

Community Intervention to Prevent Adolescent Health Behavior Problems: Evaluation of Communities That Care in Australia

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Objective: A major challenge for health psychologists is to ensure the implementation of evidence-based interventions to improve population health. To reduce high rates of adolescent alcohol use and related health problems, trials of the Communities That Care (CTC) prevention process were implemented in Australia beginning in 2001. The process assists communities to strategically plan and monitor implementation of evidence-based preventative interventions. This article reports an evaluation of the effects in the first four Australian communities that completed the process. **Method:** Trends were examined based on self-report surveys completed by 41,328 adolescents (average age 13.5 years, 51.7% female) across 109 municipal localities between 1999 and 2015. Multilevel modeling compared the 5 localities where the 4 coalitions completed the CTC process with the remaining 104 localities for trends in adolescent reports of lifetime alcohol, tobacco, and cannabis use and past year antisocial behavior. **Results:** Relative to Australian trends, adolescents in CTC localities reported significantly steeper annual reductions in any lifetime alcohol (Adjusted odds ratio [AOR] = 0.94, 95% confidence intervals [CI] = [0.93, 0.95]), tobacco (AOR = 0.97, CI [0.96, 0.99]), cannabis use (AOR = 0.96, CI [0.93, 0.98]) and antisocial behavior (unstandardized regression coefficient [B] = -0.001, CI [-0.002, 0.000]). **Conclusion:** Implementation of the CTC process in Australia was associated with more rapid community reductions in adolescent health behavior problems. Supporting community coalitions to adopt evidence-based interventions appears a feasible means for health psychologists to improve the health of large adolescent populations and prevent related chronic health problems in later life.

Keywords: substance use, community intervention, health promotion

This article was published Online First April 18, 2019.

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A conflict is noted in that John W. Toumbourou served as Chief Executive Officer, Bosco Rowland and Rachel Smith as Deputy Chief Executive Officers, and George C. Patton as a Director of Communities That Care Ltd, the not-for-profit company established to manage the

process in Australia. Data collection and analysis were supported with funding from the National Health and Medical Research Council (Project Grants 334304; APP1087781) and the Australian Research Council (Linkage LP100200755). The authors declare their independence from the funders and from any tobacco, alcohol, pharmaceutical or gaming industries or anybody substantially funded by one of these organizations. The funding bodies impose no contractual constraints on publishing. We wish to acknowledge the important contribution made by John (Jack) Melbourne and Bill Pickett who have served as Rotary Club members and Jennifer Nazareth as administrative officer to the Board of Communities That Care Ltd across the years reported in this study.

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This article reports an Australian evaluation of a community-based adolescent health promotion intervention called Communities That Care (CTC). In what follows are details of the intervention together with the Australian public health context that framed the evaluation.

The Imperative to Prevent Adolescent Health Problems

Recently a Lancet Commission called for priority action to address adolescent health problems (Patton et al., 2016). This call to action was based on the large world population that will fall into the adolescent age period in the coming decades and the potential for interventions to markedly improve health in later years. Priority targets for adolescent health behavior change include the reduction of alcohol, tobacco, and other drug use and related behaviors such as violence and associated injuries (Toumbourou, Olsson, Rowland, Renati, & Hallam, 2014). There is substantial evidence that preventing adolescent health behavior problems can reduce future public health burden related to adult chronic disease and disability (Toumbourou et al., 2014).

Alcohol, tobacco, and other drug use are underlying causes of a wide range of health and social problems and the earlier a person commences using these substances, the greater their risk of harm (Catalano & Hawkins, 1996).

Alcohol consumption is associated with increased risk of developing a range of chronic diseases, is a cause of cancer, and has been linked to high blood pressure and overweight and obesity (Shield, Parry, & Rehm, 2013). Adolescent alcohol, tobacco, and illicit drug use not only increase the immediate risk of health problems but also predict adult dependence and related health and social problems (Silins et al., 2015), therefore, reducing substance use during adolescence is important for preventing long-term adverse consequences and for protecting against short-term harms.

Summaries of adolescent health psychology interventions suggest that reducing the cumulative number of risk factors and enhancing protective factors in the family, school, and community environments can reduce adolescent problems including alcohol, tobacco, illicit drug use, and antisocial behavior (Toumbourou et al., 2014). This knowledge has led to a focus on social environmental intervention strategies as a means of advancing adolescent health (Patton et al., 2006).

CTC

CTC was developed in the United States as a framework to guide community coalitions to design and implement local action plans to improve child and adolescent health using a science-based prevention approach (Hawkins et al., 2008). CTC assists in the formation and training of community coalitions from local agencies and volunteers serving child and adolescent health using a five-phase process. These phases provide communities with a standardized structure and benchmarking for intervention implementation, monitoring and evaluation and include: recruitment and orientation of community leaders and stakeholders to the CTC process (Phase 1), formation of a local coalition to guide decision making (Phase 2), use of epidemiologic data to prioritize risk factors to be targeted for preventive action (Phase 3), selection of appropriate evidence-based intervention programs (Phase 4), and

implementation and monitoring of selected programs (Phase 5). A lead agency (e.g., a local government council) is required to lead the community through the phases (see www.communitiesthatcare.org.au/5-phases-ctc). Communities are trained in each of the five phases with trainings delivered by an accredited trainer. Once a community completes the five phases, the cycle can be repeated to target new health promotion priorities.

The process also guides coalitions to use valid and reliable youth surveys (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002) to assess community needs and develop prevention plans that are tailored to local community priorities (Hawkins et al., 2009). The behavior change theory guiding the CTC approach is the social development model (SDM; Catalano & Hawkins, 1996). The SDM integrates a range of health behavior theory, while emphasizing the importance of social bonding (e.g., with peers or adults) as a critical step leading to socially influenced behavior. The SDM recognizes opportunities, skills and social rewards as modifiable protective factors that influence social bonding. Coalitions are encouraged to plan evidence-based interventions to increase these protective factors to increase “prosocial bonding” to healthy role models.

The CTC resources include regularly updated lists of manualized programs that have been evaluated in randomized trials and found to be effective. The CTC approach encourages implementation of “evidence-based” programs of this type. In the U.S. large community trials reveal the CTC process led to increased community implementation of evidence-based interventions (Hawkins et al., 2008). Longitudinal follow-up studies have linked the implementation of CTC in the United States with increases in protective factors and reductions in risk factors for adolescent problems, while also revealing reductions in targeted problems including alcohol and drug use (Hawkins et al., 2009) and crime (Greenberg, Feinberg, Gomez, & Osgood, 2005).

The Australian Adolescent Health Context

In the late 1990s in Australia there were rising rates of adolescent health problems such that in 2002 a cross-national comparison observed almost twice the rate of adolescent alcohol and other drug use among Australian adolescents compared to their same-aged peers in the US (McMorris, Hemphill, Toumbourou, Catalano, & Patton, 2007; Toumbourou, Hemphill, McMorris, Catalano, & Patton, 2009). In this context, it was considered important to investigate whether there were feasible and effective community-led intervention alternatives to reduce adolescent alcohol and drug use. A number of reports in that period recommended the implementation of CTC as a means of improving adolescent health (National Crime Prevention, 1999; Toumbourou, 1999).

Findings from the United States suggested that evidence-based strategies that are coordinated and delivered by communities could be effective for implementation in Australia (Toumbourou, 1999). However, to be supported for wider dissemination, these community delivered prevention strategies required testing and systematic evaluation in the Australian context.

The Australian Implementation of CTC

The Australian license to implement the CTC process was purchased from the U.S. developer in 1999 (Toumbourou, 1999)

and a company was formed to offer the technical assistance and resources to Australian communities. The Australian implementation of CTC was initiated using the training manuals and technical resources available in 2002, with the developer providing training updates in later years.

The present project sought to analyze data collected across Australia over a 15-year period using the Communities That Care Youth Survey (CTC Youth Survey). The CTC Youth Survey was designed in the United States to provide a valid tool for community monitoring of risk factors that influence adolescent health behaviors such as alcohol and drug use (Arthur et al., 2002). The survey includes a comprehensive range of scales that had been found in systematic reviews of longitudinal studies to be consistent risk factors for adolescent health behavior problems, while also monitoring the protective factors identified by the SDM (Arthur et al., 2002).

The CTC Youth Survey assesses adolescent alcohol and drug use behavior using valid questions from the Monitoring The Future survey (Johnston, O'Malley, Bachman, & Schulenberg, 2011) that are used internationally in the European School Survey Project on Alcohol and Other Drugs (ESPAD; Hibell et al., 2011) student surveys. The CTC Youth survey measures risk and protective factors in an ecological context at the individual, peer, family, school, and community levels (e.g., substance use attitudes, attachment to family and school, opportunities and rewards for prosocial involvement). The Australian adaptation of the CTC Youth Survey was first trialed as a state-wide student monitoring instrument in the south-eastern state of Victoria in 1999. The Australian CTC Youth Survey has been prospectively tested in matched longitudinal studies in Victoria and in Washington State in the United States and found to be a valid and reliable longitudinal predictor of adolescent alcohol and drug use in both states (Hemphill et al., 2011).

The Present Report

National CTC Youth Survey data was used to evaluate the behavioral impact of the implementation in the five localities served by the first four Australian CTC coalitions (pioneer communities). It was hypothesized that in the municipal localities implementing CTC, community rates of adolescent alcohol and other drug use and related antisocial behavior would reduce more steeply over time compared to Australian community trends in other localities.

Method

Study Design

The study sought to evaluate the effect of CTC exposure based on the comparison of Australian population trends (Toumbourou et al., 2018) in adolescent health behavior. To achieve this, multilevel analysis was completed on student survey data collected using the Australian version of the CTC Youth Survey. Data from the pioneer and comparison communities were collected through cross-sectional school surveys that were designed to estimate the youth population characteristics within Australian municipal localities (local government areas [LGA]).

