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BRIEF REPORT

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Effects of the Sacramento Neighborhood Alcohol Prevention Project on rates of child abuse and neglect 7 years post-implementation (1999–2010)

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Abstract

Introduction: Evaluations of alcohol environmental prevention efforts examine short-term effects of these interventions on alcohol-related problems. We examine whether the effects of the Sacramento Neighborhood Alcohol Prevention Project (SNAPP), an alcohol environmental intervention aimed to reduce alcohol-related problems in two neighbourhoods, on child abuse and neglect remained 7 years post-implementation.

Methods: SNAPP used a quasi-experimental non-equivalent control group design, where intervention activities occurred in the South area, followed by those in the North area 2 years later. Our sample size is 3912 space–time units (326 census block groups × 12 years [1999–2010]). Outcomes were measured at the household level and included: (i) all foster care entries total; and (ii) the subset of foster care entries that were alcohol related. Data were analysed using Bayesian conditionally autoregressive space–time models.

Results: We find that the decreases in total (relative rate [RR] = 0.882, 95% credible interval [CrI] 0.795, 0.980) and alcohol-related (RR = 0.888, 95% CrI 0.791, 0.997) foster care entries remain in the North intervention area although the magnitude of those changes are smaller than immediately post-intervention. Increases found in alcohol-related foster care entries in the South area immediately post-intervention were not significant 7 years later (RR = 1.128, 95% CrI 0.975, 1.307).

Discussion and Conclusions: Reductions in child abuse and neglect due to an alcohol environmental intervention can be maintained. Environmental interventions that provide community-level primary prevention strategies could be more easily sustained and more cost effective than individual-level interventions, although more research is needed to identify why interventions may be successful in specific contexts and not others.

KEYWORDS
alcohol environmental intervention; Bayesian conditionally autoregressive model; child abuse and neglect; foster care entry, space–time analysis; longitudinal study

1 | INTRODUCTION

Alcohol environmental interventions, designed to reduce alcohol supply in communities, are evidence-based programs that reduce risky alcohol use and alcohol-related problems [1, 2]. These community-based interventions focus on reducing alcohol supply, namely to underage youth and already intoxicated patrons. These programs have been successful in reducing harm from alcohol, including violence and traffic crashes, across the community immediately after the intervention occurs [3–5]. