Addiction (2000) 95(2), 209–217

RESEARCH REPORT

Communities Mobilizing for Change on Alcohol (CMCA): effects of a randomized trial on arrests and traffic crashes

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Abstract

Aims. *We previously reported effects of the CMCA intervention in reducing social and commercial access to alcohol by youth, and reducing alcohol use by 18–20-year-olds. This paper reports on effects of CMCA on arrests and car crashes.* **Design**. *CMCA was a group-randomized trial that implemented and evaluated a community-organizing effort to change community policies and practices to reduce youth access to alcohol. Seven Midwestern communities were randomly assigned to the intervention condition and eight communities were assigned to the control condition.* **Intervention**. *For 2.5 years, a part-time community organizer worked in each of the seven intervention communities with local public officials, enforcement agencies, alcohol merchants, the media, schools and other community groups to reduce youth access to alcohol.* **Measurement**. *We collected annual arrest and quarterly traffic crash data for the years 1987–1995, providing a 6-year baseline and 3 years of data during the intervention. Data were stratified into two target age groups (15–17 and 18–20) and a control group (age 21 and over). Analyses used random-coefficient models because we had repeated observations for each unit of assignment in a group-randomized trial with heterogeneous trends across communities.* **Findings**. *We observed net declines in the intervention communities for all arrest and traffic crash indicators. The decline was statistically significant for DUI arrests among 18–20-year-olds and approached significance for DUI arrests and disorderly conduct violations among 15–17-year-olds.* **Conclusions**. *Together with previously published results from this study, the results reported here suggest that a community-organizing approach to limit youth access to alcohol may be effective, at least for selected end-points and subgroups. We conclude that this approach may be useful, but that a longer intervention period is required to increase effectiveness.*

Introduction

Alcohol use is associated with traffic crashes and other health problems, including assaults, suicides, drownings, recreational injuries and early unprotected sex (Stall *et al.*, 1986 Howland & Hingson, 1988; Leigh, 1990; Roizen, 1993; Gottlieb & Gabrielsen, 1992; Hayward, Zubrick & Silburn, 1992; Frintner & Rubinson, 1993).

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Submitted 25th January 1999; initial review completed 22nd April 1999; final version accepted 17th August 1999.

ISSN 0965–2140 print/ISSN 1360-0443 online/00/020209–09

Carfax Publishing, Taylor & Francis Ltd

Interventions to reduce youth drinking rates are being developed in an effort to reduce such problems. Past efforts to reduce youth access to alcohol through changes in policies, practices and norms have created sustained decreases in youth drinking and related problems such as traffic crashes (Coate & Grossman, 1987, 1988; Moskowitz, 1989; Wagenaar, 1993; Grossman *et al.*, 1994; Toomey, Rosenfeld & Wagenaar, 1996).

The most well known policy to reduce youth access to alcohol is the age 21 minimum legal drinking age (MLDA). At least in part because of weak enforcement of the MLDA laws (Wagenaar & Wolfson, 1994, 1995), many underage youth are still drinking (Johnston *et al.*, 1998). As a result, states and communities have continued to identify methods to further reduce youth access to alcohol from both commercial (e.g. bars, restaurants, liquor stores, convenience stores) and social (e.g. parents, friends, coworkers, siblings) sources.

The CMCA (Communities Mobilizing for Change on Alcohol) project was a 15-community group-randomized trial which developed, implemented and evaluated a community organizing intervention to change policies and practices of major community institutions to reduce youth access to alcohol. The goal of the CMCA project was to change policies and practices and community norms in ways that reduced commercial and social sources of alcohol to youth under age 21.

Survey results indicated that the CMCA intervention reduced both commercial and social access to alcohol. The intervention significantly changed the selling and serving practices of bars, restaurants and taverns in intervention communities, most notably reducing service of alcohol to underage youth (effect size = 1.18). Eighteen–20-year-olds in intervention communities were also significantly less likely to provide alcohol to other underage youth. Results also demonstrated that the intervention had significant effects on reducing alcohol use among 18–20-year-olds (effect size 0.76). Significant changes in alcohol use among younger adolescents were not observed. These findings are described in detail elsewhere (Wagenaar *et al.*, 2000).