The student survey data used for the present article has been described previously (Toumbourou et al., 2018) and is summarized in what follows. Data were drawn from 11 cross-sectional CTC youth survey studies. In each survey, schools were selected to provide valid estimates of the youth population within sampled LGAs. Surveys were conducted in 109 Australian LGAs between 1999 and 2015 (Toumbourou et al., 2018).

Procedure

Ethics approval for data collection was obtained from the Royal Children's Hospital and University of Melbourne Human Research Ethics Committees for the surveys completed until 2012 and from the Deakin University Human Research Ethics Committee for the surveys completed after 2012. Relevant education authorities and school principals provided consent. For each of the surveys, all students in the selected year levels within the participating schools were invited to take part. All surveys were anonymous. The survey questions and procedures were matched across years, with students supervised by trained research staff to complete questionnaires during class time of approximately 45 min.

CTC Intervention

The present evaluation focused on the first four Australian coalitions that completed all five phases of the CTC process. The first three communities (Mornington Peninsula Shire [an outer urban municipality] and Ballarat in Victoria and Bunbury in Western Australia [regional towns]) initiated activities from 2001 to 2002. Champions from these three municipalities approached CTC following national publicity about the process. All three communities were able to successfully raise state-government funding to complete the process. An independent process evaluation reported these communities successfully completed all five phases of the CTC process in one or more locations within their community (Kellock, 2007). After completing their first five-phase cycle (in 2007), CTC Mornington Peninsula were supported by their local government to complete a further two cycles of the process. The Bunbury coalition completed their first cycle in 2006. Although they have not implemented a further CTC cycle, they have remained active as a regional child and adolescent health coalition and as of 2018 were continuing to implement evidence-based practices in early childhood populations (www.investinginouryouth.com.au/). The Ballarat coalition (Strengthening Generations) completed their first cycle in 2009. From 2009, the Ballarat coalition continued to use knowledge gained from the CTC process to implement adolescent alcohol prevention services supported by local government until 2014, when local priorities changed. The fourth pioneer community (CTC Myrtleford) was the first small town to implement the process. Champions from a local health service approached CTC following publicity of positive findings from the initial pioneer sites. Beginning in 2009, their first cycle was completed in 2015, funded from community health and other contributions. Having achieved significant reductions in adolescent problems in their first cycle, the Myrtleford coalition have since expanded to a LGA (CTC Alpine) and as of 2018 were actively implementing a second cycle of the CTC process.

The evidence-based programs available for CTC sites in Australia are regularly updated by the Australian Research Alliance for

Children and Youth, Prevention Science Network and listed on a searchable website (<http://whatworksforkids.org.au>). As relevant to adolescents, the initially developed action plans in all four communities have focused on the prevention of adolescent alcohol use (and in three communities other drug use was also targeted). All action plans focused on reducing favorable attitudes to alcohol and drugs in youth using school-based drug education (e.g., School Health and Alcohol Harm Reduction Project; McBride, Farringdon, & Kennedy, 2007) and on reducing family risk factors using evidence-based parent education and family intervention (e.g., Triple P; Sanders, Kirby, Tellegen, & Day, 2014). Evaluations confirmed the majority of the strategies listed in the action plans were successfully implemented (Kellock, 2007).

Measures

Lifetime substance use was measured in the CTC youth survey as follows: (a) alcohol use: "In your lifetime on how many occasions (if any) have you: Had alcoholic beverages (like beer, wine or liquor/spirits) to drink—more than just a few sips?" Response options ranged from *never* to *ten or more times* and were recoded as categorical outcomes 0 (*never*) and 1 (*one or more times*); (b) tobacco use: "Have you ever smoked cigarettes?"; and (c) cannabis use: "In your lifetime on how many occasions (if any) have you . . . used marijuana (pot, weed, grass)?" Response options ranged from *never* to *ten or more times* and were recoded as categorical outcomes 0 (*never*) and 1 (*one or more times*).

Antisocial behavior was measured as follows: antisocial behavior: five items (How many times in the past year [12 months] have you: carried a weapon? sold illegal drugs? stolen or tried to steal a motor vehicle such as a car or motorcycle? attacked someone with the idea of seriously hurting them? been drunk or high at school?) Response options ranged from *never* to *ten or more times* (Cronbach's alpha = .62) and were recoded as 0 (*never*) and 1 (*one or more times*). The scale comprised the count across the five items averaged to range from 0 to 1.

