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Communities Mobilizing for Change on Alcohol (CMCA): Secondary Analyses of an RCT Showing Effects of Community Organizing on Alcohol Acquisition by Youth in the Cherokee Nation

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Abstract

Aims—We evaluated the effects of a community organizing intervention, Communities Mobilizing for Change on Alcohol (CMCA), on the propensity of retail alcohol outlets to sell alcohol to young buyers without age identification and on alcohol acquisition behaviors of underage youth.

Design—Random assignment of community to treatment (n=3) or control (n=2). Student surveys were conducted four times per year for three years; the cohort was in 9th and 10th grades in the 2012–13 academic year. Alcohol purchase attempts were conducted every 4 weeks at alcohol retailers in each community (31 repeated waves).

Setting—The Cherokee Nation, located in northeastern Oklahoma, USA.

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Declaration of interests: Sole outside sponsor was U.S. National Institutes of Health, National Institute on Alcohol Abuse and Alcoholism. The Cherokee Nation also contributed in-kind services to the project (e.g., staff time). As a condition of cooperation and approval of the study protocol by the Cherokee Nation Industrial Review Board (IRB), the IRB required all presentations and manuscripts from the study be submitted to the Cherokee Nation IRB for review and approval before presentation or publication. We have noted this on the cover page of the paper. [In the case of this manuscript, the IRB made no requests for any changes to the draft manuscript that was written solely by the authors.] In general, many would deem IRB approval for publication not an appropriate role. However, due to a long history of mistreatment of Cherokee Indians in the U.S., we deemed this a special case for that expanded IRB role.

HUMAN PARTICIPANT PROTECTION

Cherokee Nation and University of Florida institutional review boards approved the study protocol. Emory University and University of North Texas Health Sciences Center institutional review boards approved the data analysis phase. The Cherokee Nation institutional review board approved the article for publication.

Note. The content is solely the responsibility of the authors and does not necessarily represent the views of the National Institutes of Health, our universities, or the Cherokee Nation.
Participants—1399 high school students (50% male; 45% American Indian) and 113 stores licensed to sell alcohol across 5 study communities.

Intervention—Local community organizers formed independent citizen Action Teams to advance policies, procedures and practices of local institutions in ways to reduce youth access to alcohol and foster community norms opposed to teen drinking.

Measurements—Perceptions regarding police enforcement and perceived difficulty of and self-reported actual acquisition of alcohol from parents, adults, peers, and stores.

Findings—Alcohol purchases by young-appearing buyers declined significantly, an 18 (95% CI: 3, 33) percentage-point reduction over the intervention period. Student survey results show statistically significant differences in the trajectory of perceived police enforcement, increasing 7 (4, 10) percentage-points, alcohol acquisition from parents, decreasing 4, (0.1, 8) percentage-points, acquisition from 21+ adults, decreasing 6 (0.04, 11) percentage points, from <21 peers decreasing 8 (3, 13) percentage-points, and acquisition from stores decreasing 5 (1, 9) percentage-points.

Conclusions—A community organizing intervention, Communities Mobilizing for Change on Alcohol (CMCA), is effective in reducing the availability of alcohol to underage youth in the USA. Furthermore, results indicate that the previously reported significant effects of CMCA on teen drinking operate, at least in part, through effects on alcohol access.

Keywords
RCT; cluster randomized trial; youth drinking prevention; alcohol access; community organizing; intensive longitudinal; Native American; Cherokee Nation

INTRODUCTION

Of the many factors contributing to teen drinking, physical access to ethanol-containing beverages is central, and represents a potent malleable risk factor for initiation, continuation, and excessive drinking by underage youth[1]. Laws prohibiting sales or provision of alcoholic beverages to youth, and restricting possession or consumption, are known from four decades of research to significantly reduce teen drinking and reduce rates of leading alcohol-related problems, such as car crashes and suicides [2–4]. Laws, regulations, and policies prohibiting or restricting alcohol use by youth have two broad mechanisms of effect—directly reducing physical accessibility, and constructing a normative environment in which drinking by youth is deemed hazardous and inappropriate.

