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Addictive Behaviors



Effectiveness of social norms media marketing in reducing drinking and driving: A statewide campaign

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ABSTRACT

This research evaluated the efficacy of a high-intensity social norms media marketing campaign aimed at correcting normative misperceptions and reducing the prevalence of drinking and driving among 21-to-34-year-olds in Montana. A quasi-experimental design was used, such that regions of Montana were assigned to one of three experimental groups: social norms media marketing campaign, buffer, and control. Four random samples of Montanans between the ages of 21 and 34 were assessed at four time points over 18 months via phone surveys. Findings suggest that the social norms media campaign was successful at exposing the targeted population to social norms messages in the counties within the intervention region. Moreover, results demonstrate the campaign reduced normative misperceptions, increased use of designated drivers, and decreased drinking and driving among those young adults in counties within the intervention region. Social norms media marketing can be effective at changing drinking-related behaviors at the population level. This research provides a model for utilizing social norms media marketing to address other behaviors related to public health.

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1. Introduction

In 2002, Montana ranked first in the nation for alcohol-related fatalities per Vehicle Miles Traveled, up from fourth in 1999 (National Highway Traffic Safety Administration [NHTSA], 2000, 2003). Alcohol- and drug-related vehicle crashes accounted for approximately 10% of all crashes in Montana (Montana Department of Transportation, 2003). Young adults play a disproportionate role in incidence of crashes involving driver impairment. In 2002, 21-to-30-year-olds represented nearly half of all alcohol- and drug-related crashes in Montana (MDT, 2003). The purpose of this research was to evaluate the efficacy of a high-intensity social norms marketing media campaign at correcting normative misperceptions and reducing drinking and driving behavior in this population in Montana.

1.1. Social norms marketing

Social norms marketing is an intervention strategy that originated on college campuses. In function, social norms marketing consists of disseminating accurate norms such as with drinking (e.g., “85% of students on our campus drink 0–1–2–3 or at most 4 drinks when they

party;” “Most students drink only once a week, less often, or do not drink”) usually in the form of newspaper ads, flyers, posters, electronic media, etc. The approach has a theoretical foundation that can be expressed by four tenets (Perkins, 2003a). First, perceived norms are consistently and positively associated with drinking. Second, people tend to overestimate the drinking of their peers (i.e., normative misperception). Third, overestimation of peer drinking is associated with heavier subsequent drinking. Fourth, and finally, successful correction of normative misperception should reduce drinking. The first three of these tenets have been consistently supported in peer-reviewed empirical studies among young adults (e.g., Borsari & Carey, 2003; Lewis & Neighbors, 2004; Perkins, Meilman, Leichliter, Cashin, & Presley, 1999; Perkins, Haines, & Rice, 2005). The fourth tenet has also received support in rigorous studies evaluating the relationship between changes in perceived norms and changes in drinking (e.g., Borsari & Carey, 2000; Lewis & Neighbors, 2007; Mattern & Neighbors, 2004; Neighbors, Larimer, & Lewis, 2004; Neighbors, Lewis, Bergstrom, & Larimer, 2006; Perkins & Craig, 2006). Moreover, consistent empirical support for individual assumptions underlying the theory (albeit limited largely to college student populations) suggests that correcting alcohol-related normative misperceptions is a sound approach.

Perhaps not surprisingly, the social norms marketing strategy has been implemented most extensively in the U.S. higher education

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system (Wechsler, Seibring, Liu, & Ahl, 2004). Despite the compelling theoretical soundness of this approach and its extensive dissemination in the peer-reviewed literature, controversy exists regarding the effectiveness of social norms marketing. Much research demonstrates support for social norms marketing as an effective strategy in reducing drinking (e.g., DeJong et al., 2006; Haines & Spear, 1996; Mattern & Neighbors, 2004; Perkins, 2002; Perkins & Craig, 2006; Perkins et al., 2005; Turner, Perkins, & Bauerle, 2008) although some other research indicates no support (e.g., Clapp, Lange, Russell, Shillington, & Voas, 2003; Wechsler et al., 2003).

Fewer published studies have researched utilization or correction of normative misperceptions outside of adolescent and college student populations (Chan, Neighbors, Gilson, Larimer, & Marlatt, 2007; Cunningham, Koski-Jannes, Wild, & Cordingley, 2002; Cunningham, Wild, Bondy, & Lin, 2001; Linkenbach & Perkins, 2003; Miller, Zweben, DiClemente, & Rychtarik, 1994). For example, Chan and colleagues (2007) discuss incorporating normative feedback into prevention and treatment for adults using norms from a nationally represented dataset. Project MATCH (1998) presented gender-specific normative feedback to adults based on the National Alcohol Survey as a component of the motivational enhancement therapy condition (Miller et al., 1994). Moreover, Cunningham and colleagues (2002) found that normative information in combination with self-help materials was effective at reducing drinking at a six-month follow-up for an adult population.