We hypothesized a priori that changes in policies that reduce youth access to alcohol, and consequently underage drinking, could result in decreased rates of alcohol-related problems among youth. This paper reports the results of analyses of the effects of the CMCA intervention on arrests for disorderly conduct and driving under the influence of alcohol. We also examined the effects of CMCA on single-vehicle night-time and police-reported drinking driver traffic crashes.

Methods

Population and design

Fifteen of 24 eligible school districts in Minnesota and Wisconsin agreed to participate in the school survey data collection and thus define the participating communities for CMCA. Eligible communities had school districts with at least 200 students in the 9th grade, were not participating in other University of Minnesota alcohol-related studies, were within a 5-hour drive of the University of Minnesota, were at least 25 miles from another eligible district and drew their students primarily from no more than three municipalities. Districts that declined to participate did so because they had recently participated in other health-related survey projects. The average population of the study communities was 20 836 (range 8029–64 797). These communities are representative of similarly sized communities in the upper Midwest and the participating districts were similar to those that chose not to participate.

After all baseline data were collected, the 15 participating communities were matched on population size and presence of a college. From within matched sets, seven communities were randomized to receive the community organizing intervention and the remaining eight were assigned to the control group (see Wagenaar *et al.*, 1994 for a full description of the overall project design).

Intervention

Community organizers were hired in each intervention community. During a 2.5-year intervention period, organizers worked with local public officials, enforcement agencies, alcohol merchants and merchant associations, the media, schools and other community institutions to change community policies to reduce youth access to alcohol. The target of the intervention was the entire community rather than individual young people. As a result of the CMCA organiz-

ing effort, institutional policy changes were made in each of the seven intervention communities, including changes in alcohol merchant policies and practices, increases in media coverage of alcohol issues, and changes in practices of law enforcement agencies (full details on implementation of the intervention are available in Wagenaar *et al.*, 1999).

Surveys

To measure effects of the community organizing intervention on youth access to alcohol and underage drinking, extensive survey and observational data were collected at baseline and again at follow-up. Data included: surveys of high school students; surveys of youth age 18–20; surveys of alcohol retailers; alcohol purchase attempts at bars, restaurants, liquor stores and convenience stores; and content analyses of media coverage. Results from all data other than archival data on arrests and crashes have been reported previously (Wagenaar *et al.*, 1999, 2000).

Archival data

Arrest and traffic crash outcome data reported here were collected for the years 1987 to 1995, providing a 6-year baseline and 3 years of data during intervention implementation. Data were stratified into three age groups: 15–17 years, 18–20 years and those aged 21 and over. Those age 18–20 years serve as the primary target group, with 15–17-year-olds examined for possible spillover effects. Data for those aged 21 and over were used to control for broader trends in arrests and crashes that cannot be attributed to the teen-focused CMCA project. All data were analyzed as rates per 100 000 population to control for substantial variation in size of the communities.

Annual arrest counts for the specific intervention and control cities in the study were obtained from the Minnesota Department of Public Safety and the Wisconsin Office of Justice Assistance. We analyzed two categories of arrests hypothesized to be affected by the CMCA intervention: disorderly conduct and driving under the influence.

Data on all injury-producing traffic crashes in the 15 counties that contain the intervention and control communities were obtained from the Minnesota Department of Public Safety and the Wisconsin Department of Transportation. The catchment area for crash data was defined as the core intervention or control city plus all surrounding townships adjacent to the core city. Drinking-driver crashes were defined as those in which the investigating police officer noted that the driver had been drinking. Single-vehicle night-time crashes were defined as those involving one moving vehicle and occurring from 20.00–04.59 h. All crash variables included cars, light trucks and motorcycles, and excluded heavy trucks, buses and other miscellaneous vehicles. Because of low incident counts in these modest-sized communities, crash data were aggregated into quarterly counts. We hypothesized the CMCA intervention would reduce DUI and disorderly conduct arrests and traffic crashes, particularly among 18–20-year-olds, since alcohol consumption was reduced among this age group.