A risk factor average score was calculated as the mean (scaled 1 to 4) of the following eight CTC Youth Survey risk factors:

For community substance abuse, there were four items (e.g., How easy would it be for you . . . if you wanted to get some . . . cigarettes? alcohol . . . ? marijuana . . . ? a drug like cocaine, heroin . . . ?) had response options ranging from 1 (*very hard*) to 4 (*very easy*; Cronbach's alpha = .87). For low community attachment, three items (I'd like to get out of my neighborhood. If I had to move, I would miss the neighborhood I now live in [reverse coded, R]. I like my neighborhood [R]) had response options ranging from 1 (*NO!*) to 4 (*YES!*; Cronbach's alpha = .77). For parent favorable attitudes to substance use, four items (How wrong do your parents feel it would be for you to: smoke cigarettes? drink beer or wine regularly . . . ? drink liquor/spirits regularly . . . ? use marijuana . . . ?) had response options ranging from 1 (*very wrong*) to 4 (*not wrong at all*; Cronbach's alpha = .81). For poor family management, nine items (My parents ask if I've gotten my homework done? . . . parents know if you did not come home on time? The rules in my family are clear? When I am not at home, one of my parents knows where I am and who I am with? My parents want me to call if I am going to be late getting home? My family has clear rules about alcohol and drug use?; . . . would you be caught by your parents . . . if you: drank some alcohol . . . ? . . . carried a

weapon . . . ? . . . skipped school . . . ?) had response options ranging from 1 (*YES!*) to 4 (*NO!*; Cronbach's alpha = .83). For family conflict, three items (. . . In my family . . . We argue about the same things . . . over and over? People . . . have serious arguments? . . . often insult or yell at each other?) had response options ranging from 1 (*NO!*) to 4 (*YES!*; Cronbach's alpha = .80). For low commitment to school, seven items (During the last four weeks . . . how many whole days have you missed because you skipped or "cut/wagged" [R]? How often do you feel that the schoolwork you are assigned is meaningful and important? How interesting are most of your school subjects to you? . . . the things you are learning in school are going to be [important] for your later life?; . . . over the past year . . . how often did you . . . Enjoy being in school? Hate being in school [R]? Try to do your best work in school?) had response options ranging from 1 (*almost always*) to 4 (*never*; Cronbach's alpha = .80). For academic failure, two items (. . . what were your grades/marks like last year?—response options ranged from 1 [*very good*] to 4 [*very poor*]; Are your school grades better than the grades/marks of most students in your class?—response options ranged from 1 [*YES!*] to 4 [*NO!*]; Cronbach's alpha = .68). For perceived substance use, four items (How much do you think people risk harming themselves (physically or in other ways) if they: . . . smoke . . . cigarettes . . . ? Take . . . an alcoholic beverage . . . nearly every day? use marijuana . . . once or twice? regularly?) had response options that ranged from 1 (*great risk*) to 4 (*no risk*; Cronbach's alpha = .85). The risk factor average score aggregated from the eight risk factors had a mean score = 1.87 (95% CI [1.83, 1.91]; Cronbach's alpha = .72).

A protective factor average score was calculated as the mean (scaled 1 to 4) of the following seven CTC Youth Survey protective factors:

For community opportunities for prosocial involvement, there were five items (Which of the following activities for people your age are available in your community? Sports teams; Scouting . . . ; Youth groups . . . ; Community service . . . ; There are lots of adults in my neighborhood I could talk to about something important) had response options for all the protective factors ranged from 1 (*NO!*) to 4 (*YES!*; Cronbach's alpha = .72). For family attachment, there were four items (Do you feel very close to your mother? . . . father? Do you share your thoughts and feelings with your mother? . . . father?; Cronbach's alpha = .79). For family opportunities for prosocial involvement, there were three items (My parents . . . give me lots of chances to do fun things with them? . . . ask me what I think before most family decisions affecting me are made? . . . I could ask . . . for help; Cronbach's alpha = .74). For family rewards for prosocial involvement, there were four items (My parents . . . notice when I am doing a good job . . . tell you they're proud of you . . . Do you enjoy spending time with your mother? . . . father?; Cronbach's alpha = .77). For school opportunities for prosocial involvement, there were five items (In my school, students have lots of chances to help decide things . . . Teachers ask me to work on special classroom projects. There are lots of chances for students . . . to get involved in . . . school activities outside of class . . . to talk with a teacher one-on-one. I have lots of chances to be part of class discussions or activities; Cronbach's alpha = .67). For school rewards for prosocial involvement, there were four items (My teacher(s) notices when I am doing a good job . . . I feel safe at my school. The school lets my parents know when I have done something well. My teachers praise me . . . ; Cron-

bach's alpha = .75). For emotional control, there were four items (I know how to relax when I feel tense . . . keep my feelings under control . . . calm down when I am feeling nervous . . . control my temper; Cronbach's alpha = .76). The protective factor average score derived from the seven protective factors had a mean score = 3.02 (CI [2.99, 3.04]; Cronbach's alpha = .77).