This trial of the Communities Mobilizing for Change on Alcohol (CMCA) intervention is built on two key strains of theory [5]. The first is the theory of cause—factors influencing rates of youth drinking and alcohol-related problems. Based on a half century of research, we know that ease of access to alcoholic beverages affects the amount and patterns of drinking, and affects rates of damaging health and social sequelae[1]. And the effects of alcohol accessibility are particularly noteworthy and well-established for youth[3]. Intertwined with physical access are community norms and practices regarding alcohol and youth. If adults in the community provide alcohol to teens, if police ignore teen drinking,
and residents subtly communicate that youth drinking is not worth worrying about, these permissive practices encourage and facilitate youth drinking[6]. Preventive interventions focused on changing policies, practices and norms in communities, such as CMCA, are often called environmental approaches, contrasting them with individual approaches to reduce drinking risks by addressing persons one by one.

The second key theory underlying this trial is the theory of change—how does one effectively change the targets drawn from the theory of cause? How does one effectuate a change in alcohol accessibility to youth and a change in community practices regarding drinking by teens? CMCA is a community organizing intervention based on democratic traditions of local citizen action to hold local institutions and community leaders responsible for creating safe and healthy communities. CMCA is not a community coalition. The theory of change and the operational implementation of the CMCA community organizing intervention is fundamentally different from common coalition models. This is a frequent confusion in the literature and among practitioners. The confusion may come from both approaches loosely saying they “bring together diverse sectors/members of the community for joint action.” The members of a CMCA Action Team do not represent community organizations and institutions, as coalition members typically do. Members of a CMCA Action Team are (ordinary) citizens passionately concerned about the problem of underage drinking and willing to take collective action to prevent it. Changing policies, institutionally established procedures and practices, and community norms and culture—the core of the CMCA intervention—requires actions challenging or “taking on” powerful or entrenched local institutions. In contrast, community coalitions consist of representatives from community organizations and institutions—often exactly the organizations and institutions that must be changed for effective prevention. Thus, a coalition might have a representative from the school system, a representative from the police department, from the local hospital, from the Mayor’s office, from local treatment centers, etc. The theory of how to create community change and its daily operational implications for implementation are fundamentally different between a CMCA organizing effort and a traditional community coalition approach. There is a relatively large literature on community coalitions, and careful evaluations typically show little effect[7–10].

The CMCA intervention was previously tested in a 15-community randomized trial; results indicated significant effects on older underage drinkers (age 18–20), and apparent effects on off-sale alcohol merchants, but no significant effects on younger adolescents[11, 12]. One of the co-investigators on the original CMCA trial subsequently adapted CMCA for implementation on college campuses[13]. Wolfson’s team conducted a randomized trial with 10 campuses, finding significant effects on drinking consequences but not on various measures of drinking behavior[14]. While the college intervention was modeled on CMCA, there also are some noteworthy differences. The community organizers had an office on campus, and the organizers were supervised by a campus administrator[14]. The task of the organizer on each campus is also described as “building a coalition.” These features might have affected the ability of the effort to fully challenge institutional practices and norms because organizers might not have had the full measure of independence for action that is a hallmark of the CMCA community organizing intervention.
Other randomized trials have also used direct-action community organizing in combination with other intervention components, finding various significant effects, but making it more difficult to discern the specific effect of the organizing intervention component[15, 16]. A community organizing intervention was solely used in a trial focused on tobacco use by youth, resulting in new tobacco control ordinances in each intervention community and modest changes in teen tobacco access and use[17].

The trial reported here was initiated before requirements for pre-trial registration. Nevertheless, the theory, hypothesized main outcomes, hypothesized secondary outcomes, and measures were all published before the outcome data were collected and analyzed[5, 18]. Analyses of baseline patterns, trajectories and correlates of alcohol and drug use among American Indian and white youth have been reported[19], including analyses specifically of young women[20].

The CMCA trial reported here is embedded in a larger preventive intervention trial that also tested the effects of CONNECT, an individual-level screening and brief intervention, which was universally implemented (as opposed to the typical indicated or secondary prevention approach). The main outcome results—effects on drinking behaviors and drinking consequences of each intervention—were recently published[21]. Importantly, results showed the following statistically significant effects of CMCA: 13 percentage-point reduction in current alcohol use, 12 percentage-point reduction in heavy episodic drinking, and 8 percentage-point decrease in alcohol-related consequences. These effects amounted to 25% reductions in outcomes relative to the control condition. In short, previously published results showed that CMCA reduced the primary outcomes—drinking and consequences. Effects of CMCA on key secondary outcomes—measures of access to alcohol—are reported here.

