Combined Treatment for At-Risk Drinking and Smoking Cessation among Puerto Ricans: A Randomized Clinical Trial

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Abstract

Tobacco and alcohol use are linked behaviors that individually and synergistically increase the risk for negative health consequences. This study was a two-group, randomized clinical trial evaluating the efficacy of a behavioral intervention, "Motivation And Problem Solving Plus" (MAPS+), designed to concurrently address smoking cessation and the reduction of at-risk drinking. Targeted interventions may promote coaction, the likelihood that changing one behavior (smoking) increases the probability of changing another behavior (alcohol use). Puerto Ricans (N=202) who were smokers and at-risk drinkers were randomized to standard MAPS treatment focused exclusively on smoking cessation (S-MAPS), or MAPS+, focused on cessation and at-risk

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drinking reduction. Drinking outcomes included: number of at-risk drinking behaviors, heavy drinking, binge drinking, and drinking and driving. MAPS+ did not have a significant main effect on reducing at-risk drinking relative to S-MAPS. Among individuals who quit smoking, MAPS+ reduced the number of drinking behaviors, the likelihood of meeting criteria for heavy drinking relative to S-MAPS, and appeared promising for reducing binge drinking. MAPS+ did not improve drinking outcomes among individuals who were unsuccessful at quitting smoking. MAPS + showed promise in reducing at-risk drinking among Puerto Rican smokers who successfully quit smoking, consistent with treatment enhanced coaction. Integrating an alcohol intervention into cessation treatment did not reduce engagement in treatment, or hinder cessation outcomes, and positively impacted at-risk drinking among individuals who quit smoking. Findings of coaction between smoking and drinking speak to the promise of multiple health behavior change interventions for substance use treatment and chronic disease prevention.

Keywords

smoking; at-risk drinking; coaction; multiple health risk behaviors; Latinos

1. Introduction

Smoking and problematic alcohol use are both major risk factors for death and chronic disease. For example, almost one-third of all cancers and cardiovascular disease in the U.S. are directly attributable to smoking[1,2] and 10% of deaths are attributable to excessive alcohol use [3,4]. Not only are tobacco and alcohol use major public health problems individually, they are clustered within individuals[5] and the simultaneous use of both substances synergistically increases the risk for chronic disease and mortality[6-8]. Moreover, these negative consequences are not limited to only heavy use. Light smoking increases cancer risk as does "at-risk" drinking[9]. At-risk drinking, as defined by the Institute of Medicine and the National Institute on Alcohol Abuse and Alcoholism, is characterized by engaging in chronic moderate or high levels of use and/or frequent binge drinking, and is related to numerous negative health and social consequences[10-12].

Fortunately, the risk for various diseases and other negative health consequences declines following smoking cessation and the reduction of alcohol use[13-15]. Thus, a critical strategy for chronic disease prevention is to reduce the use of these two substances. National recommendations include integrating screening and treatment of tobacco use and at-risk drinking into health-related settings[12,16]. Further, because the clustering of smoking and drinking increases disease risk, treatment costs, and public health burden, there is an urgent need for interventions designed to change multiple risk factors[17]. Some research suggests that multiple risk behavior interventions are cost effective, efficacious, and well received[18,19]. In addition, research on multiple health risk behaviors is increasingly emphasizing the study of coaction, defined as the likelihood that change in one behavior increases the probability of change in a second behavior[20,21]. Importantly, coaction is more likely to occur in the context of targeted interventions addressing the behaviors of interest, indicating that coaction can be induced via treatment. However, few studies have evaluated

coaction between smoking and at-risk drinking either via treatment or as part of the natural history of change in these behaviors[22-25].

Combined treatments for smoking and alcohol use have been primarily conducted among individuals who were in treatment for alcohol abuse/dependence, with smoking as a secondary target of treatment[26]. However, the few studies that have evaluated interventions that add treatment for nondependent alcohol use to smoking cessation treatment have yielded promising results for both smoking and drinking outcomes[27,28]. Given that approximately half of all smokers attempt to quit each year[29], introducing alcohol risk reduction into smoking cessation treatments could be an effective approach to increasing the impact of substance use treatment and chronic disease prevention efforts.