Analysis methods

The data were available in the form of one observation per community per time point for each measure. Nine annual data points were available for each community for the arrest measures and 36 quarterly data points were available for each community for the crash measures. Analyses employed a random coefficients model. Such models are appropriate when repeated observations are available on each unit of assignment in a group-randomized trial and there is concern that the underlying trends in those communities are heterogeneous (Murray *et al.*, 1998). In this case, there were nine or 36 repeated observations in each community and it was certainly possible that both the intercepts and the slopes in the 15 CMCA communities might be heterogeneous. Random coefficients models allow such heterogeneity, whereas more traditional repeated measures ANCOVA methods do not.

Analyses were conducted using SAS PROC MIXED, a general mixed-model regression program that is well-suited for analysis of data from a group-randomized trial (Murray, 1998). Fixed effects included condition (intervention vs. control), period (baseline vs. intervention), year within period (continuous variable) and all interactions among the three fixed effects. In addition, the dependent variable as reported for adults aged 21+ was included as a time-

dependent covariate to adjust for broader secular trends in the dependent variable not limited to the targeted youth age group. Random effects included community and interactions among community, period and year-within-period.

The model estimated a linear regression line from each community's data for the 6 baseline years (1987–92), with a separate intercept and slope for each community. Separate lines were estimated for each community's data from the 3 intervention years (1993–95). Mean slopes were estimated separately for each condition (treatment and control) and each period (baseline and intervention). The intervention effect was estimated as the net difference among those four mean slopes: $(T_{int}-T_{base})-(C_{int}-C_{base})$. That effect was assessed against the variation among the community-specific slopes. All tests were one-tailed on the basis of directional a priori hypotheses.

Results

Previously published results confirmed that the matching and randomization were effective in creating comparable intervention and control conditions at baseline (Wagenaar *et al.*, 2000). Results presented here revealed net declines associated with the CMCA intervention in all the arrest and traffic crash indicators among both the 15–17 and 18–20 age groups, although declines approached significance only for arrest data (Table 1). For DUI arrests among 18–20-year-olds, baseline rates declined in both treatment and control conditions (Fig. 1). The control group began to increase during follow-up, and the intervention group's decline accelerated. The net difference (-30.296 arrests/100 000 population per year) was significant. During the baseline phase, both treatment and control conditions had declining rates of DUI arrests among 15–17-year-olds. The decline accelerated in the treatment condition during the follow-up period, and the net difference (-7.051 arrests/100 000 population per year) approached statistical significance.

Both treatment and control conditions had flat trends in disorderly conduct arrests during the baseline phase (Fig. 2). The treatment condition declined somewhat during follow-up while the control condition increased for the 18–20-year-olds. The net difference (-16.122 arrests/100 000 population per year) was not significant. Disorderly conduct arrests among those aged

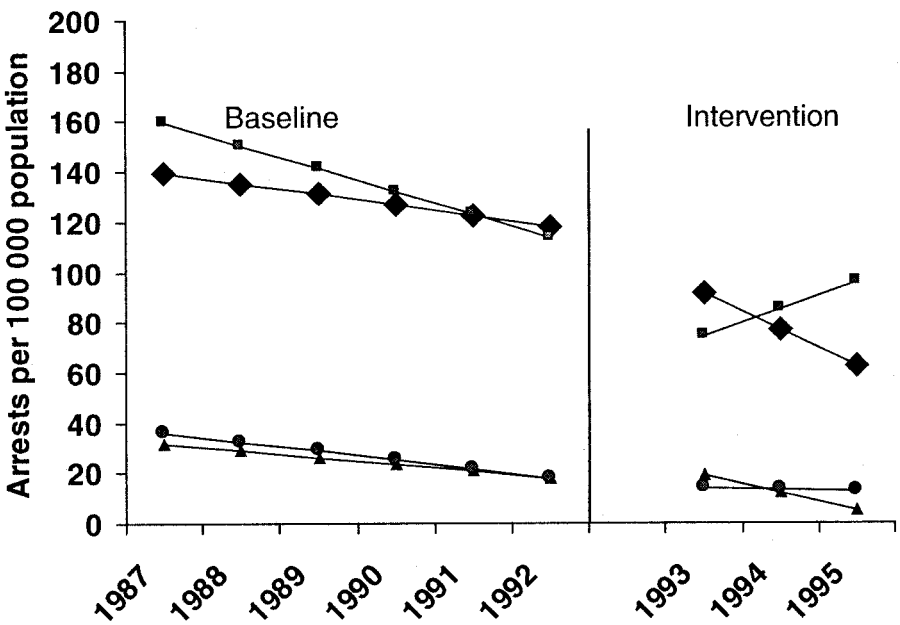

Figure 1. *Driving under the influence arrests (◆ 18–20 intervention, ■ 18–20 control, ▲ 15–17 intervention, • 15–17 control).*