**METHODS**

**Research Design**

We combined multiple design elements to optimize causal inference while meeting the constraints of the setting, number of sites available, and budget (see Supplemental Figure 1 for CONSORT information and Komro et al. for additional details)[5]. The two central design features are the combination of a controlled intensively longitudinal or time-series design with random assignment of community to study condition. Of communities with a high school within the Cherokee Nation, 12 met study selection criteria: (1) served by a high school with 400 to 700 students; (2) had at least a 30-mile separation from other study communities; and (3) had local businesses, including ones that sell alcohol. We constructed a risk score for each community on the basis of school characteristics, and selected the highest-risk communities. Three communities were randomized (using a random number table) into the CMCA condition, and are compared to two control communities. All outcome data were collected monthly or quarterly beginning in the baseline period before intervention initiation and continuing to the end of the trial. Thus, the design provides the strength of time series in measuring the effect of intervention implementation roll-out on trajectories of outcomes over time, not simply on single-time-point treatment vs. control and baseline vs. post-intervention comparisons typical of previous randomized community trials.
Setting

American Indian teenagers drink at similar rates to the broader population, but experience disproportionate rates of damaging health and social consequences[22, 23]. Moreover, American Indian populations, and rural residents more generally, have been substantially underrepresented in health intervention trials. Therefore, we created a close collaboration between university-based prevention scientists and Cherokee Nation Behavioral Health professionals to implement a well-designed randomized intervention trial in the Cherokee Nation.

The Cherokee Nation is the largest American Indian tribe with 347,880 citizens. They experienced a tortuous history after the Europeans arrived in North America. Best known is the “trail of tears” when they were driven from their lands in the eastern part of the continent in the 1830s, but also including a litany of mistreatment and loss after being forcibly resettled in what is now Oklahoma[24]. About half of the tribal members currently live within the 14-county jurisdictional service area of the Cherokee Nation in northeastern Oklahoma. It is not a reservation. Cherokee citizens comprise a significant proportion of the population within this 14-county region; however, these are multi-ethnic, rural communities with mostly Native American (10–44%) and White (44–79%) populations. Tahlequah, Oklahoma is the capitol of the Cherokee Nation and home to the tri-partite government (executive, judicial, legislative), which includes a democratically elected principal chief, deputy principal chief and 17-member tribal council. The laws, rules and regulations of the Cherokee Nation, and the enforcement powers of the Cherokee Nation Marshals, all operate in complex layers of cooperation with municipal, county, state and federal law.

Given the difficult history the Cherokees experienced, and the sometimes less-than-collaborative research previously conducted on American Indians by outsiders, it was particularly important to design the trial as equal partners, and attend to the careful development of roles and relationships across the entire project team. These key features of the trial that draw on community-based participatory traditions are described in detail by Komro et al.[5].

CMCA Intervention Design and Implementation

We initiated CMCA in August 2012, recruiting and hiring three community organizers, each from the community in which they worked beginning January, 2013. In November, 2012, the organizers underwent an initial three days of training on evidence-based environmental alcohol prevention strategies and the methods and techniques of community organizing. They were provided a binder summarizing environmental strategies, organizing methods, and relevant alcohol laws, as well as a text on community organizing for health[25]. Each organizer was given a laptop computer loaded with a research-team-designed management information system that facilitated their organizing work as well as provided on-going measures of progress. Once per week all data on contacts, Action Teams, meetings, actions/events held and outcomes achieved were uploaded and reviewed by the project team.

To encourage action and help strategize next steps, the organizers typically received two calls per month. One was a conference call including all organizers, the organizing
supervisor and select other members of the project team. The second was an individual phone conversation with the organizing supervisor. Additionally, the supervisor visited each organizer in their own community once per month. Twice per year, the organizers met for one to two days of booster trainings in which they presented their community Action Team’s evolving strategic plan and progress to date, receiving feedback and advice from the larger team.

