appear to agree with previous research^{38,39} that has demonstrated alcohol dependent participants fare better for alcohol use outcomes following SBI and discharge from a trauma center. Given that the *multiple risks* classes in the samples possess higher probabilities for risks and consequences associated with at-risk alcohol use, these classes possibly approximate the use patterns and alcohol problems associated with symptoms of dependence. Therefore, the *multiple risks* classes in

both samples could be experiencing similar changes as those individuals with drinking patterns consistent with alcohol dependence.^{38,39}

Some research indicates, however, that heavier drinkers respond less to SBI,²⁰ and federal guidelines encourage brief interventions to be delivered to those with risky or less than risky alcohol use while referral to treatment should be the focus of interactions with those who drink at higher levels.¹ The results of the current study showed that, although at somewhat smaller magnitudes, the *minimal risks* classes also reported significant improvements in use patterns. Consistent improvements for the *minimal risks* class may be in line with findings from previous research and clinical guidelines regarding the utility of brief intervention for reducing alcohol use among populations who drink at lower risk levels.

Together, these facts may help to explain some of the mixed research findings among brief interventions for injured drinkers. Considering that the results of this project possibly provide support for previous studies that have demonstrated efficacy for SBI among alcohol dependent injured patients³⁹ as well as injured patients who drink at lower levels,²⁰ it may be the case that brief alcohol interventions are helpful to both populations—not only to one or the other. Moreover, the current study may help demonstrate that improvements following SBI and discharge from a trauma center could be associated with more than just level of alcohol use. Indeed, changes injured individuals experience following SBI and discharge could be related to the multiple behaviors contributing to alcohol-related injury. LCA and other mixture modeling statistical techniques seem to be appropriate to draw out these complexities. Therefore, because subclasses and differential levels of change have been identified in two samples, future research would benefit from further exploring the similarities between models as well as possibly including effects for type of treatment.

The *accidents and injury history* class from the Delta sample also reported significant improvements for days abstinent and volume of alcohol consumed, while MARIA participants did not show significant improvements for these two outcome measures. However, we reported large effects for reductions in the maximum amount of alcohol consumed on one occasion for MARIA participants classified in the *accidents and injury history* class in our previously published MARIA LCA project.²⁶ Unfortunately (as was noted above), maximum amount consumed was not asked of Delta participants, so a comparison based on this outcome is not possible. However, a general comparison can be noted that the *accidents and injury history* class members in both studies showed significant improvements in drinking behaviors.

In addition to findings from the current study showing improvements among classes of injured patients, the *fighting and foolish risk* classes in both studies experienced some of the smallest drinking improvements. The absence of change in the *fighting and foolish risk* classes in both datasets may be somewhat counter to findings from Watt and colleagues²³ demonstrating that those who commit violent offenses have greater improvements following SBI. Future research should possibly explore alternative intervention modalities for this population if they are somewhat resistant to the SBI modality. For instance, it may be possible that brief interventions that focus on anger management skill building in connection with alcohol use reductions may yield greater changes for the individuals within this class.

Model Inconsistencies

Differences between the models warrant discussion. The Delta model does not have a *drunk driving foolish risk* class that is comparable to MARIA. State-level drinking and driving patterns may help to explain this difference. In Texas (where MARIA was conducted), drinking and driving-related fatalities are ranked 5th highest and alcohol-related crashes rank 6th highest in the nation. In Maryland (where Delta was conducted), alcohol-related traffic fatalities are ranked 35th highest and alcohol-related crashes are 36th highest in the nation.⁴⁰ It is possible that because of these higher levels of drinking and driving in Texas, a *drunk driving foolish risk* class did not emerge from the Delta sample. These regional differences in drinking and driving could also help to explain why the MARIA *multiple risks* class reported higher levels of DUI than those in the Delta *multiple risks* class.

In addition to differences based on region, the absence of a *drunk driving foolish risk* class in Delta could also be attributed to the racial/ethnic make-up of the samples. The MARIA project contained a number of Hispanic individuals, and Hispanics have been observed to drink and drive at disproportionately higher rates in the United States compared to other race/ethnicities.⁴¹ Therefore, it seems reasonable that a *drunk driving* class would emerge from the Texas sample but not from Maryland. However, further research would be beneficial to substantiate or disprove these possible explanations for model differences.