Motivational enhancement and problem solving/coping skills training are empirically supported treatments for both smoking and problematic alcohol use[16,30,31], and recommendations have been made for the integration of these approaches[32,33]. Motivation And Problem Solving (MAPS) is an intervention that combines attributes of both approaches[16,34,35] to address the consideration, initiation, and maintenance of behavior change[36]. MAPS utilizes a Wellness Program that is developed in collaboration with the participant. The Wellness Program addresses treatment goals related to behavior change as well as other salient concerns for the participant such as mood and contextual factors[36]. Compared to approaches that emphasize stages or phases of change[37], MAPS conceptualizes motivation for behavior change and maintenance as a dynamic and fluid process that varies from moment to moment depending on both individual and contextual factors[36]. Randomized clinical trials have demonstrated that MAPS and its precursors are effective interventions for improving smoking related outcomes including promoting a quit attempt, cessation, and relapse prevention[38-40].

The current study evaluated the efficacy and coaction potential of using MAPS to address both smoking cessation and reduction of at-risk alcohol use among Puerto Rican smokers who were also at-risk drinkers. Like the general population of the U.S., tobacco and alcohol use are major public health problems in Puerto Rico (PR). Although the adult prevalence of smoking in PR is lower (14.8%) than the prevalence of smoking in the U.S. (18.1%)[41,42], three (heart disease, cancer and cerebrovascular disease) of the five leading causes of death in PR are associated with smoking[43]. Similarly, although Puerto Ricans living in PR are less likely to drink than are either the general population or Latinos in the U.S., those who do drink are more likely to be binge drinkers[44]. Thus, reducing both smoking and drinking is crucial to disease prevention in this population.

A standard MAPS treatment (S-MAPS) focused on smoking cessation alone was compared to an enhanced MAPS intervention (MAPS+) that addressed both smoking cessation and the reduction of at-risk drinking behaviors. MAPS+ was hypothesized to be more effective than S-MAPS at reducing at-risk drinking and to produce greater coaction such that individuals who quit smoking would be more likely to also reduce at-risk drinking behaviors. Similar to coaction metrics in previous research[23], in our study coaction was evidenced by individuals indicating change in a second behavior (e.g. at-risk drinking) after successfully changing an

initial behavior (e.g. smoking). S-MAPS and MAPS+ were hypothesized to be equally effective with respect to smoking cessation.

2. Methods

2.1. Participants

The study was a two-group randomized clinical trial (RCT) conducted among 202 Puerto Rican smokers who were attempting to quit smoking and who were also at-risk drinkers. Inclusion criteria were: current daily smoker interested in quitting smoking in the next 30 days, aged 18 years, resident of PR, having a working telephone number and home address, no other household members enrolled in the study, and meeting at least one at-risk drinking criterion in the past 30 days [average of 2 drinks per day (males) or 1 drink per day (females); two or more occasions of consuming 5 drinks (males) or 4 drinks (females); or one or more occasions of driving after consuming 3 drinks][11,12]. Exclusion criteria were: currently pregnant, currently incarcerated, or having a score of 16 on the Alcohol Use Disorders Identification Test[45], which indicated a probable alcohol use disorder and the need for more than brief counseling. Major causes of ineligibility included not meeting criteria for at-risk drinking (37%) or scoring 16 or above on the AUDIT (62%). Individuals excluded from the study due to high AUDIT scores were given referral for more intensive alcohol treatment.

2.2. Procedures

This trial was registered on the United States National Institutes of Health Clinical Trials Registry, and was approved by the Institutional Review Board.

Potential participants were recruited through the Puerto Rico Quitline (PRQ) and via local newspaper advertisements in PR. Individuals were screened for eligibility by phone, and eligible participants were scheduled for a Baseline assessment call. All individuals who were ineligible, withdrew from the study, or chose not to participate, remained eligible for free smoking cessation treatment from the PRQ. Baseline assessments were conducted following verbal informed consent procedures (i.e. audiotaped, encrypted, and stored in password protected files). Enrollment spanned September 2009 through May 2011. After the Baseline assessment call, participants were randomly assigned to S-MAPS or MAPS+ using a computer-generated form of adaptive randomization called *minimization*[46,47]. Compared to techniques such as stratification, minimization results in a better group balance with respect to participant characteristics. Minimization also provides for balanced treatment groups throughout the randomization process and extended accrual periods. The variables used for minimization randomization were: age, gender, cigarettes/day, drinks/day and depressive symptoms (as measured by The Center for Epidemiologic Studies Depression Scale[48]. Blinded follow-up assessments were conducted via telephone at weeks 12, 26 and 52 after Baseline. Study procedures were conducted in Spanish. Different personnel functioned as counselors and assessors. Participant's compensation (gift cards up to $100) was for data collection only and was not associated with treatment. Figure 1 shows participant flow.

Counselor selection criteria and training were consistent with several major national clinical trials evaluating motivational interviewing-based approaches and with real world quitline counselors[49,50]. Five counselors provided the treatments. All counselors had a masters or doctoral degree in counseling or psychology, at least two years of clinical experience, and received approximately 40 hours of training in tobacco cessation and MAPS.

2.3. Interventions

All participants received Spanish-language self-help materials addressing alcohol and tobacco use[51,52] and up to seven telephone counseling calls, which lasted approximately 20-30 minutes each, and occurred within 26 weeks of the Baseline assessment. The sessions were usually completed over the six month time frame. Sessions typically occurred more often in the beginning as participants attempted to set a quit date, with more time elapsing between sessions as the treatment progressed. For participants willing to set a quit date, a typical call schedule included two pre-quit calls, one call on the quit day, and four calls post-quit day. However, is important to highlight that MAPS is characterized by a patient-centered approach, and as such, the timing of each call was flexible, based on the participant's individual needs and negotiated together by the participant and counselor.

In brief, S-MAPS utilized motivational enhancement techniques to increase motivation to change smoking behavior and enhance participant's self-efficacy to make a quit attempt[35]. In addition, S-MAPS utilized skills training and problem solving techniques to assist participants in initiating and maintaining their quit attempts, and in recovering from lapses[16,34]. In the S-MAPS group, the Wellness Program addressed treatment goals related to smoking abstinence as well as other relevant issues for the participant. Importantly, this treatment approach underscore participant's language to help guide the course of the treatment from moment-to-moment and determine when to shift from a motivational to a skill-building focus, and vice versa (for details see Vidrine et al., 2013)[36].

The content of MAPS+ was identical to S-MAPS with respect to smoking cessation. Additionally, MAPS+ incorporated discussion of at-risk drinking and the counselor encouraged the inclusion of reducing at-risk drinking as a goal in the Wellness Program. Typically, the introduction of alcohol use in MAPS+ occurred in relation to participant's smoking patterns (e.g. contexts in which they smoke, past relapses). If alcohol use was not brought up by the participant, the counselor would note that drinking is a common antecedent of smoking and would inquire about how drinking might influence the participant's smoking in order to introduce the topic. In MAPS+, the topic of at-risk drinking was raised in each session by the counselor if the participant themselves did not raise it. In S-MAPS, the counselor never raised the issue of at-risk drinking, but would be responsive to its discussion as a trigger for smoking (similarly to other triggers like stress, etc.) if the issue was raised by the participant.

To ensure treatment fidelity and monitor drift from the protocol, all counseling sessions were recorded, and two randomly selected sessions per month per counselor were coded using a modified version of the Motivational Interviewing Treatment Integrity Code 3.1.1(MITI)[53]. Additionally, the supervisor assessed intervention fidelity by assuring that the counselor raised the discussion of at-risk drinking only in the MAPS+ sessions.

2.4. Measures

2.4.1. Demographic and tobacco-related variables at baseline—Demographic and tobacco-related variables collected at Baseline included age, gender, partner status, education, employment status, income, daily smoking rate, and time to first cigarette upon awakening. Daily smoking rate and time to first cigarette comprised the Heaviness of Smoking Index (HSI)[54].

2.4.2. Drinking Outcomes—Drinking outcomes included indicators of at-risk drinking within the past 30 days. Specifically, to assess heavy drinking, participants were asked to indicate how many drinks they consumed on average each day of the week. To assess binge drinking, participants were asked how many times they consumed four or more drinks (for females) and five or more drinks (for males) in one occasion. To assess drinking and driving, they were asked how many times they drove after consuming three or more drinks. Raw data were categorized to identify respondents that met criteria for one or more at-risk drinking indicators, as defined in the eligibility criteria. For instance, *primary drinking outcomes* were: (a) number of at-risk drinking behaviors for which the person met criteria; (b) average number of drinks per day; (c) number of binge drinking episodes; and, (d) number of drinking and driving episodes. *Secondary drinking outcomes* were dichotomous indicators of whether the person met criteria (yes/no) for: (a) overall at-risk drinking (meeting criteria for either heavy drinking, binge drinking, or drinking and driving); (b) heavy drinking - an average of 2 drinks per day (males) or 1 drink per day (females); (c) binge drinking - two or more occasions of consuming 5 drinks (males) or 4 drinks (females); and (d) drinking and driving - one or more occasions of driving after consuming 3 drinks.

Drinking outcomes were measured at each follow-up (weeks 12, 26 and 52).

2.4.3. Smoking Outcomes—*Smoking status* was defined as a seven-day point prevalence smoking abstinence, indicated by a self-report of not smoking during the previous 7 days. Smoking outcomes were measured at each follow-up (weeks 12, 26 and 52).

2.5. Data Analysis

Descriptive statistics, chi-square tests, and t-tests were used to describe the sample and examine between-group differences in Baseline demographic characteristics, tobacco use, and at-risk drinking behaviors. Because all of the outcome measures were repeated over time and correlated within subjects, the data analytic approach utilized generalized linear mixed model (GLMM) regression[55,56]. For continuous outcomes, linear mixed models (LMMs) were fitted. For binary outcomes, GLMM with logit link and binomial variance functions were used. All tests were two-sided.

To examine treatment effects at the end of the intervention and beyond, the main effect of treatment condition (S-MAPS vs. MAPS+) on each of the primary and secondary at-risk drinking outcomes over time (i.e., weeks 26 and 52) was tested after adjusting for time, demographics [age, gender, partner status, education, employment and income], smoking status (at week 12) and the baseline measure of the specific outcome being analyzed (e.g.,

average drinks/day). Additionally, to evaluate the effect of treatment on coaction between smoking and alcohol use, the interaction between treatment and smoking status at week 12 was tested to prospectively predict the reduction of at-risk drinking overtime (i.e., weeks 26 and 52) after adjusting for time, the same covariates, treatment, and week 12 smoking status.

To evaluate treatment effects on smoking outcomes over time, analyses included treatment condition (S-MAPS vs. MAPS+) as the predictor, adjusted for time, demographics, and baseline HSI. An intent-to-treat imputation procedure was utilized for smoking outcomes whereby participants lost to follow-up were treated as smokers. This approach was compared with a "Completers only" analyses.

3. Results

3.1. Participants characteristics and follow-up rates

There were no group differences in demographics, tobacco use, or at-risk drinking behaviors at Baseline (Table 1). Follow-up rates were 79% (n = 160) at week 12, 73% (n = 148) at week 26, and 67% (n = 136) at week 52. Over 68% of the sample completed all seven counseling calls, and 82.1% completed at least 4 of the 7 calls. Follow-up rates and completion of counseling sessions did not differ by treatment group (Figure 1; X^2=4.65, df (3); p < .05).

3.2. Drinking Outcomes

The main effect of treatment condition was not statistically significant for any of the primary or secondary at-risk drinking outcomes (Table 2). However, the interaction between treatment condition and smoking status at week 12 (coaction) was significant for multiple at-risk drinking outcomes (Table 2). Specifically, the treatment by smoking status interaction significantly predicted the primary outcomes of number of at-risk drinking behaviors and number of binge drinking episodes, and the secondary outcomes of meeting criteria for heavy drinking and binge drinking (Table 2).

Follow-up analyses of the significant interactions revealed that MAPS+ increased the likelihood of reducing various at-risk drinking behaviors compared to S-MAPS, but only among smokers who successfully quit, as predicted by the coaction hypothesis. Figure 2 illustrates the reduction of at-risk alcohol drinking patterns for the treatment conditions by smoking status. For smoking abstainers at week 12, MAPS+ was significantly more efficacious than S-MAPS in reducing the number of at-risk drinking behaviors (B= −0.560; 95% CI = −1.067, − 0.053; p = 0.031) and the odds of meeting criteria for heavy drinking (OR= 0.042; 95% CI = 0.003, 0.579; p = 0.018), and approached significance for reducing the odds of meeting criteria for binge drinking (OR= 0.214; 95% CI = 0.043, 1.060; p = 0.059), but was not statistically significant in reducing the number of binge drinking episodes (OR= −1.42; 95% CI = −3.40, 0.56; p = 0.159). Among smokers at week 12, MAPS+ did not reduce the total number of at-risk drinking behaviors (B= 0.158; 95% CI = −0.126, 0.442; p = 0.276), number of binge drinking episodes (B= 1.092; 95% CI = −0.015, 2.199; p = 0.053), the likelihood of meeting criteria for heavy drinking (OR= 1.513; 95% CI

= 0.490, 4.667; $p = 0.471$), or the likelihood of meeting criteria for binge drinking (OR= 1.842; 95% CI = 0.802, 4.233; $p = 0.150$).

3.3. Smoking Outcomes

As expected, there were no effects of treatment condition on smoking abstinence overtime or at any single time point when examining intent-to-treat or completers only analyses, including after controlling for demographics and HSI (all p's > .05).

4. Discussion

MAPS+, a theoretically and empirically-based intervention to simultaneously treat smoking and at-risk alcohol use, showed promise in reducing at-risk drinking behaviors among Puerto Rican smokers, but only among those individuals who were able to quit smoking. These effects are consistent with treatment enhanced coaction. Among those individuals who quit smoking, MAPS+ reduced the overall number of at-risk drinking behaviors and the likelihood of meeting criteria for heavy drinking relative to S-MAPS, and appeared promising for reducing binge drinking, although the treatment effect was not significant. MAPS+ did not improve drinking outcomes among individuals who were unsuccessful at quitting smoking.

Contrary to our hypotheses, MAPS+ did not have a significant main effect on reducing at-risk drinking relative to S-MAPS. Notably, both groups showed substantial declines in at-risk drinking behaviors from screening to week 12 and those declines were sustained across the entire one year follow-up period. The findings demonstrating considerable reductions in drinking behaviors in *both* treatment groups is consistent with results from Kahler et al.[27], one of the few other trials explicitly designed to address drinking in the context of a smoking cessation intervention. Together, these results suggest that participants receiving smoking cessation treatments may learn and apply principles and skills for behavior change that apply across behaviors, or that such participants may be motivated for changing multiple behaviors (at least with respect to smoking and drinking). Importantly, however, the current study found that the reductions in at-risk drinking differed among those who continued to smoke and those who successfully quit only when treatment specifically addressed the reduction of drinking. That is, there was evidence for MAPS+ induced coaction related to successful smoking cessation and declines in at-risk drinking, but not coaction related to abstinence from smoking per se[57,58]. These findings are consistent with previous research indicating that higher levels of coaction typically occur among participants receiving treatments designed to promote multiple behavior change compared to usual care or control groups[21,23], and indicate that further research is needed to elucidate the natural history of alcohol use among smokers attempting to quit.

Our findings uniquely contribute to the literature[26,59-61] by suggesting that concurrent treatment for at-risk alcohol use in the context of smoking cessation treatment may facilitate coaction. Given that coaction has typically been examined in the context of stage-based interventions, this study also contributes to the dearth of research addressing coaction in the context of other theoretically-driven approaches[21,23]. MAPS-based interventions specifically target behavior change in an integrated and holistic way by addressing substance use within

the context of general life stressors and regardless of the individual's motivation to change[36]. By taking a broad, holistic approach to treatment, MAPS-based interventions may be a particularly appropriate approach for addressing multiple risk factors simultaneously. The results also indicate that integrating an alcohol intervention into smoking cessation treatment does not undermine smoking outcomes (or improve them either)[26,27]. Given the phone-based nature of the intervention, our findings are consistent with current recommendations that quitlines should offer alcohol counseling to smokers who exhibit hazardous drinking[62], and particularly so among successful quitters.

4.1. Strengths and Limitations

To the best of our knowledge, this research is the first randomized controlled trial evaluating a combined behavioral intervention for at-risk drinking and smoking cessation among a Latino group, and one of the few addressing at-risk drinking in the context of a smoking cessation treatment, rather than focusing on smoking cessation among alcohol dependent individuals. Long term follow up, and satisfactory follow-up rates were also strengths.

Findings should be interpreted in light of some limitations. Results may not be generalizable to individuals from other racial/ethnic groups and/or dependent drinkers. Applicability to Puerto Ricans living in the U.S. as well as other Latino subgroups also awaits verification. Also, the sample size may be considered small and precluded formal examination of the mechanisms of coaction effects. Finally, this study examined self-reported abstinence from both tobacco and alcohol[63,64]; thus, future studies should utilize additional methodologies including biochemical markers or other corroborating data sources[19,65].

4.2. Conclusion

The present study addresses the need for treatments targeted at changing multiple addictive behaviors (i.e., smoking and at-risk alcohol use), and does so through telephone counseling, a population-based delivery mechanism that is ubiquitous throughout the U.S. and Puerto Rico. Findings suggest that integrating an alcohol intervention into smoking cessation treatment does not reduce engagement in smoking cessation treatment, does not hinder smoking cessation outcomes, and can positively impact at-risk drinking among individuals who successfully quit smoking. Findings of coaction between smoking and drinking speak to the promise of multiple health behavior change interventions for substance use treatment and chronic disease prevention[19,20].

Acknowledgments

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Highlights

- Study tested the efficacy of concurrently treating smoking and at-risk drinking

- Motivation And Problem Solving (MAPS+) was the enhanced intervention in the study

- There was no main effect of treatment on at-risk drinking or smoking outcomes

- Smoking status moderated the effect of MAPS+ on several at-risk drinking behaviors

- Findings are consistent with treatment enhanced coaction for smoking and drinking
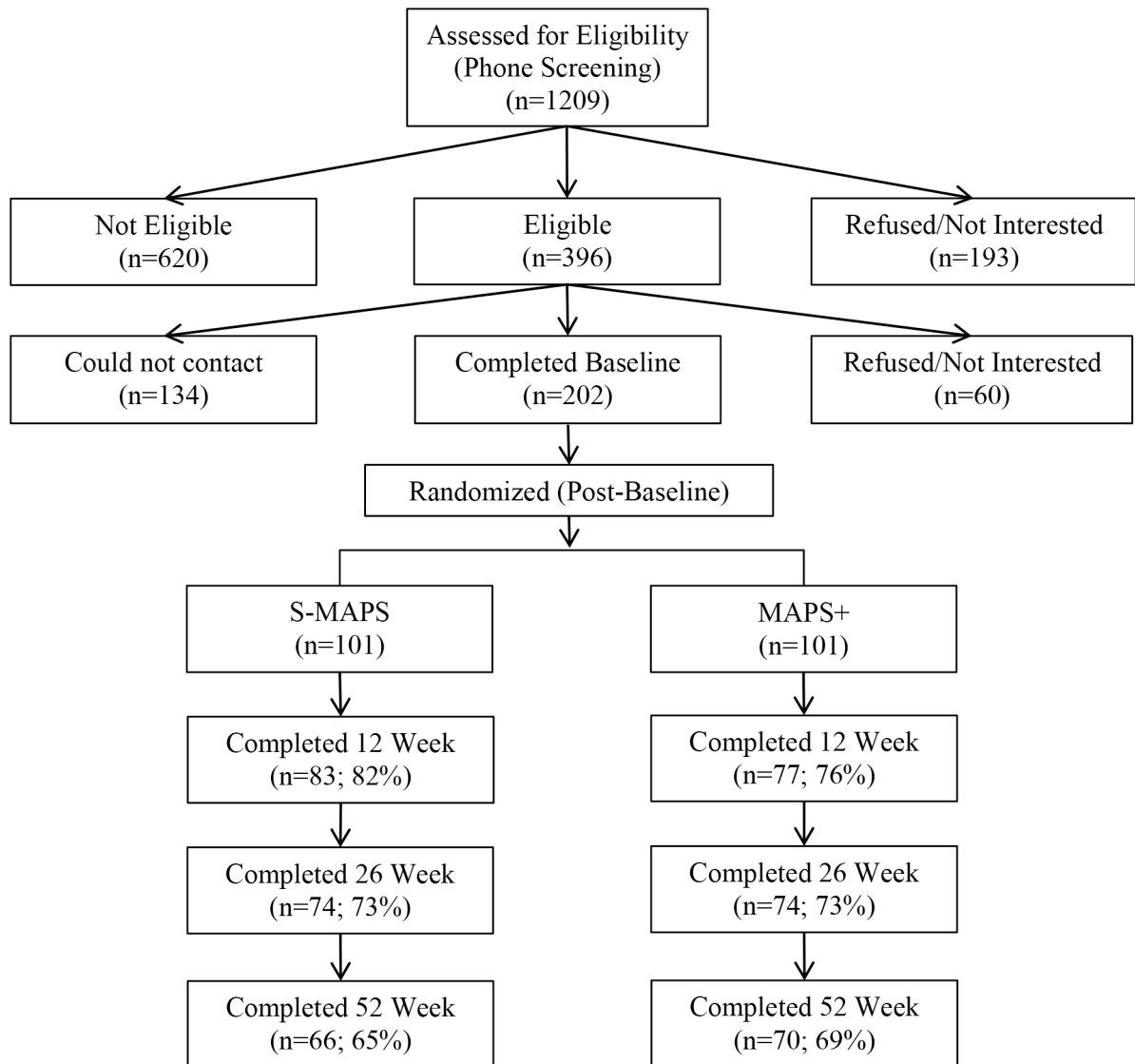
Figure 1.
CONSORT flowchart of recruitment, randomization, attendance and follow-ups. S-MAPS = Standard Motivation And Problem Solving treatment for smoking cessation; MAPS + = Motivation And Problem Solving for smoking cessation plus at-risk alcohol use
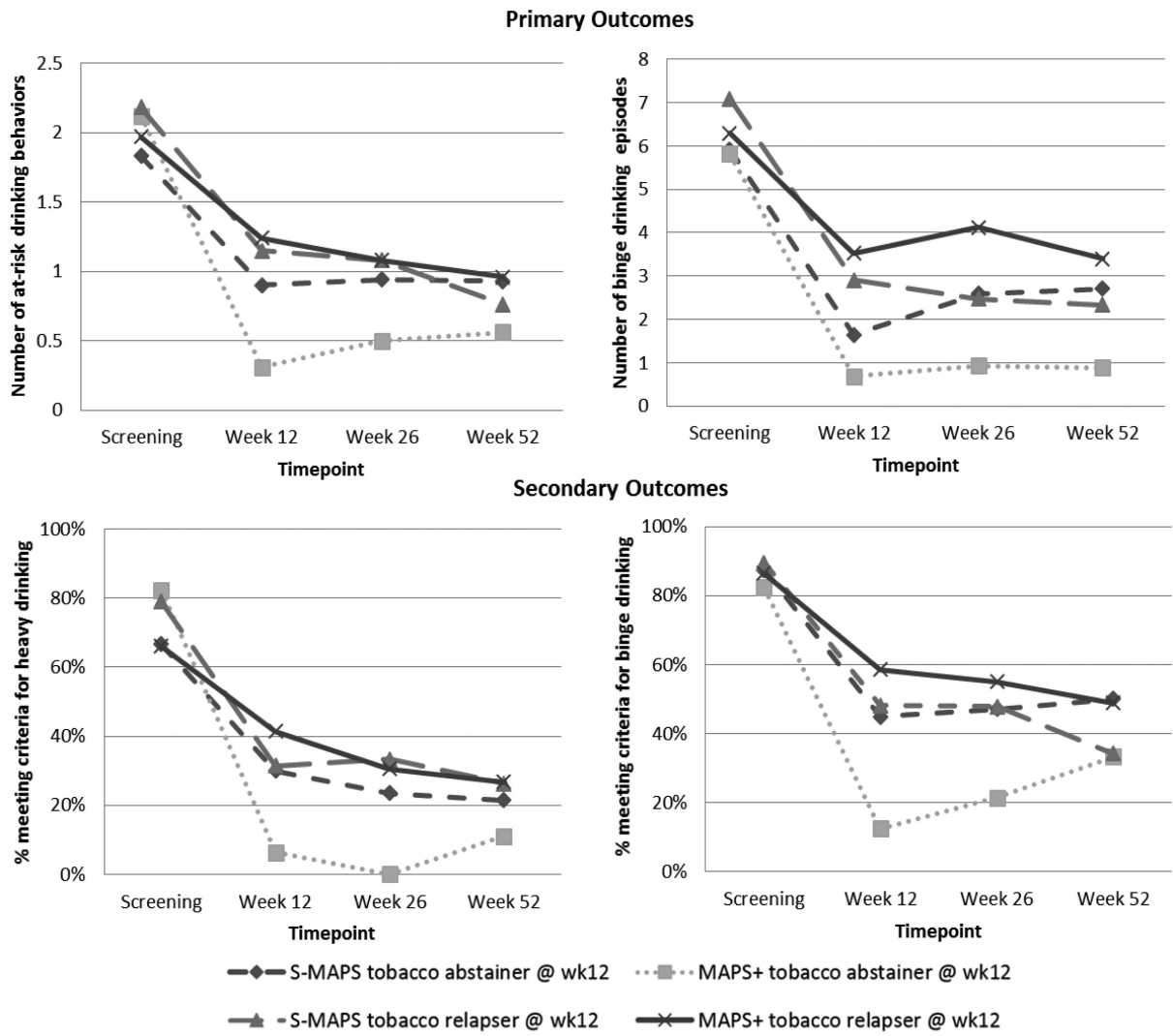
Figure 2.
At-risk drinking behaviors by treatment group and smoking status.