The organizing process used by CMCA involved six interacting stages (see Wagenaar et al. [26] and CMCA Guide link on the project website for details[27]). The first stage was assessing the community involving more than 100 one-on-one conversations with citizens to learn their motivations, what they value, their skills and resources, and their views on local norms about underage drinking. The second stage was building the base, in which an Action Team of 5 to 15 citizens who care deeply about preventing underage drinking was assembled. Action Team members were not affiliated with formal prevention programs or anti-drug coalitions. Rather they were everyday citizens—a retired school teacher, local zookeeper, minister, stay-at-home parent, bank teller, etc. Few held positions of formal power in their communities. The Action Team was coached by the organizer on evidence-based strategies for reducing underage drinking and how to take actions to advance those evidence-based strategies. In the third stage, expanding the base, the Action Team built additional rings of supporters connected to the effort. Then in phase four the Action Team developed a specific action plan, wherein they scheduled strategic actions designed to accomplish specific organizing outcomes. Stage five involved implementing the plan, carrying out their planned actions. Stage six involved assessing results, celebrating accomplishments, and refining planned next steps. The stages are not rigidly linear, and involve feedback loops and cycling back to earlier stages as needed. Keep in mind that many CMCA citizen actions involved challenging entrenched policies, procedures, norms and practices of key community institutions such as city police, education officials, county sheriffs, or prosecuting attorneys.

Implementation metrics illustrate these stages, and how at times an organizer strategically cycles back to an earlier stage (Figure 1). In the first few months, each organizer had over 120 one-on-one citizen conversations before initiating development of an Action Team, but also cycled back and had dozens more in months 6 to 9 as they recruited specific people to fill specific needs in their Action Team. After the first three months, the organizers assembled Action Teams from the most committed people they identified in the one-on-one conversations. Action Teams then made strategic plans for actions and began to carry them out. Actions include such things as information sessions for parents, gaining support from key stakeholders, and increasing police patrols. As evident in Figure 1, actions led to organizing outcomes, which were consistently achieved starting in month 9 and continuing through to the end of the intervention period. Accomplishments include such things as increased police compliance checks of alcohol sales outlets, changes in police operating procedures for dealing with underage drinking, passage of a local social host ordinance, and various supporting media actions, such as editorials published and public service announcements made.

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In total, 622 one-on-one citizen conversations were conducted over the 29-month intervention period. There were 248 Action Team meetings, 122 other meetings (with law enforcement, community leaders, etc.), and 193 actions, which resulted in 89 community organizing outcomes. Action Teams created numerous policy and enforcement changes in the intervention communities. Citizen pressure resulted in replacement of the police chief in one community. Two city ordinances were passed—one increasing social host penalties and the second enhancing the state’s social host law by assessing local response costs on violators. Action Teams successfully pressured city and county police to charge crimes related to social hosting and prosecutors to pursue prosecution on those charges. Teams worked closely with the local District Attorneys and sheriffs offices to create countywide response plans for social hosting and prosecuting cases when they occur. Action Teams collaborated with state alcohol control officers, state highway patrol, Cherokee Nation Marshalls and others to create an enforcement and training plan for large concert events (~60,000 attendees). Additional responsible beverage server training was combined with stepped up cross-agency enforcement efforts.

Outcome Data

Alcohol purchase attempts were conducted at a census of all retail alcohol off-sale outlets in four of the study communities, and, due to the large number of outlets, a random sample of outlets in the fifth community (n=113 outlets). A new wave of data collection was completed every 4 weeks (n=31 waves). All attempts used our well-established protocol with young-appearing female buyers attempting purchases without age identification, implemented from 5pm to 11pm on Friday evenings. Details on the protocol have been published previously [5, 28], and further analyses of the baseline purchase attempt data were previously reported [29]. Purchase attempt data were collected by research staff completely separate from the intervention, data collection staff were blinded as to treatment status, and none of the collected data were shared with intervention organizers or Action Teams during the treatment phase of the trial. Thus, these data were solely a component of the evaluation of the trial, not used as a component of the intervention.

Student surveys were conducted four times per year across the three-year study period of the cohort consisting of all public school students in each study community that were in 9th and 10th grades in the 2012–13 academic year (n=1399). The survey was brief (10–15 minutes), administered entirely by research staff, followed University of Florida and Cherokee Nation IRB-approved parental consent and student assent procedures, and included a $5 incentive for each completed survey plus an additional $10 incentive if all four survey waves were completed in an academic year. Previously published analyses of internal consistency, test–retest reliability, criterion validity, and predictive validity of the survey scales showed high levels of measurement quality, both for the total sample as well as by race/ethnicity subgroups[18]. Specific items in the scales analyzed for this paper are shown in Supplemental Figure 2.