Conclusion

This analysis lends support to the concept that traumatically injured patients who receive SBI can be classified based on injury-related risks and consequences of alcohol use into similar subgroups within separate trauma centers. This analysis further demonstrates that certain classes of individuals, particularly the *multiple risks and consequences* and the *minimal risks* classes, experience some of the greatest improvements following discharge. Future research should be directed toward additional verification of the findings from this study, and research should further examine the differences noted and develop methods to test the findings within practice settings. For instance, using patient data management platforms, clinicians and researchers could develop strategies and tools to enable providers to identify patients who are included in these subclasses. With such tools created, those likely to change could more easily be targeted to receive more costly brief intervention services to maximize service delivery outcomes, and those who may be less likely to change could receive tailored interventions to meet their specific needs. Such a data-driven and targeted approach to SBI also has the potential to improve outcomes for injured patients and reduce unnecessary costs of delivering services to those unlikely to reduce use.

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Figure 1.

Plotted conditional item probabilities comparisons for MARIA (black line) and Delta (gray line)

Table 1

Population characteristics

Characteristic	MARIA			Delta			χ^2	df	p
	#	%	#	%	#	%			
Gender									
	630	85.5	212	84.8			0.07	1	0.79
	107	14.5	38	15.2					
Race/Ethnicity									
	326	44.2	157	63.1			26.4	1	<0.001
	411	55.8	92	36.9					
Education									
	196	26.6	76	30.4			9.1	2	0.01
	263	35.7	106	42.4					
	278	37.7	68	27.2					
Marital Status									
	214	29.0	54	21.6			5.2	1	0.02
	523	71.0	196	78.4					
Age ^a									
	33.4	11.4	33.3	12.4			-0.1	985	0.93
Baseline Alcohol Use									
	306	47.1	---	---			---	---	---
	0.67	0.3	0.57	0.3			-4.7	985	<0.001
Percent days abstinent [*]									
	0.62	0.4	0.55	0.4			-2.6	985	0.01
Percent days heavy drinking [*]									
Average volume consumed [*]	15.47	22.1	17.21	16.4			1.14	985	0.25

^{*} Mean, standard deviation, t-value, df, and p

Table 2

Optimum number of classes for observed indicators from MARIA and Delta samples*

MARIA LCA			
Classes	AIC	ABIC	BLRT
2	5042.20	5063.61	0.00
3	4979.08	5011.91	0.00
4	4963.14	5007.38	0.00
5	4950.12	5005.78	0.00
6	4954.35	5021.43	1.00
Delta LCA			
2	2045.95	2051.22	0.00
3	2025.66	2033.75	0.00
4	2021.48	2032.73	0.03
5	2024.30	2038.01	0.24

* Bolded values represent the class solution with the best fit.

Table 3
Covariates predicting class membership (accidents and injury history comparison group, MARIA white and Delta gray)

Class	Effect	Estimate	S.E.	p	OR	95%CI
Multiple risks	History of injury care	0.49	0.50	0.326	1.63	0.6–4.3
	Causal attribution	–0.46	0.52	0.376	0.63	0.2–1.7
	Gender	1.09	0.62	0.081	2.97	0.9–10.0
	White	0.99	0.49	0.043	2.68	1.0–7.0
	History of injury care	0.46	0.49	0.345	1.59	0.6–4.1
Fighting and foolish risks	Causal attribution	–0.92	0.56	0.098	0.40	0.1–1.2
	Male	1.34	0.87	0.123	3.83	0.7–21.1
	White	0.10	0.53	0.854	1.10	0.4–3.1
	History of injury care	0.33	0.62	0.593	1.39	0.4–4.7
	Causal attribution	–1.45	0.62	0.019	0.24	0.1–0.8
Minimal risks	Gender	0.48	0.78	0.539	1.62	0.3–7.5
	White	0.06	0.62	0.923	1.06	0.3–3.6
	History of injury care	0.38	0.62	0.543	1.46	0.4–4.9
	Causal attribution	–1.54	0.66	0.020	0.22	0.1–0.8
	Male	0.06	0.82	0.937	1.07	0.2–5.3
Minimal risks	White	–1.45	0.61	0.018	0.23	0.1–0.8
	History of injury care	–0.71	0.46	0.124	0.49	0.2–1.2
	Causal attribution	–1.82	0.49	0.000	0.16	0.1–0.4
	Gender	–0.19	0.55	0.726	0.82	0.3–2.4
	White	–0.24	0.46	0.599	0.79	0.3–1.9
Minimal risks	History of injury care	0.47	0.42	0.263	1.60	0.7–3.7
	Causal attribution	–1.26	0.49	0.011	0.28	0.1–0.7
	Male	–0.17	0.53	0.744	0.84	0.3–2.4
	White	–0.63	0.44	0.149	0.53	0.2–1.3