Table 1. *Net differences and follow-up and baseline slopes for the intervention and control conditions*

Outcome	group	Intervention		Control		Net difference	SE	df	t	p-value[c]
		Follow-up	Baseline	Follow-up	Baseline					
Driving under the influence[a]	18–20	−14.589	−4.250	10.829	−9.128	−30.296	17.169	13	−1.76	0.0506
	15–17	−6.930	−2.782	−0.785	−3.688	−7.051	4.778	13	−1.48	0.0819
Disorderly conduct violations[a]	18–20	−9.652	−0.556	5.698	−0.217	−16.122	14.466	13	−1.11	0.1426
	15–17	−10.837	8.375	79.986	16.930	−82.268	49.630	13	−1.66	0.0607
Single vehicle night-time injury[b]	18–20	−0.1071	−0.1757	−0.0162	−0.1410	−0.0562	0.3250	13	−0.17	0.4327
	15–17	−0.0813	−0.1129	0.1826	−0.0789	−0.2299	0.2897	13	−0.79	0.2208
Injury crashes driver drinking[b]	18–20	0.0948	−0.1721	0.1289	−0.2631	−0.1351	0.3297	13	−0.41	0.3444
	15–17	−0.0686	−0.0729	0.0925	−0.1000	−0.1882	0.1892	13	−0.99	0.1691

[a]Slopes scaled in change per year; [b]slopes scaled in change per quarter; [c]one-tailed test for expected net decrease: $p < t$.

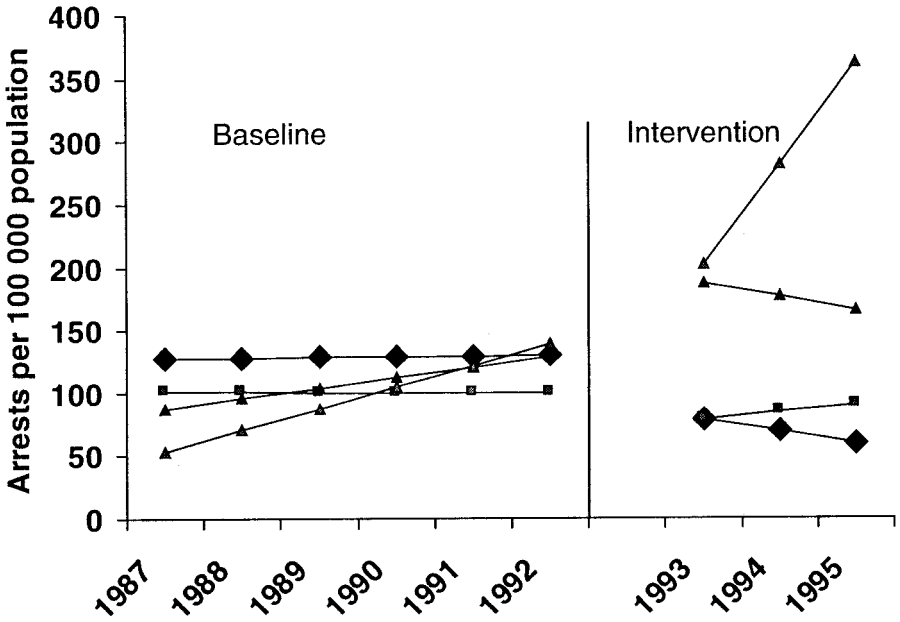

Figure 2. *Disorderly conduct arrests (◆ 18–20 intervention, ■ 18–20 control, ▲ 15–17 intervention, • 15–17 control).*

15–17 increased over the baseline phase in both treatment and control conditions. During follow-up, the control condition increased and the treatment condition decreased, so that the net difference (−82.268 arrests/100 000 population per year) approached significance.

Single-vehicle night-time injury-producing traffic crashes declined generally over the 9-year study period, with no significant differences between treatment and control communities, either among 18–20-year-olds or 15–17-year-olds (Fig. 3). Our second measure of injury-producing alcohol-related traffic crashes, police-reported drinking-driver involvement, also declined gen-

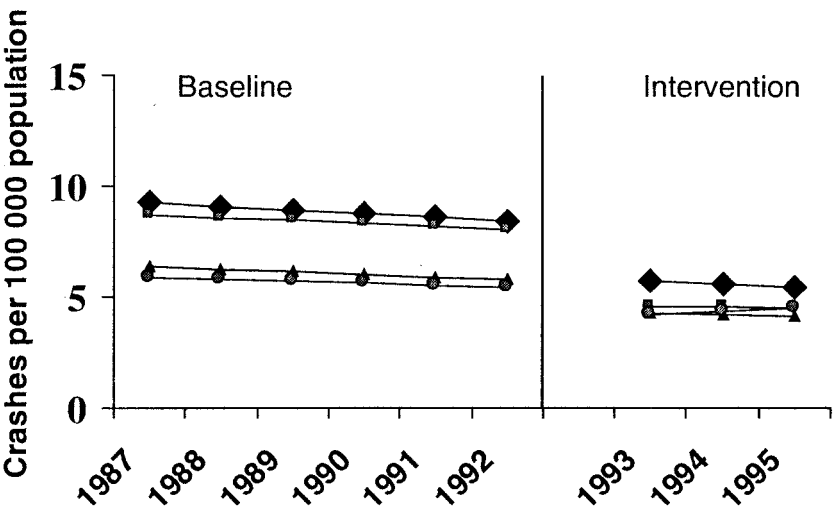

Figure 3. *Single-vehicle night-time injury traffic crashes (◆ 18–20 intervention, ■ 18–20 control, ▲ 15–17 intervention, • 15–17 control).*

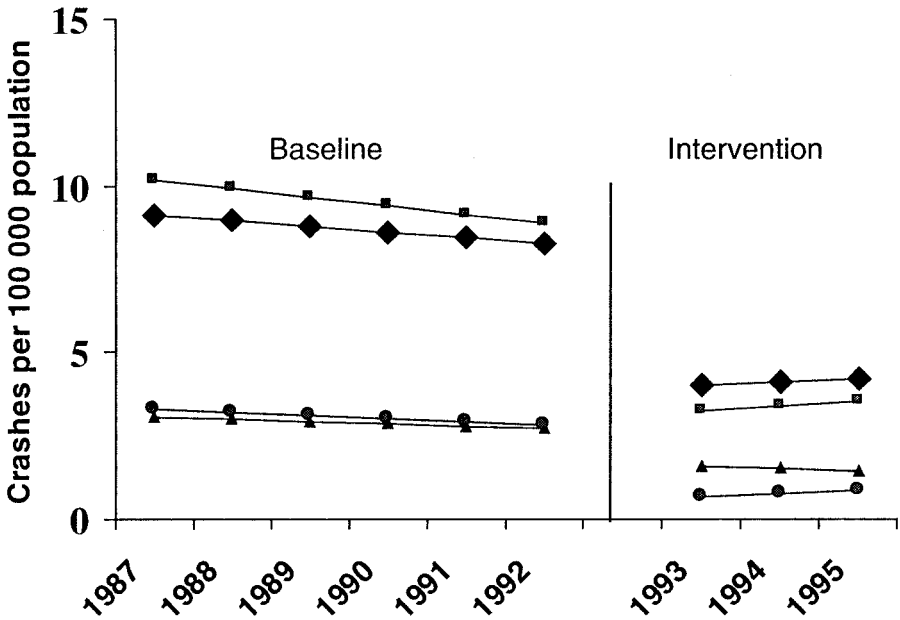

Figure 4. *Police-reported alcohol-involved injury traffic crashes (◆ 18–20 intervention, ■ 18–20 control, ▲ 15–17 intervention, • 15–17 control).*

erally over the 9-year study period, with no significant differences between treatment and control communities, either among 18–20-year-olds or 15–17-year-olds (Fig. 4).