Analysis Methods

We used generalized estimating equations to estimate treatment effects, incorporating all of the repeated measures of study outcomes. Analyses were conducted using PROC GENMOD.
in SAS v9.3, using an AR1 correlation structure for the residuals. Because of the small number of communities per condition the treatment effect is highly correlated with community. As a result, we were unable to estimate a random effects model explicitly accounting for within community clustering. However, the generalized estimating equation approach has the benefit of being relatively unaffected by minor errors in the specified correlation structure.

For dichotomous outcomes, we estimated linear probability models with intervention-by-time interactions to assess the effects of CMCA on the change in probability of each outcome over time. Additionally, we estimated a model including fixed effects for time to allow for non-linear changes over time. No substantive differences were seen between the linear and fixed effect specification. Accordingly, we present the simpler linear models in the results. Results from linear probability models were also verified with corresponding binomial models. Change in probability estimates were then transformed into a percentage-point-change over time for ease of interpretation.

Similar generalized estimating equations were used to estimate the effect of CMCA on continuous scale outcomes. To facilitate interpretability of the scale, while avoiding problems of z-standardization for longitudinal data, we transformed the scale using the percent of maximum possible scaling method[30]. The regression estimate is then interpreted as the change in percent of the maximum possible scale value.

Multiple imputation was used to account for non-response over time and potential differential attrition in the student surveys. Data were converted to a wide structure and twenty imputation data sets were generated using multiple imputations by chained equations in PROC MI in SAS v9.3, subsequently combined using PROC MIANALYZE.

To account for possible pre-study differences that may confound intervention effects, we controlled for baseline values of risk factors found to affect the outcomes within these specific communities based on previous analyses[18, 29]. For the alcohol purchase attempts, we controlled for successful alcohol purchases during baseline, seller age, and outlet type. For the student survey measures, we controlled for baseline values of the outcome, student age, student sex, and student race.

**RESULTS**

**Baseline Characteristics by Study Condition**

For the alcohol purchase attempts, there were no significant differences between treatment and control sites at baseline for the buy rate, seller’s age, or outlet type (Table 1). Among surveyed students, there were no significant baseline differences by study condition in student age, sex, reported access difficulty from parents or adults age 21+ or self-reported alcohol acquisition from non-parent adults or peers age <21. There were significant differences at baseline in student race, perceived police enforcement, perceived commercial access, parental acquisition, and commercial acquisition, but the magnitude of these differences was small. The overall response rate across all students and waves was 76%. Prior to correction via multiple imputation, students from the control communities were
more likely to be missing (p<0.0001) compared to students in CMCA communities. Additionally, students in CMCA communities with higher levels of alcohol acquisition from peers under 21 at baseline were more likely to be missing compared to equivalent students in the control communities. No other statistically significant differences in response rates were observed across intervention conditions.

**Alcohol Purchase Attempt Results**

Results show a statistically significant difference in the linear trajectory of successful alcohol purchase attempts over time associated with the CMCA intervention (Figure 2). We estimated a 0.6 percentage-point reduction in successful alcohol purchase attempts per wave due to the CMCA intervention. Over the intervention period this resulted in an 18 percentage-point reduction in successful alcohol purchases due to CMCA.

**Student Survey Results**

Results show a statistically significant difference in the trajectory of perceived police enforcement, parental acquisition, 21+ social acquisition, <21 social acquisition, and commercial acquisition over time associated with the CMCA intervention (Table 2). In contrast to alcohol acquisition behaviors, there were no corresponding significant effects on measures of perceived availability from these various sources. In terms of magnitudes of effect, results show a 0.7 percentage-point increase each wave in perceived police enforcement, representing a 7 percentage-point increase of the maximum possible score over the course of the intervention period. Similarly, over the intervention period results show a 4 percentage-point reduction in parental acquisition, a 6 percentage-point reduction in obtaining alcohol from non-parent adults age 21+, a 8 percentage-point reduction in obtaining alcohol from peers <21, and a 5 percentage-point reduction in acquisition directly from commercial establishments.

**DISCUSSION**

Results indicate CMCA reduced alcohol acquisition from direct commercial purchase as well as second-hand from social sources—peers and adults. It appears this community-wide environmental intervention had its effect on drinking, at least in part, by reducing alcohol accessibility to youth.