Table 4

Drinking levels and changes for baseline, 6, and 12 months (MARIA white; Delta gray)

Mean and SD				Changes in Mean			Partial η^2			
Class	Base	6 months	12 months	Base to 6 months	Base to 12 months	Base to 6 months	Base to 12 months			
Percent days abstinent										
Multiple risks	52%	0.3	68%	0.4	69%	0.3	16%	17%	0.15	0.18
Fighting and foolish risks	75%	0.3	92%	0.1	91%	0.1	18%	16%	0.22	0.20
Accidents and injury	70%	0.3	83%	0.3	78%	0.3	12%	8%	0.14	0.07
Minimal risk	76%	0.3	82%	0.3	77%	0.3	6%	1%	0.04	0.00
Multiple risk	60%	0.2	85%	0.1	90%	0.1	25%	29%	0.73	0.65
Fighting and foolish risks	65%	0.3	90%	0.1	88%	0.1	25%	23%	0.45	0.40
Accidents and injury	59%	0.3	89%	0.2	84%	0.2	30%	25%	0.56	0.36
Minimal risk	58%	0.3	85%	0.2	81%	0.3	28%	23%	0.58	0.41
Percent days heavy drinking										
Multiple risks	70%	0.4	61%	0.4	59%	0.4	-9%	-11%	0.06	0.05
Fighting and foolish risks	21%	0.1	51%	0.5	44%	0.4	31%	23%	0.37	0.31
Accidents and injury	72%	0.4	55%	0.5	55%	0.5	-17%	-17%	0.07	0.06
Minimal risk	49%	0.4	38%	0.4	39%	0.4	-11%	-10%	0.05	0.04
Multiple risk	46%	0.4	41%	0.4	50%	0.4	-6%	3%	0.02	0.01
Fighting and foolish risks	47%	0.4	67%	0.4	54%	0.4	20%	8%	0.14	0.24
Accidents and injury	53%	0.4	61%	0.4	57%	0.4	8%	-4%	0.03	0.01
Minimal risk	56%	0.4	56%	0.4	55%	0.4	0%	-1%	0.00	0.00
Volume per week										
Multiple risks	17.0	1.1	7.7	1.2	9.9	1.2	9.3	7.2	0.18	0.13
Fighting and foolish risks	3.3	2.2	2.4	1.5	1.7	2.1	1.0	1.6	0.02	0.08
Accidents and injury	5.4	1.4	3.2	1.6	4.7	1.5	2.3	0.8	0.11	0.02
Minimal risk	4.1	1.1	3.0	1.2	4.0	1.2	1.1	0.2	0.03	0.00
Multiple risks	8.8	1.3	2.7	1.4	2.1	1.2	6.1	6.6	0.46	0.73

Class	Mean and SD				Changes in Mean				Partial η^2	
	Base		6 months		12 months		Base to 6 months		Base to 12 months	
	Base	SD	Base	SD	Base	SD	Base	SD	Base	SD
Fighting and foolish risks	6.4	1.9	1.8	2.3	3.5	2.1	4.7	2.9	0.58	0.33
Accidents and injury	10.4	1.3	2.3	1.3	3.2	1.3	8.1	7.2	0.62	0.49
Minimal risk	15.8	1.2	4.0	1.4	6.2	1.3	11.8	9.6	0.59	0.50

(Bolded values represent $p < .05$)