1.2. The present research

The present study was designed to accomplish several aims. First, to date, no peer-reviewed publications have evaluated a social norms marketing campaign implemented on a statewide level. Second, in spite of relatively few controlled studies in the peer-reviewed literature, and hence limited evidence, social norms marketing is being implemented widely in the U.S. education system, especially on college campuses (Wechsler et al., 2004). Thus, evaluations of the approach in large scale controlled studies are desperately needed. Third, and finally, the vast majority of interventions incorporating the social norms approach have been limited to school settings. While evidence suggests that when these approaches are successful in correcting normative misperceptions they also change behavior (i.e., reduce drinking), few published studies have explored whether the approach generalizes to the general population. Based on these considerations, this research was designed to test an extensive statewide social norms media marketing campaign targeting drinking and driving among young adults. Specifically, we wished to evaluate whether the social norms media marketing campaign reached the target audience, whether it was effective in reducing perceived norms of the prevalence and frequency of drinking and driving, and whether it was effective in reducing actual drinking and driving.

2. Method

2.1. Participants/procedure

The target population for the present research was young adults between the ages of 21 and 34. This demographic group was selected given its high percentage of involvement in alcohol-related motor vehicle crashes (MDT, 2003). Mean age of participants ranged from 27.4 ($SD = 4.1$) to 29.5 ($SD = 3.8$) across the four assessments. Gender was roughly equal at all four assessments (50.0–54.6% female). Between 6.1 and 7.3% of the sample across the four surveys were racial/ethnic minorities. Response rates based on eligible people reached by phone (i.e., excluding disconnected numbers, those with people outside the age range, or no answer when dialed) were 36% in 2001, 25% in 2002, 48% in March 2003, and 44% in June 2003. The 2002 survey had a notably lower response rate, but the demographic characteristics of the sample were similar across assessments (see Table 1).

Table 1
Demographic characteristics of samples.

	Nov-01	Nov-02	March-03	June-03
N of cases	1000	1000	1005	517
Gender (% female)	50.0	50.0	54.6	50.7
Mean age	28.4	29.5	27.5	27.4
College student (%)	13.5	10.3	12.1	14.0
Living with a partner (%)	72.5	68.0	71.7	63.7
Living with a child (%)	64.7	61.8	63.9	56.3
Lived most time in last six months in western target county (%)	49.5	49.2	47.9	42.6

A quasi-experimental design was used in the current research. Regions of Montana were assigned to one of three experimental groups: social norms media marketing campaign, buffer, and control (Fig. 1). Fifteen counties in the western Montana region were assigned to receive a high-dosage social norms media marketing campaign. These counties were an optimal choice because they inhabit the majority of Montanans between the ages of 21 and 34 (U.S. Bureau of the Census, 2001). Furthermore, these counties comprise two Designated Marketing Areas (DMAs) for controlled media distribution. By purchasing airtime solely within these two DMAs, we were able to reach all of the media campaign area with the paid media placement while limiting such media exposure elsewhere (i.e., buffer and control counties). Because radio and television messages could not be completely contained in intervention counties, counties in the buffer region were used to adjust for diffusion of social norms media messages outside of the intervention counties. Counties in the buffer region were those that were adjacent or close in geographical proximity to the intervention counties. Counties in the control region were those on the eastern half of Montana and thus not in close geographical proximity to the counties in the campaign region. Diffusion of social norms media messages to control counties via television and radio and travel of individuals within control counties to intervention counties was less likely than that of the buffer counties. See Table 2 for Ns at each time point by intervention, buffer, and control counties.

Additionally, fear-producing media efforts (e.g., ads that show mangled cars or child-sized coffins) were eliminated or severely restricted in the social norms media campaign counties. Fear-based media efforts may compete with social norms messages by solidifying misperceptions about the prevalence of impaired driving; thereby potentially reducing the impact of a social norms campaign (Linkenbach, 2001; Perkins, 2003b). Counties outside of the social norms media campaign area continued to operate according to their standard operating (messaging) procedures, which included popular fear-based campaign themes.

The target population was selected and surveyed a total of four times. One assessment occurred prior to the social norms media campaign (Time 1: November 2001; $n = 1000$) and one during the media intervention (Time 2: November 2002; $n = 1000$). Finally, two assessments occurred at the end of the intensive media campaign period. One occurred immediately following the intervention (Time 3: March 2003; $n = 1005$) and the final was administered three months after the conclusion of the campaign (Time 4: June 2003; $n = 517$). The final sample size was reduced because of cost restraints. Ten- to twelve-minute telephone interviews were conducted at each assessment by trained interviewers through a Computer Assisted Telephone Interviewing laboratory. A point-in-time phone survey was chosen over mail and other survey methods because of its cost-effectiveness and ability to achieve the desired sample size. Sampling frames purchased from Genesys Sampling Systems provided targeted lists of Montana households with residing adults ages 21–34. A random selection of households was drawn from the list. All procedures were approved by the university's institutional review board and all participants provided informed consent.