At baseline, about 5–15% of youth reported obtaining alcohol from each source during the past 30 days (Table 1). Thus, observed CMCA effects represent roughly a one-third reduction in reported acquisition. Over repeated measurement before CMCA Action Teams were active, about a third to half of alcohol outlets sold to young-appearing buyers without age identification. Thus, observed CMCA effects again represent roughly a one-third reduction in propensity of outlets to sell to youth. It is interesting that despite (1) reductions in the directly tested propensity of outlets to sell to underage youth, (2) reductions in self-reported acquisition of alcohol from social and commercial sources, and (3) reductions in self-reported drinking and heavy episodic drinking, we find no effects on teens’ perceptions of ease of access to alcohol, which remained high.
Instead of a coalition of local organizations or positional leaders, CMCA uses community organizing methods to activate citizens to pressure community leaders to alter procedures and practices in evidence-backed ways to reduce the accessibility of alcohol to youth and reinforce community norms that drinking by teens is hazardous and unacceptable. Future reviews and meta-analyses should pay closer attention to the theory of change underlying community interventions. It is our impression that coalition interventions often show modest to no effects, but that organizing interventions have shown larger and more consistent preventive effects. Future replications of CMCA by others and further analyses of the larger literature are needed to verify that impression.

Like all trials in the real world, our control sites were not pure no-treatment controls. Our tracking data indicated an average of 4 school-based and 3 or 4 community-based prevention activities underway each year during the study period in the control sites. Thus, our estimates of CMCA effects are necessarily comparisons with “normal practice” of prevention in Cherokee Nation communities. A more serious limitation of the trial is that only a small number of sites were randomized to treatment or control. This was purely due to strict budgetary constraints, and we attempted to overcome some of the disadvantages of a small number of sites with many repeated measures.

One strength of our intensive longitudinal design is the ability to examine more closely the trajectory of intervention effects. We observed an expected pattern of effects emerging after the ramp-up phase of the organizing effort, but also observed how further progress appeared to stall in the final months leading up to the termination of the intervention phase. As citizen Action Teams and project staff see the project end coming soon, it is likely energy and commitment begins to turn elsewhere. This natural history of temporary project-funded prevention efforts deserves more attention in future research. It obviously raises questions about how to best optimize long-term sustainability. A classic community organizing approach would have Action Teams continue focused effort on a particular community problem (in this case underage drinking) until the existing public and private sector institutions were restructured or otherwise changed such that they adequately addressed the issue. At that point, the citizen teams, having learned and developed improved organizing skills, would move on with renewed energy to another pressing issue in the community. Two randomized trials of CMCA have now shown the beneficial effects of community organizing, but further research is warranted on optimizing the amounts and duration of funding and related support to ensure long-term sustainability.

**Supplementary Material**

Refer to Web version on PubMed Central for supplementary material.

**Acknowledgments**

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Neighborhoods Nonprofit Resource Center, the Cherokee Nation, participating school districts and high schools, students, parents, and communities.