To provide additional control for peer, family and community contextual factors student reports were also included based on the following scales. For peer substance use, there were four items (In the past year (12 months), how many of your best friends have: smoked cigarettes? tried alcohol . . .? used marijuana . . .? used other illegal drugs . . .?). Response options ranged from 1 (*no friends*) to 5 (*four or more friends*; Cronbach's alpha = .80). For parent antisocial attitudes, three items (How wrong do your parents feel it would be for you to: steal something worth more than \$5/10? draw graffiti, or write things or draw pictures on buildings or other property (without the owner's permission)? pick a fight with someone?) had response options ranging from 1 (*very wrong*) to 4 (*not wrong at all*; Cronbach's alpha = .77). For community mobility, four items (Have you changed homes in the past year? Have you changed schools . . . in the past year? How many times have you changed schools . . . since kindergarten? How many times have you changed homes since kindergarten?) had response options that ranged from 1 (*never*) to 5 (*7 or more times*; Cronbach's alpha = .60).

Demographic details were recorded based on student reports of gender, age, school grade, Non-Australian country of birth (referent Australian birth and missing), and Indigenous status (referent non-Indigenous and missing). Community, state, urban/non-urban region and government (referent Catholic, independent, or missing) school were coded based on the student school type and location. The survey response rate (percentage of students surveyed from the school population in each LGA: range 50% to 90%, mean 73%) was included in analyses. Community disadvantage was assigned based on 2011 census data (Index of Relative Socioeconomic Disadvantage; Australian Bureau of Statistics, 2011) for each LGA. A variable representing the survey year that students completed questionnaires was developed with each unit representing the increment of one year (i.e., 1 = 1999; 3 = 2001; 17 = 2015).

Analyses

All analyses were completed using Stata, Version 15. Multilevel modeling was conducted using STATA procedure "mixed" for continuous outcomes and "melogit" for categorical. First, linear trends for four adolescent health behavior problems were estimated based on the odds ratio for the effect of survey year adjusting for gender, school grade, urban location, government school, survey response rate, community disadvantage, child country of birth, Indigenous status, peer substance use, family antisocial attitudes, and community mobility. All estimates controlled for the clustering of students within LGAs. Second to enable hypothesis testing, the predictive effect of the student location in a CTC site was evaluated based on the interaction with the survey year annual trend estimate. The four CTC coalitions implemented in five localities and trends in these sites were compared to the remaining 104 localities. Finally, the STATA "margins" command was used to obtain adjusted prevalence estimates for adolescent behaviors

and risk factors from the multivariate models that were plotted graphically.

To maximize the analytic sample, missing data was included in the referent for three variables (government school [not recorded on 14,994 surveys], child country of birth [12,403 missing values], Indigenous status [11,431 missing values]) and imputed using regression from correlated variables in three cases (gender [1,034 missing values imputed], peer substance use [1,252 values], family antisocial attitudes [2,619], and community mobility [3,978]). The multivariate analyses in the imputed data were compared with a sample of nonimputed data in analyses that did not include the high missing variables—government school, child country of birth and Indigenous status. In overview the models were similar with imputed and nonimputed data and hence the imputed data were retained in the analyses.

Results

Participants

Youth surveys were completed by 41,328 adolescents ($M_{\text{age}} = 13.5$ years; $SD = 1.7$; $M_{\text{grade}} = 8$; 51.7% female). Table 1 presents other demographic information for the samples surveyed in the comparison and the CTC intervention communities. There were no significant differences except for Australian birth, parent antisocial attitudes, and community mobility where rates were significantly higher in the intervention communities.

Table 2 presents details of the multilevel models predicting adolescent substance use behaviors, adjusted for demographic and socioeconomic factors. Table 2 revealed that the multivariate adjusted odds ratio (OR) for the survey year showed a linear trend for annual reductions in community rates of the three behaviors across the 15 years. The largest reduction was for tobacco use (OR = 0.86, confidence interval [CI]: [0.85, 0.87]) and the lowest was for alcohol use (OR = 0.96, CI [0.95, 0.97]). The CTC sites had significantly higher rates of alcohol and cannabis use at the baseline in 1999 (e.g., alcohol use OR 1.88). The interaction (CTC Sites \times Survey Year) revealed significantly higher annual reductions in the CTC sites compared to other Australian localities in adolescent substance use behavior, with the largest reductions for alcohol use (OR = 0.94).

Multivariate adjusted estimates from these models revealed that the prevalence of any lifetime alcohol use in average Grade 8 in 1999 was significantly higher for students in the CTC sites (74%, CI [71, 77]%) compared to other Australian communities (64%, CI [62, 65]%). The reduction in Grade 8 alcohol use was steeper in the CTC sites, such that in 2015 alcohol use was lower (46%, CI [43, 49]%) compared to the other Australian localities (52%, CI [50, 53]%). These trends are presented in Figure 1.