2.1.1. Intervention model

This project was implemented according to the seven-step Montana Model of social norms marketing (Linkenbach, 2003). This

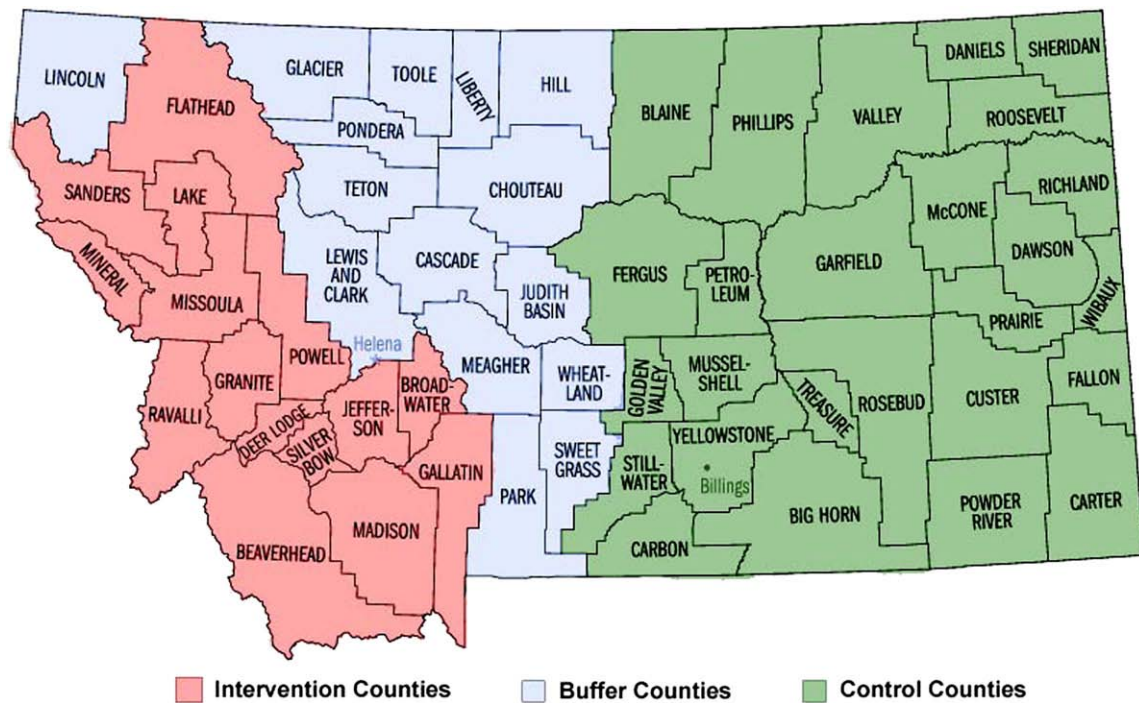


Fig. 1. Intervention, buffer, and control counties in Montana.

model includes: planning and environmental advocacy, collecting baseline data, message development, market planning, piloting and refining materials, implementation of campaigns, and evaluation.

2.1.2. Social norms media campaign

The social norms media campaign was comprised of television, radio, print, and theater ads, in addition to posters and promotional gifts. Specific ads focused on traditional social norms marketing statistics (e.g., Most Montana Young Adults [4 out of 5] Don't Drink and Drive). For example, one television commercial depicted a typical Montana ranch family in a barn preparing to ride horses. The script read "In Montana, our best defense against drinking and driving is each other. Most of us prevent drinking and driving. We take care of our friends, our families, and ourselves. Four out of five Montana young adults don't drink and drive. Thanks for doing your part." Another TV ad depicted a ski lodge window with snow falling. A male voice read the script, "In Montana there are two things you need to know about snow: how to drive on it and how to ski on it. After a day on the slopes and some time in the lodge, my friends and I all take turns being designated drivers." The view widens to reveal the message written on the window, "Most of us (4 out of 5) don't drink and drive." The commercial closes with the voice asking, "How are you getting home?" Fig. 2 provides examples of two of the poster ads. Moreover, messages pointed out that the majority of Montana young adults practice protective behaviors, such as taking cabs or using designated drivers.

County-level and regional norms were highlighted within some of the fifteen intervention counties.

The intensive media intervention ran from January 2002 to March 2003 (fifteen months). Because many of the fifteen intervention counties were sparsely populated (e.g., six are home to fewer than 600 persons in the 21–34 year-old range), we placed heavy focus on television airtime, since not all newspaper and radio advertisements could effectively reach the entire target audience. A high-exposure market plan was used, with focus on the Butte/Bozeman and Missoula/Kalispell DMAs. A total of 18 media advertisements (i.e., 9 television and 9 radio) were used. Social norms advertisements consistently emphasized positive behavior and avoided negative and/or fear-based messages. The television ads were aired during two media flights. The first lasted five and a half months while the second lasted six months. The two radio flights lasted six and a half and six months, respectively.

Television and radio advertisements were supplemented by local and college newspaper advertisements, theater slides, billboards, various print and promotional items (i.e., t-shirts, key chains, pens, and windshield scrapers), and indoor advertisements. These additional advertisements and theater slides ran January 2002 through December 2003. Print ads were taken out in four local (150 advertisements) and four college (102 advertisements) newspapers, theater slides (70 slides) appeared on over twenty movie screens, and a billboard design appeared in seven locations for a two-month period. Over 45,000 promotional items were distributed in the intervention counties. Finally, 41 indoor ads were placed in Bozeman and Missoula restaurants, which were the two cities with the largest number of individuals from the target population. A summary of media placements are provided in Table 3. Gross rating points (GRPs) are included for television ads. GRPs equal ad "reach" (the number of people who saw the ad at least once) times "frequency" (the average number of times each person saw the ad).

Table 2
Total Ns for intervention, buffer, and control counties.

	Date				Total
	Nov-01	Nov-02	March-03	June-03	
Western intervention counties	492	481	478	218	1669
Buffer counties	186	235	212	132	765
Eastern control counties	315	262	308	162	1047
Total	993	978	998	512	3481

Note. The slightly smaller Ns in the total compared to the total sample Ns reported are due to respondents who could not or would not identify a county where they lived most of the time in last six months.

2.2. Measures

2.2.1. Social norms media message exposure

Exposure was assessed using both prompted and not prompted recall. Participants were asked, "During the last twelve months, do you remember seeing or hearing any alcohol prevention campaign

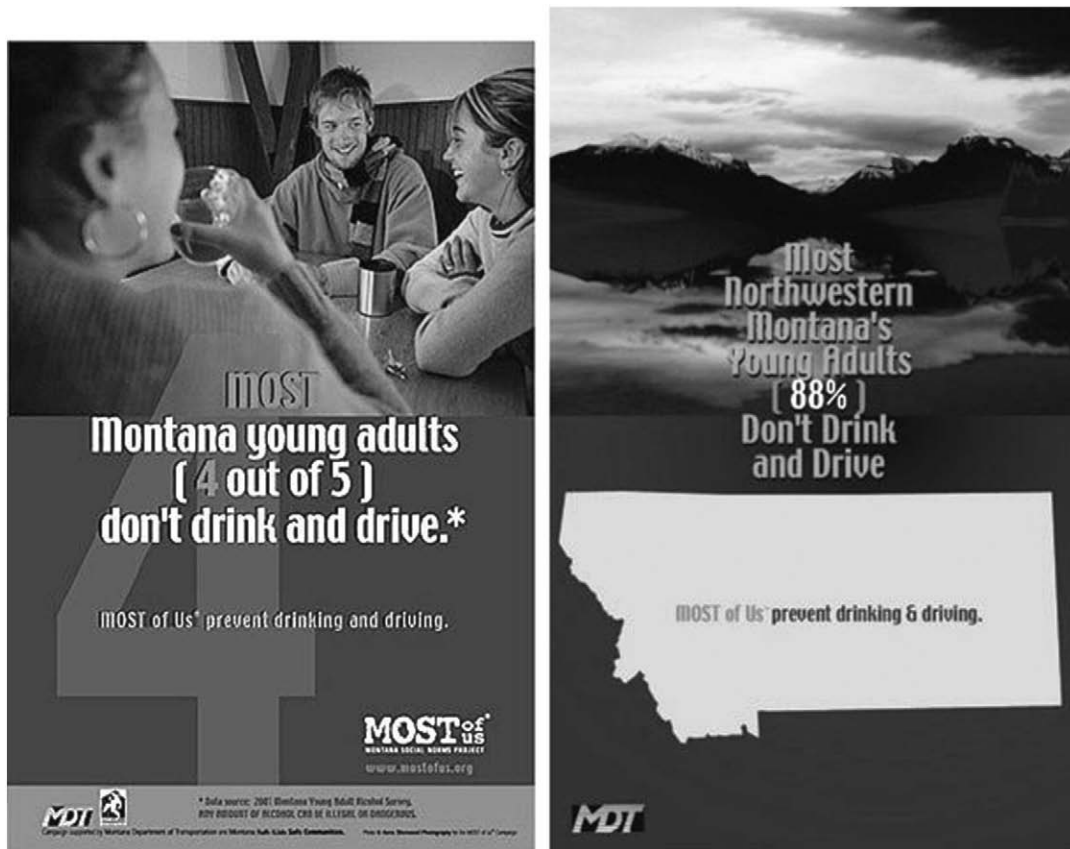


Fig. 2. Example of social norms marketing posters.

advertisements, posters, radio or TV commercials, or brochures?” If they responded yes, then they were asked what the main message was that they remembered. Participants that reported a message regarding “most of us,” “the majority,” or “4 out of 5” and moderate drinking, not drinking and driving, or using a designated driver were identified as recalling a social norms message as the primary message.

2.2.2. Perceived normative behavior

Perceptions of the average Montanan's behavior was assessed with two questions. Participants were asked, “During the past month, do you think the average Montanan your age has driven within one hour after consuming two or more alcoholic beverages within one hour?” They were also asked, “In your opinion, among Montanans your age who drink, what percentage almost always make sure they have a

Table 3 Summary of social norms media marketing placements.

Media	Location	Time 1–Time 2	Time 2–Time 3	Time 3–Time 4
Television	Intervention counties	31 weeks of ads @ approx 1400 GRPs/mo.	17 weeks of ads @ approx 965 GRPs/mo	
	Non-intervention counties	PSAs sent to 18 T.V and 41 radio stations 6/02		
	Statewide			8016 PSAs 4/03–9/03; “Street Talk” during 6/03
Radio	Intervention counties	32 weeks of ads @ approx. 650 GRPs/mo.	18 weeks of ads @ approx 1065 GRPs/mo	
	Non-intervention counties	275 PSA spots		
Local papers	Intervention counties	100 ads	50 advertisements	
	Non-intervention counties	18 ads		
College papers	Intervention counties	86 ads	16 advertisements	
	Non-intervention counties	24 ads		
Promo items	Intervention counties	37,400 items	8400 items	
	Non-intervention counties	37,700 items	11,800 items	
Theater slides	Intervention counties	24 screens for 8 weeks	8 screens for 16 weeks; 19 screens for 12 weeks	9 screens for 12 weeks
	Non-intervention counties			
Billboards	Intervention counties		7 ads for 1 mo. each @ avg. daily circulation of 7000	
	Non-intervention counties			
Indoor ads	Intervention counties		9 ads for 1 mo. in 4 Bozeman restaurants; 2 ads for 1 mo. in 1 Missoula restaurant	9 ads for 3 mos. in 4 Bozeman restaurants; 21 ads for 3 mos. in 5 Missoula restaurants
	Non-intervention counties			

Note: GRP = gross rating points.

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designated non-drinking driver with them before they consume any alcohol and will be riding in a car later?"

2.2.3. Personal attitudes and behavior

Behavior questions paralleled perceptions of normative behavior questions. Participants were asked, "During the past month, have you driven within one hour after you have consumed two or more alcoholic beverages within an hour?" Participants were also asked, "When you consume alcohol and know that later you will be riding in a car, what percent of the time do you make sure you have a designated non-drinking driver with you before you start drinking?" Finally, participants were asked, "The current law in Montana states that a blood alcohol concentration of above .10% constitutes legal impairment. Would you support or oppose changing the law in Montana to make a blood alcohol concentration above .08% constitute legal impairment? This change would permit less alcohol consumption before driving." At the time of this research, the legal limit in Montana was .10%. Currently, the legal limit in Montana is .08%.

3. Results

Data for intervention and control counties were compared for each survey measure in terms of any change observed over time occurring from baseline to final assessment. Buffer counties were not included in analyses because the sample sizes were not as robust. It is important to note that prior MOST of US social norms campaigns had taken place in previous years throughout the state, including a previous campaign targeting drinking and driving (described in Linkenbach & Perkins, 2005). Thus, some recognition or recall of Most of US social norms messages about drinking and driving at baseline was not unexpected. More importantly, during the trial period, social norms messages were targeted in the intervention region. Relative change in proportional differences between participants in intervention counties versus control counties across time points was evaluated using a z-test of the difference of difference of proportions for each measure. A summary of relative change and statistical significance is presented in Table 4.

3.1. Did the campaign provide social norms message exposure?

Participants were asked if they recalled any alcohol prevention campaign advertisements (i.e., posters, radio or television commercials, or brochures). Table 4 presents social norms message recall by intervention and control counties prior to and following the campaign. Overall, results reveal that the campaign was successful at differentially exposing Montanans between the ages of 21 and 34 to social norms messages.

3.2. Did the campaign affect perceptions of peer norms?

Results suggest that the social norms campaign reduced misperceptions of those in the intervention counties relative to those in the control counties, such that those in the intervention counties believed the average Montanan their same age had driven significantly less often within one hour of consuming two or more drinks in the past month compared to those in the control counties (Fig. 3). The relative difference in change prior to and following the social norms campaign between the intervention and control counties was significant, -7.5% (Table 4).

Similar results were found regarding the perception of peer use of designated drivers. Those in the intervention counties believed that the majority of Montanans their age almost always had a designated driver with them when they consumed alcohol and would be riding in a car later, significantly more so than those in the control counties (Fig. 4). The relative difference in change prior to and following the social norms campaign between the intervention and control counties was marginally significant (11.0% ; Table 4). Combined, these findings suggest the campaign was successful at reducing normative misperceptions regarding peer drinking and driving behavior.

3.3. Did the campaign influence personal attitudes and reported behaviors?

Relative to participants in the control counties, findings reveal that the percentage of young adults in the intervention counties who reported driving within an hour of consuming two or more drinks in the previous month decreased following the social norms campaign. Of interest, results demonstrate that the percentage of young adults in the control counties who reported driving within an hour of consuming two or more drinks in the previous month increased during this time (Fig. 3). With reported driving after drinking decreasing in the intervention counties by 2% and increasing in the control counties by 12%, there was an overall significant relative decrease in the intervention counties compared to the control counties (-13.7% ; Table 4).

Results also show that the percentage of individuals in the intervention counties who reported that they always (100% of the time) used a designated driver if they planned to drink increased following the social norms campaign; whereas, there was a drop in the use of designated drivers in the control counties (Fig. 4). There was a significant difference in the overall change for the intervention counties compared to the control counties (15.0% ; Table 4).

Additionally, results demonstrate that individuals in the intervention counties increased their support for changing the BAC legal limit for driving to .08 following the social norms campaign, which is a significant difference compared to the decrease in support seen for those in

Table 4

Differences between intervention and control counties for perceived and reported behavior in November 2001 and June 2003.

	Western intervention counties			Eastern control counties			Intervention–control counties difference of change
	Nov-01	June-03	Change	Nov-01	June-03	Change	Difference
Percent recalling social norms media as main message (unprompted recall)	53.8	70.5	16.7	50.7	42.6	−8.1	24.8***
Percent thinking average Montanan drove within one hour of consuming two drinks in month	91.8	86.7	−5.1	91.9	94.3	2.4	−7.5*
Percent perceiving the majority of peers almost always have a designated driver when drinking and later use car	29.9	39.2	9.3	24.9	23.2	−1.7	11.0†
Percent driving after having two or more drinks within the hour in past month	22.9	20.9	−2.0	16.9	28.6	11.7	−13.7*
Percent reporting they always make sure they have a designated driver when drinking and later use car	41.7	46.4	4.7	42.3	32.0	−10.3	15.0*
Percent supporting changing BAC legal limit for driving to .08	63.5	70.7	7.2	71.1	61.8	−9.3	16.5**

Note. † $p < .06$. * $p < .05$. ** $p < .01$. *** $p < .001$.

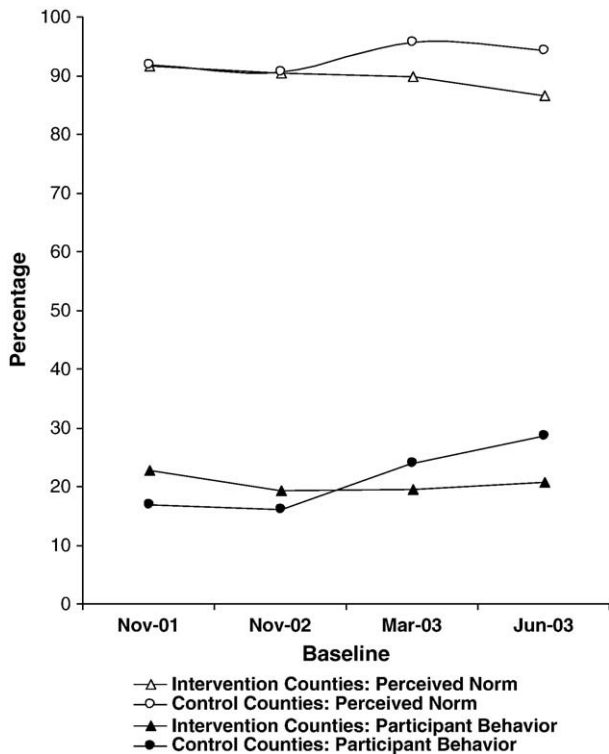


Fig. 3. Percent thinking the average Montanan their age has driven within one hour of consuming two or more drinks in the past month and percent driving after having two or more drinks within the hour in the past month.

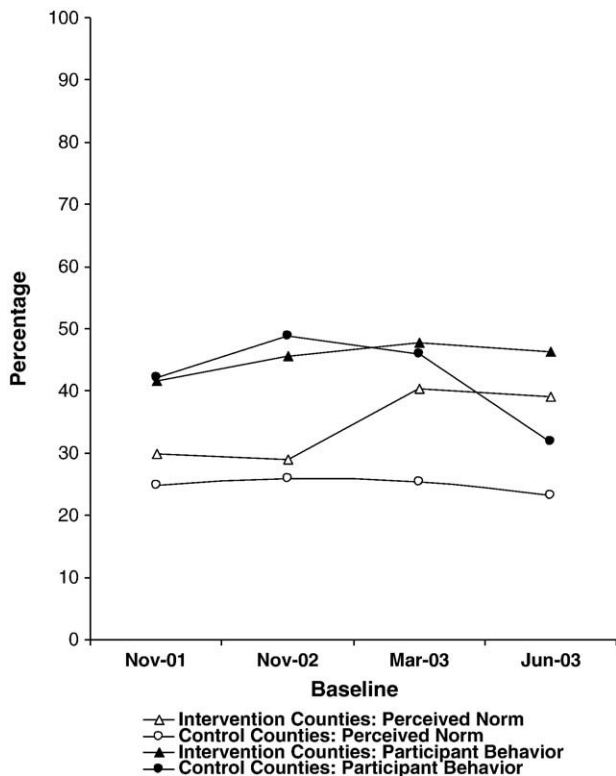


Fig. 4. Percent perceiving majority of same age Montanans almost always have a designated non-drinking driver when drinking and will be riding in a car later and percent reporting they always (100% of the time) make sure they have a designated non-drinking driver before they consume alcohol if they will be riding in a car later.

the control counties (16.5%; Table 4). These findings demonstrate that the social norms media marketing campaign was effective at reducing high-risk drinking and driving behavior and at increasing use of protective behaviors (i.e., designated drivers) among those in the intervention counties compared to those in control counties.

Finally, we obtained archival motor vehicle crash records from counties in the intervention and control regions. These data were reformulated into the % of crashes that were alcohol-related in 2001 and 2003. These data do not provide a perfect test of intervention impact because crashes in Montana were coded as alcohol-related when anyone involved in the crash was under the influence of alcohol, regardless of who was driving or at fault in multiple car crashes. Moreover, the available data only report if an alcohol-related crash occurred in the county and not if the driver was from that county. So there may have been some blurring across county lines, but that would only serve to reduce an observed impact of the intervention, not create a difference. Nevertheless, even with these qualifications, the data did reveal a pattern in the expected direction. In 2001 there were 9.6% and 10.1% alcohol-related crashes in the intervention and control counties, respectively, and the difference was not statistically significant ($p > .05$). In 2003 alcohol-related crashes had declined to 9.1% in the intervention counties and had risen to 10.3% in the control counties (resulting in a statistically significant difference ($p < .05$)).