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Figure 1.
CMCA Implementation Metrics
Figure 2.
CMCA Effects: Alcohol Purchases
### Table 1
Treatment vs. Control Communities at Baseline: Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Control (N=48 outlets)</th>
<th>CMCA (N=65 outlets)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alcohol Purchase Attempts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Baseline Buy Rate (%, SE)</strong></td>
<td>25.0 (6.3)</td>
<td>19.0 (5.0)</td>
<td>0.4504</td>
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<tr>
<td><strong>Seller's Estimated Age (%, SE)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 20</td>
<td>2.2 (2.2)</td>
<td>8.6 (3.7)</td>
<td>0.3593</td>
</tr>
<tr>
<td>20–29</td>
<td>15.6 (5.4)</td>
<td>20.7 (5.3)</td>
<td></td>
</tr>
<tr>
<td>30–39</td>
<td>26.7 (6.6)</td>
<td>17.2 (5.0)</td>
<td></td>
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<tr>
<td>40 or Older</td>
<td>55.6 (7.4)</td>
<td>53.4 (6.6)</td>
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<tr>
<td><strong>Outlet Type (%, SE)</strong></td>
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<td></td>
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<tr>
<td>Liquor stores</td>
<td>20 (6.0)</td>
<td>20 (5.2)</td>
<td>1.0000</td>
</tr>
<tr>
<td>Grocery/convenience stores, etc.</td>
<td>80 (6.0)</td>
<td>80 (5.2)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Student Surveys</strong></td>
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<tr>
<td><strong>Demographics</strong></td>
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<tr>
<td>Age (Mean, SE)</td>
<td>15.4 (0.0)</td>
<td>15.4 (0.0)</td>
<td>0.8491</td>
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<tr>
<td>Female (%, SE)</td>
<td>51.2 (2.1)</td>
<td>49.3 (1.8)</td>
<td>0.4759</td>
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<tr>
<td>Race (%, SE)</td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
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<tr>
<td>American Indian only</td>
<td>19.0 (1.6)</td>
<td>27.7 (1.6)</td>
<td></td>
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<tr>
<td>White only</td>
<td>45.7 (2.1)</td>
<td>45.3 (1.7)</td>
<td></td>
</tr>
<tr>
<td>American Indian and white</td>
<td>21.4 (1.7)</td>
<td>20.7 (1.4)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>13.8 (1.4)</td>
<td>6.3 (0.9)</td>
<td></td>
</tr>
<tr>
<td><strong>Perceptions (POMPS, SE)</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Police Enforcement</td>
<td>66.6 (1.2)</td>
<td>70.2 (1.0)</td>
<td>0.0180</td>
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<td>Parental Access Difficulty</td>
<td>72.5 (1.1)</td>
<td>74.1 (0.9)</td>
<td>0.2568</td>
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<tr>
<td>21+ Social Access Difficulty</td>
<td>59.0 (1.2)</td>
<td>60.5 (1.0)</td>
<td>0.3475</td>
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<td>&lt;21 Social Access Difficulty</td>
<td>66.5 (1.2)</td>
<td>69.5 (1.0)</td>
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<td>Commercial Access Difficulty</td>
<td>80.3 (1.1)</td>
<td>83.7 (0.8)</td>
<td>0.0107</td>
</tr>
<tr>
<td><strong>Self-reported Alcohol Acquisition(% , SE)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From parents</td>
<td>14.0 (1.4)</td>
<td>9.9 (1.1)</td>
<td>0.00194</td>
</tr>
<tr>
<td>From age 21+ adults</td>
<td>16.6 (1.6)</td>
<td>14.6 (1.3)</td>
<td>0.3218</td>
</tr>
<tr>
<td>From age &lt; 21 peers</td>
<td>16.2 (1.5)</td>
<td>13.0 (1.2)</td>
<td>0.0951</td>
</tr>
<tr>
<td>From commercial outlets</td>
<td>6.6 (1.0)</td>
<td>3.8 (0.7)</td>
<td>0.0168</td>
</tr>
</tbody>
</table>
### Table 2
CMCA Effects: Survey Measures

<table>
<thead>
<tr>
<th>Scale Measures (linear with POMPS transformation)</th>
<th>Crude</th>
<th>Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception Outcomes</td>
<td>Change in POMPS Per Wave</td>
<td>Pr &gt;</td>
</tr>
<tr>
<td>Police Enforcement</td>
<td>0.8 (0.5, 1.2)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Parental Access Difficulty</td>
<td>0.1 (−0.3, 0.5)</td>
<td>0.5319</td>
</tr>
<tr>
<td>21+ Social Access Difficulty</td>
<td>−0.1 (−0.5, 0.3)</td>
<td>0.5831</td>
</tr>
<tr>
<td>&lt;21 Social Access Difficulty</td>
<td>0.1 (−0.3, 0.5)</td>
<td>0.5878</td>
</tr>
<tr>
<td>Commercial Access Difficulty</td>
<td>0.1 (−0.2, 0.4)</td>
<td>0.5550</td>
</tr>
</tbody>
</table>

| Binary Measures (linear probability models) | | |
| Self-reported Alcohol Acquisition Outcomes | Percentage-point Change Per Wave | Pr > |t| | Percentage-point Change Per Wave | Pr > |t| |
| From Parents | −0.6 (−1.0, −0.1) | 0.0089 | −0.4 (−0.8, −0.008) | 0.0455 |
| From age 21+ adults | −0.7 (−1.2, −0.1) | 0.0210 | −0.6 (−1.1, −0.04) | 0.0371 |
| From age<21 peers | −0.9 (−1.4, −0.4) | 0.0003 | −0.8 (−1.3, −0.3) | 0.0010 |
| From commercial outlets | −0.6 (−1.0, −0.1) | 0.0109 | −0.5 (−0.9, −0.1) | 0.0264 |

Note: POMPS=percent of maximum possible scale value.