Table 3 presents multivariate regression analyses predicting youth-report of the number of antisocial behaviors and risk and protective factors. The interaction term (CTC Sites \times Survey Year) was significant revealing larger annual changes in the CTC sites compared to other Australian communities for reduction of antisocial behavior (unstandardized regression coefficient [B] = -0.001, CI [-0.002, -0.000]), risk factors (B = -0.007, CI [-0.008, -0.005]) and increased protective factors (B = 0.007, CI [0.005, 0.010]). Although protective factors increased in the CTC sites, a declining

Table 1
Demographic Information for Intervention and Comparison Communities

Variable	Comparison communities (n = 27,467)		Communities that care (n = 13,861)		p
	M or %	95% CI	M or %	95% CI	
Survey year	2006.04	[2,005.34, 2,006.74]	2,006.19	[2,004.07, 2,008.32]	ns
Grade	8.25	[8.09, 8.41]	8.24	[7.16, 9.32]	ns
Community disadvantage	2.40	[2.05, 2.75]	2.71	[.97, 4.45]	ns
Peer substance use	1.71	[1.65, 1.77]	1.86	[1.49, 2.22]	ns
Family antisocial attitudes	1.36	[1.35, 1.37]	1.39	[1.36, 1.43]	*
Community mobility	1.82	[1.79, 1.84]	1.88	[1.85, 1.91]	***
Female #	51.77%	[50.21, 53.33]	51.66%	[50.35, 52.97]	ns
Survey response rate	68.18%	[66.12, 70.24]	73.73%	[65.50, 81.96]	ns
Government school #	60.36%	[54.87, 65.84]	73.43%	[72.36, 74.49]	ns
Urban	69.24%	[56.69, 81.79]	63.11%	[62.31, 63.92]	ns
Victoria	77.46%	[65.79, 89.12]	91.06%	[59.57, 1.00]	ns
Non-Australian birth #	10.19%	[8.28, 12.11]	4.48%	[.67, 8.29]	**
Indigenous #	2.29%	[1.23, 3.35]	2.27%	[.00, 4.52]	ns

Note. 95% CI = 95% confidence interval; CTC = Communities That Care. p = Test of difference between comparison and intervention based on logistic regression: ns = nonsignificant difference; LGAs = local government areas. As interventions were delivered in one neighboring LGA - 5 LGAs were included in the CTC and 104 in the comparison sample. # Based on nonimputed sub-samples (see text in Analysis section).

*p < .05. **p < .01. ***p < .01.

trend was observed over the 15-years in other Australian communities (survey year B = -0.006: see Figure 1).

Discussion

The hypothesis that exposure to the CTC intervention would be associated with steeper declines in adolescent alcohol, tobacco,

and cannabis use and antisocial behavior was supported. The CTC intervention was also associated with steeper reductions in adolescent risk factors and larger increases in protective factors.

The current findings are in line with previous reports of outcomes following the implementation of the CTC process. Although previous evaluations have been mostly limited to the

Table 2
Multilevel Logistic Regression Predicting Adolescent Behaviors

Predictors	Alcohol use (n = 39,467)		Tobacco use (n = 39,681)		Cannabis use (n = 36,130)	
	OR	95% CI	OR	95% CI	OR	95% CI
Survey year	.96	[.95, .97]	.86	[.85, .87]	.90	[.89, .92]
CTC site	1.88	[1.49, 2.37]	1.28	[.94, 1.73]	1.95	[1.31, 2.90]
CTC site × Survey year	.94	[.93, .95]	.97	[.96, .99]	.96	[.93, .98]
Grade	1.28	[1.26, 1.30]	1.21	[1.19, 1.24]	1.49	[1.45, 1.54]
Female	.77	[.74, .81]	1.14	[1.07, 1.20]	.72	[.66, .78]
Government school	1.04	[.98, 1.10]	1.20	[1.11, 1.29]	1.35	[1.17, 1.54]
Urban location	.76	[.67, .86]	1.05	[.89, 1.25]	1.08	[.85, 1.38]
Survey response rate	.72	[.44, 1.19]	.70	[.35, 1.43]	10.62	[1.91, 59.15]
State (ref: Victoria)						
Queensland	.70	[.60, .83]	.60	[.47, .77]	.68	[.38, 1.20]
Western Australia	.79	[.66, .95]	.67	[.51, .87]	2.11	[1.29, 3.47]
Community disadvantage (ref: Highest quartile)						
Second quartile	1.15	[.94, 1.42]	1.17	[.89, 1.53]	.78	[.56, 1.10]
Third quartile	1.04	[.91, 1.18]	1.14	[.96, 1.34]	1.07	[.86, 1.33]
Lowest disadvantage	.95	[.83, 1.09]	1.21	[1.01, 1.46]	.69	[.54, .88]
Non-Australian birth	.70	[.64, .76]	.95	[.84, 1.07]	.77	[.62, .95]
Indigenous	.86	[.73, 1.02]	1.19	[.98, 1.43]	1.41	[1.05, 1.90]
Peer substance use	3.87	[3.69, 4.06]	3.75	[3.62, 3.89]	3.96	[3.78, 4.13]
Family antisocial attitudes	1.77	[1.68, 1.87]	1.59	[1.51, 1.68]	1.50	[1.39, 1.61]
Community mobility	1.09	[1.05, 1.14]	1.39	[1.33, 1.46]	1.38	[1.29, 1.47]
	(109 LGAs) LGAv _{ar} .03 (.02, .05)		(109 LGAs) LGAv _{ar} .06 (.04, .10)		(108 LGAs) LGAv _{ar} .07 (.03, .14)	

Note. OR = odds ratio; 95% CI = 95% confidence interval; CTC = Communities That Care; LGAs = local government areas. Figures in bold are significant (p < .05).