3.3.1. Demographic variation

It is important to note that the differences found in drinking and driving behaviors and attitudes between the intervention and control counties across time were not the result of any underlying differences in the proportion of drinkers in these areas. Although there was some minor variation in the prevalence of drinking (those reporting having consumed alcohol within the past year) across the different survey times, there was not a significant difference ($p > .05$) in this rate between intervention/control counties at each time point: 83%/81% in Nov 2001, 76%/76% in Nov 2002, 81%/81% in Mar 2003, and 78%/76% in June 2003.

Furthermore, although there was some demographic variation over-time and between intervention and control counties, we conducted a detailed multivariate analysis to control for this variation and its effects when examining intervention and control county differences. Specifically, we ran a logistic regression analysis that provides odds-ratios predicting our dependent variables. The interaction variable combining time (baseline vs. post-intervention) and where the respondent lived (intervention county or control county) was the key independent variable assessing intervention impact. Time per se and where one lived were also entered as independent variables to control for general changes over time and general differences in intervention (West) and control (East) along with all the demographic variables to parse out their effects. For this analysis we created the time measure as a pre/post variable and excluded the 2002 data for the calculation of these odds-ratios. The 2001 data were specified as baseline and the March and June surveys were combined as post-intervention to provide a large enough sample size to include all the demographic variables in the analysis. The logistic regression results are presented in Table 5. These results confirmed the findings reported above. In the intervention counties, social norms media exposure increased almost fourfold over the more general decline for the state. The specific effect of being in the intervention counties in the post-intervention period (i.e. the specific effect of having experienced the campaign) was in the predicted direction for all of the drinking and driving measures, and significantly so for four of the five measures. Notably, the predicted effect of the campaign on personal drinking and driving within the hour was to cut this behavior by 43%.

4. Discussion

The present research represents a unique evaluation of a social norms media marketing campaign aimed at reducing normative

Table 5

Logistic regression odds-ratios for intervention time period and residence in an intervention county predicting social norms campaign exposure and drinking and driving controlling for demographic characteristics.

Independent variables	Recall social norms media as main message	Thinks average Montanan drove within one hour of consuming 2+ drinks in month	Perceives majority of peers almost always have a designated driver when drinking and later use a car	Drove after having 2+ drinks within the hour in past month	Always had a designated driver when drinking and later uses a car	Supports changing BAC legal limit to driving to .08
Gender (female compared to male)	1.02	1.47*	1.39***	0.28***	1.90***	2.20***
Age (30–35 compared to 21–29-year-olds)	1.01	0.60**	1.19	0.94	1.00	1.17
College student	1.57**	0.57*	1.18	0.72	1.18	1.21
Lives with a partner	0.89	0.84	1.16	0.50***	1.79***	1.42**
Lives with a child	0.98	1.07	0.87	0.69*	1.17	1.21
Lives in western intervention county (compared to eastern control county)	1.06	1.09	1.31	1.16	1.11	0.80
Post-intervention time (2003 compared to Baseline 2001)	0.61***	1.78	1.02	1.51	1.05	0.91
Post-intervention time and lives in intervention county	3.92***	0.38**	1.57*	0.57*	1.21	1.57*

Note. Odds-ratio is significant at * $p < .05$; ** $p < .01$. *** $p < .001$.

misperceptions and drinking and driving behavior. It has been, to our knowledge, the most comprehensive and large scale social norms marketing campaign yet to be rigorously evaluated in a non-college student population. Results of this study provide strong evidence that a comprehensive social norms media marketing campaign can have a population-wide effect on normative perceptions and drinking behavior, at least with respect to drinking and driving. A review of the existing published literature would suggest mixed support for social norms marketing as an effective intervention approach. However, this study differs from studies that have reported null findings of social norms marketing in a number of fundamental ways.

In order for a social norms marketing campaign to have any chance at changing behavior, the messages presented as part of the campaign must be viewed by the target audience. For example, newspaper ads that present accurate norms information but are read by a small minority of the intended audience have little chance of changing behavior at the population level. Previous empirical evaluations finding no support for social norms marketing have often not evaluated the extent to which the intervention was implemented effectively and whether the intended audience actually viewed the message (Wechsler et al., 2003). Interpreting the efficacy of an intervention approach without process evaluation is analogous to basing inferences about the effectiveness of a new cancer drug on outcomes without knowing which patients, if any, actually received the medication. In the current study, recall of ads by participants in the intervention counties was significantly higher after implementation of the campaign and relative to control counties, providing evidence that the intended social norms media message reached the target audience.