Discussion

As described in previous reports, the CMCA organizing process was successful in changing institutional policies to reduce youth access alcohol and decrease alcohol consumption among 18–20-year-olds (Wagenaar *et al.*, 1999, 2000). The results presented here suggest that this intervention also reduced alcohol-related problems among youth. Reductions were observed in all arrest and traffic crash indicators for both age groups. DUI arrests among the primary target age group, 18–20-year-olds, were down significantly. Among 15–17-year-olds, reductions in DUI arrests and disorderly conduct arrests approached significance.

Because the CMCA intervention appeared to influence alcohol consumption levels of 18–20-year-olds and not younger adolescents, we hypothesized that we would observe reductions only in alcohol-related problems among the older age groups. However, reductions were seen in all indicators for both age groups, approaching statistical significance for reductions in arrests for DUI and disorderly conduct among 15–17-year-olds. While not affecting consumption among 15–17-year-olds, the CMCA intervention may still have decreased the likelihood that they would drink and drive or be arrested for public disorderly conduct. The CMCA organizing effort influenced community norms as well as community policy (Wagenaar *et al.*, 2000). Younger youth may have been influenced by shifts in what was considered acceptable behavior in terms of underage drinking in the communities receiving the community organizing intervention.

Some may argue that observed decreases in arrest data may be the result of changes in law enforcement practices rather than changes in youth access to alcohol. Although we did not directly measure changes in law enforcement agency enforcement priorities in the intervention communities, it is unlikely that the law enforcement agencies would suddenly decrease enforcement actions against youth at a time when many agencies were actively participating in action groups and activities concerning underage drinking and its related problems (Wagenaar *et al.*, 1999). Additionally, we also controlled for changes in arrest rates among those aged 21 and

over to account for general changes in enforcement practices. Finally, we also observed decreases, although not significant, in the traffic crash outcomes—outcomes not dependent on enforcement practices.

A core limitation of this study is that the prevalence of traffic crashes among teenagers is low when looking at community-specific counts, providing low statistical power to assess the significance of observed changes. The CMCA intervention may need to be replicated in larger communities or at a state-wide level to adequately determine the effects of this type of intervention on traffic crashes and other types of alcohol-related problems among youth. More than 50 studies have evaluated the effect of reducing youth access to alcohol at a state level on aggregate levels of traffic crashes among youth by studying the minimum legal drinking age changes. Studies that used the most robust research designs found that a higher minimum legal drinking led to significant decreases in traffic crashes among youth (see Wagenaar, 1993; Toomey *et al.*, 1996 for reviews). By organizing to change policies to further reduce youth access to alcohol in additional numbers of communities and state-wide, statistical power to document effects would be increased. Replication of the CMCA organizing intervention would also improve external validity if similar effects were observed with other populations in other regions of the country.

A second core limitation of the CMCA trial is the short 2.5-year intervention period. To mobilize communities, implement actions to reduce youth access to alcohol, and have those actions reduce youth drinking, followed by reductions in alcohol problems such as traffic crashes, all may require a longer time period to observe full effects.

Finally, our process evaluation data suggested evidence of some spill-over of intervention activities from intervention communities to other communities in the upper Midwest region, including control communities (Wagenaar *et al.*, 1999). As a result, the statistical power available to detect intervention effects may have been reduced.

Our findings suggest that communities may be able to reduce alcohol-related problems among young people by changing community policies and practices reducing youth access to alcohol. Further effort is needed to increase the effectiveness of this approach to reduce alcohol-related problems among youth, and future studies may need a longer intervention period and a larger set of communities to clearly measure effects on long-term morbidity and mortality outcomes.

Acknowledgements

This study was funded by the National Institute on Alcohol Abuse and Alcoholism and the Center for Substance Abuse Prevention (R01 AA90142), Alexander C. Wagenaar, Principal Investigator. Thanks to the reviewers and editors for comments on an earlier draft. A project of this scope over a 6-year period involves the contributions of hundreds of individuals. Warm thanks to all the investigators, coordinators, community organizers, interviewers, research assistants, support staff and the citizens of the participating communities for their efforts on behalf of the CMCA project.

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