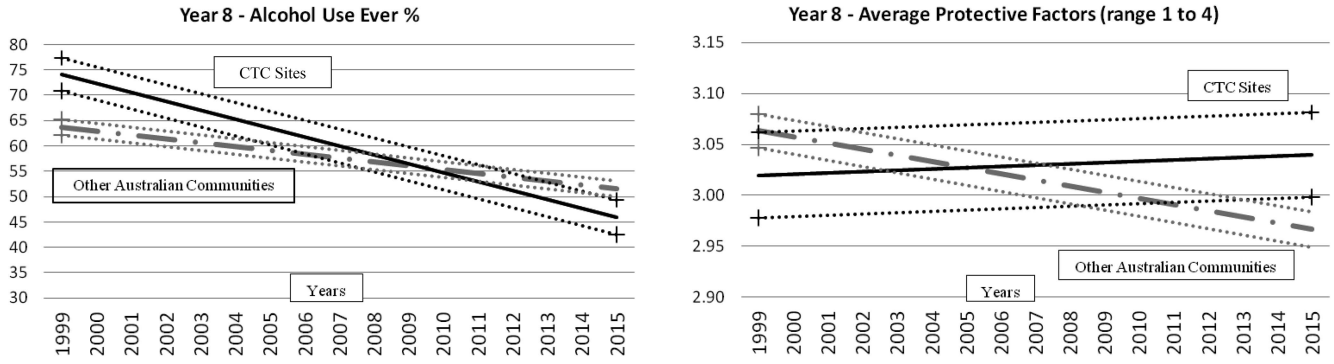


Figure 1. Fifteen-year trend in percentage Grade 8 lifetime alcohol use (left) and average protective factors (right) comparing Communities That Care (CTC) sites and other Australian communities (dotted lines are 95% confidence intervals).

United States, the significant effects observed in the present evaluation are in line with those from previous evaluations (Greenberg et al., 2005; Hawkins et al., 2009).

The present findings confirm prior studies (Livingston, 2014) in observing reductions in a range of Australian adolescent health problems in recent decades. Toumbourou et al. (2018) used the present dataset to identify the major factors that may explain the observed reductions and noted less favorable parent attitudes to alcohol and drug use and a reduced community availability of alcohol as two pivotal changes. These changes have been in part due to the increased implementation of evidence-based practices such as effective parent education (Toumbourou, Gregg, Shortt,

Hutchinson, & Slaviero, 2013) and community monitoring of alcohol and tobacco sales (Rowland et al., 2013).

The present study is also one of few to document trend reductions in antisocial behavior and risk factors and is the first to report a national decline in Australian adolescent protective factors. The study implications are discussed below after consideration of the study strengths and limitations.

Strengths and Limitations

Important strengths of the present study include the large school samples surveyed within communities using a common instrument

Table 3
Multilevel Linear Regression Predicting Risk and Protective Factors

Predictors	Antisocial behavior (n = 35,307)		Risk factor average (n = 40,790)		Protective factor average (n = 40,790)	
	B	95% CI	B	95% CI	B	95% CI
Survey year	-.001	[-.002, -.001]	-.007	[-.008, -.006]	-.006	[-.007, -.005]
CTC site	.012	[.003, .022]	.069	[.037, .101]	-.044	[-.090, .002]
CTC site × Survey year	-.001	[-.002, .000]	-.007	[-.008, -.005]	.007	[.005, .010]
Grade	-.012	[-.013, -.011]	.040	[.038, .043]	-.039	[-.042, -.036]
Female	-.052	[-.055, -.049]	-.042	[-.048, -.036]	-.009	[-.017, .000]
Government school	.005	[.001, .009]	.027	[.019, .034]	-.002	[-.012, .008]
Urban location	.002	[-.004, .008]	-.006	[-.023, .012]	-.013	[-.038, .012]
Survey response rate	.061	[.028, .094]	.216	[.151, .282]	.194	[.103, .284]
State (ref: Victoria)						
Queensland	.000	[-.009, .009]	-.025	[-.049, -.002]	.034	[.000, .067]
Western Australia	.010	[.001, .019]	-.017	[-.042, .008]	.044	[.009, .080]
Community disadvantage (ref: Highest quartile)						
Second quartile	-.001	[-.009, .007]	.008	[-.021, .037]	-.003	[-.045, .039]
Third quartile	.009	[.003, .014]	.006	[-.012, .023]	-.007	[-.032, .018]
Lowest disadvantage	.010	[.004, .016]	.009	[-.011, .028]	-.022	[-.050, .005]
Non-Australian birth	-.005	[-.011, .001]	-.042	[-.054, -.031]	.021	[.006, .037]
Indigenous	.024	[.013, .035]	.030	[.010, .050]	-.002	[-.030, .025]
Peer substance use	.065	[.064, .067]	.183	[.179, .186]	-.093	[-.098, -.088]
Family antisocial attitudes	.054	[.052, .057]	.276	[.271, .282]	-.171	[-.179, -.163]
Community mobility	.014	[.011, .016]	.044	[.039, .049]	-.051	[-.058, -.045]
	(108 LGAs)		(109 LGAs)		(109 LGAs)	
	SD(_cons) .005		SD(_cons) .026		SD(_cons) .038	
	(CI [.003, .008])		(CI [.021, .033])		(CI [.030, .049])	