Table 1

Baseline participant characteristics by treatment group

Variable	Total (N= 202)	S-MAPS (n=101)	MAPS+ (n=101)	p
Demographics				
Age, years (*M*±*SD*)	43.59 (11.8)	42.97 (11.7)	44.21 (11.9)	0.46
Gender, n (%)				0.89
Female	93 (46.0)	47 (46.5)	46 (45.5)	
Male	109 (54.0)	54 (53.5)	55 (54.5)	
Partner status, n (%)				0.89
Married/Living with partner	81 (40.1)	41 (40.6)	40 (39.6)	
Not living with partner	121 (59.9)	60 (59.4)	61 (60.4)	
Education, n (%)				1.00
High School	64 (31.7)	32 (31.7)	32 (31.7)	
> High School	138 (68.3)	69 (68.3)	69 (68.3)	
Employment status, n (%)				0.20
Employed	115 (56.9)	62 (61.4)	53 (52.5)	
Unemployed	87 (43.1)	39 (38.6)	48 (47.5)	
Household income, n (%)				0.34
<$24,000/year	133 (65.8)	64 (64.0)	69 (70.4)	
$24,000/year	65 (34.2)	36 (36.0)	29 (29.6)	
Tobacco use				
Cigarettes per day (*M*±*SD*)	16.82 (8.6)	16.62 (9.0)	17.02 (8.3)	0.74
Smokes 5 minutes after waking, n (%)	72 (35.64)	36 (35.6)	36 (35.6)	1.00
At-risk drinking behaviors				
Primary Outcomes [M±SD]				
Heavy drinking (average drinks per day)	2.63 (2.2)	2.56 (2.1)	2.70 (2.3)	0.65
Binge drinking (episodes in past 30 days)	6.46 (6.4)	6.75 (6.5)	6.16 (6.3)	0.51
Drinking and driving (episodes in past 30 days)	2.43 (4.5)	2.78 (5.2)	2.07 (3.6)	0.26
Secondary Outcomes [(meeting criteria), n (%)]				
Heavy drinking	147 (72.8)	76 (75.3)	71 (70.3)	0.43
Binge drinking	176 (87.1)	89 (88.1)	87 (86.1)	0.67

Variable	Total (N= 202)	S-MAPS (n=101)	MAPS+ (n=101)	p
Drinking and driving	89 (44.1)	43 (42.6)	46 (45.5)	0.67

Note: S-MPAS = Standard Motivation And Problem Solving; MAPS+ = Enhanced Motivation And Problem Solving.

Table 2

Effects of treatment on drinking outcomes overtime

	Overall At-risk Drinking	Heavy Drinking	Binge Drinking	Drinking & Driving
Primary Outcomes	B [CI]	B [CI]	B [CI]	B [CI]
Main Treatment Effect ^	−0.01 [−0.27, 0.24]	0.04 [−0.26, 0.34]	0.50 [−0.49, 1.49]	−0.14 [−0.63, 0.35]
Coaction Effect				
Treatment*Smoking Status (week 12) ^^	**−0.72 [−1.30, 0.14]****	−0.33 [−1.02, 0.35]	**−2.51 [−4.77, −0.26]***	−0.84 [−2.03, 0.34]
Secondary Outcomes	OR (CI)	OR (CI)	OR (CI)	OR (CI)
Main Treatment Effect ^	1.05 (0.46, 2.39)	0.78 (0.27, 2.29)	1.15 (0.54, 2.45)	0.72 (0.29, 1.79)
Coaction Effect				
Treatment*Smoking Status (week 12) ^^	0.22 (0.03, 1.44)	**0.03 (0.002, 0.49)****	**0.12 (0.02, 0.71)***	0.71 (0.07, 6.72)

Note: S-MAPS is the reference category; 1=meeting criteria for the specific at-risk behavior

Demographic covariates are age, gender, partner status, education, employment and income

Baseline alcohol = baseline (pre-treatment) value for the specific alcohol outcome variable being analyzed

Boldface indicates statistical significance (*p < .05, **p < .01)

^
Adjusted for time, demographics, week 12 smoking status & baseline alcohol

^^
Adjusted for time, demographics, treatment, week 12 smoking status & baseline alcohol