A theoretical basis for social norms marketing campaigns is the assumption that normative misperceptions (i.e., believing that drinking and driving is the norm among peers) are causally associated with behavior (i.e., actual drinking and driving). Changing perceived norms is therefore a prerequisite for a campaign to impact behavior. Results in the present study indicated that the social norms marketing campaign was successful in changing perceived norms and in changing the targeted behavior. The data showed that respondents' reported changes in behavior very closely followed their changes in perception. Between Time 1 and Time 4, the percentage of young adults in the intervention counties who reported driving within an hour of consuming two or more drinks in the previous month dropped slightly from 23% to 21% (Fig. 3). This is significant when compared to the change in the control counties, where the percentage who reported similar behavior grew from 17% to 29% between the November 2001 and June 2003 measurements. The increases in problematic behavior in the control area may have reflected some general increase in problem behavior in the state, but it is more likely

that an increase in this behavior may simply tend to occur in the warmer months of the year. The western counties, with the protection of more accurate perceptions of peer norms, did not appear to suffer this deterioration. With reported driving after drinking decreasing in the western counties by 2% and increasing in the eastern counties by 12%, there was an overall relative decrease of 14% in the west compared to the east.

The percentage of intervention county residents who reported they always (100% of the time) use a designated driver if they plan to drink increased from 42% to 46% from November 2001 to June 2003 (Fig. 4). In contrast, consistent use of designated drivers in the control counties dropped from 42% to 32% during the same period. The notable drop in the use of designated drivers in the control counties is more likely due to the greater tendency to drink and drive during the warmer, drier summer months than to an actual shift of that magnitude in the rates of impaired driving. With either interpretation, however, what is key for this study is the relative result in the experimental counties. There was a statistically significant 15% difference in the overall change for the intervention counties compared to the control counties. The counties exposed to the intensive intervention avoided the downturn observed in the control counties.

Perhaps the primary difference between the present study and previous research evaluating social norms marketing interventions for high-risk drinking is the scope of the campaign, both in the high dosage of media exposure and in the large target population. Media dosage is a critical element in social norms marketing campaigns. Without a concentrated intervention, the information presented in a social norms marketing campaign will likely be a small percentage of all of the alcohol-related messages any given individual is likely to view over the course of a project. Fear-based campaigns as well as commercial advertising of alcohol beverages are at present likely to be most prevalent in the media in most contexts, thus, limiting the chance that a low dosage social norms marketing campaign will impact perceived norms or personal drinking. Secondly, to date most social norms marketing campaigns have been limited to single college campuses, and none have been implemented at a statewide level. In terms of feasibility and effectiveness, the present study lays a strong foundation for larger social norms based approaches to public health.

The results of the present study must be viewed in the context of limitations. For instance, one limitation is that the quasi-experimental design limited our ability to draw causal inferences. Recall of ads, perceived norms, and behavior changed more in counties that received targeted exposure to the social norms marketing campaign than in counties that did not; however, we cannot rule out the possibility that other factors associated with geographic location may have directly influenced behavior or interacted with the intervention in influencing

behavior. Moreover, counties were assigned based on regions in Montana with designated marketing areas for controlled media distribution. Thus, findings should be considered in light of this limitation. In addition, a panel design would have provided greater power by allowing us to evaluate longitudinal changes at the individual level as well as to formally evaluate mediation. Changes observed in the perceptions of the pervasiveness of impaired driving in the intervention counties might be attributable to seasonal variation in impaired driving patterns (or perceptions of these patterns) or to changes in statewide legal deterrent policies and practices. It is also possible that an apparent lack of change in the intervention area could be the result of these seasonal or statewide influences suppressing or canceling out the positive effects of the intervention. Any changes observed in the western intervention counties over time must therefore be evaluated in relation to what changes took place simultaneously in the eastern control counties (as done in this study), where social norms media exposure occurred least.

Relatively low response rates in the current study, a limitation not uncommon in telephone survey research, may indicate that the sample was not fully representative of the population. This limitation further underscores the importance of comparing any observed change over time in the intervention region with change in the control county region and of the inclusion of demographic controls in the multivariate analysis of potential intervention effects. Additionally, we could not obtain data on changes in local law enforcement practices regarding DUI laws by county between 2001 and 2003, changes that might have independently altered local perceptions and behaviors concerning drinking and driving, and accordingly affected respondents' survey responses. A concentration of enforcement changes restricted to the counties chosen for the intervention, or alternatively, to the counties chosen as the control region, though perhaps not likely, cannot be ruled out as contributing to the final result of this study. Furthermore, data on the precise nature of interventions in the control counties (fear-based or other types of campaign messages) cannot be presented. We were only able to document a notably lower level of social norms messages in what control county respondents recalled as the primary message of campaigns in the post-intervention period. However, through partnership with the State Office of Traffic Safety, media messages in the treatment areas were tightly controlled to only allow positive norms messages, whereas follow-up observation revealed that control areas often incorporated fear-based strategies. Finally, assessments were based on retrospective self-report, and the sample of Montana young adults, which may not generalize to other areas of the country or populations.

4.1. Conclusions

The results of the present study suggest that social norms marketing campaigns are likely to work to the extent, and for many of the same reasons, that advertising and/or marketing campaigns generally work or do not work. Messages must reach the target audience and have the intended impact on cognition and behavior. Low dose campaigns and evaluations that do not assess exposure to norms messages, or whether perceived norms change as a function of the campaign, are of limited value in considering the effectiveness of the approach. This research demonstrates that social norms marketing can be effective in changing risky drinking behavior at the population level and provides a model for utilizing this approach to address other behaviors related to public health.

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Contributors

All authors contributed to the manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

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