Note. B = Unstandardized regression coefficient; 95% CI = 95% confidence interval; CTC = Communities That Care; LGAs = local government areas. Figures in bold are significant (p < .05).

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over a 15-year period and the use of multilevel modeling. The study design enabled a unique evaluation of the national dissemination of an intervention shown to be effective in the U.S. context. Important limitations of the study were that community recruitment was not randomized but was based on direct approaches from community champions working in localities with high-levels of adolescent health problems. Hence, the possibility cannot be ruled out that the effects may have been partly explained by the efforts of the motivated community leaders rather than the CTC process per se. A randomized trial is currently underway in Australia to examine whether similar effects are achievable when communities are randomly approached. The nonrandomized evaluation design has the benefit of external validity, given that in the real world setting motivated leaders are typically the group that seek to implement the CTC process.

A potential design limitation of the present study was that data were based exclusively on self-reports of volunteering students recruited in cross-sectional school-based samples. Toumbourou et al. (2018) noted the reported rates of adolescent substance use were equivalent to those reported using different survey methods.

The current report is limited in providing only an aggregate finding across the pioneer communities. The CTC localities varied in their size, urban-regional character, and start and finish dates for the CTC process and programs that were implemented. Although analyses for the six outcomes listed in Tables 2 and 3 noted significant community heterogeneity, due to small samples in some communities, our study was underpowered to permit a detailed comparison of the four CTC coalition sites. However, we were able to test the effects of community heterogeneity by completing a sensitivity analysis comparing two subsamples that diverged in levels of community disadvantage. These comparisons suggested that our reported findings were generally robust to community heterogeneity, with the exception of antisocial behavior where CTC effects were smaller in the less disadvantaged LGAs. Table 3 revealed that antisocial behavior varied according to socioeconomic disadvantage. The CTC process may be poorly targeted to effect reductions in communities that have low rates of antisocial behavior.

A further limitation may arise due to the argument that the study is an internal evaluation, given many of the coauthor team served in the Australian company established to implement CTC. To the extent that the coauthors did not originate the CTC process, but were required to hold research credentials to manage the process, the study represents as close to an independent evaluation of CTC as appears possible given the nature of this complex intervention.

Implications and Contribution

The current study is the first to evaluate the CTC process in the Australian context and hence broadens the range of evidence-based adolescent prevention strategies available for implementation within the international context. The findings support the potential to improve health using community-led interventions, in line with ecological health promotion theories (Patton et al., 2006).

An important finding noted in the present study is the decline in adolescent protective factors that occurred across Australia from 1999 to 2015. This decline may relate to observations of decreasing youth social capital indicated by increased: family breakdown and child neglect and abuse, school suspensions and exclusion, and

widening socioeconomic inequality (Toumbourou et al., 2015). Between 1999 and 2015 Australian students reported increases in family conflict, school academic failure, community disorganization, and community transitions and mobility (Toumbourou et al., 2018). The emphasis within the CTC process on community interventions to increase the SDM prosocial bonding constructs (Catalano & Hawkins, 1996) may explain why protective factors increased differentially in the CTC sites. Thus, an important implication arising from the current report is the feasibility of using community coalition models to enhance social capital as a means of contributing to public health.

The current findings are compatible with the implication that the CTC process can contribute to public health in adolescent populations. This is important for preventing chronic health conditions in later life as well as protecting against short-term harms.

To be implemented effectively within a national context the CTC process requires a long-time commitment and a highly skilled research team. The benefits of this commitment are the potential to improve health outcomes across very large adolescent populations, while also building national prevention expertise. U.S. studies demonstrate the process to be cost-effective (Kuklinski, Fagan, Hawkins, Briney, & Catalano, 2015). Outcome estimates from the present study can now be used to evaluate cost effectiveness in Australia.

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Received February 16, 2018

Revision received November 19, 2018

Accepted February 3, 2019 ■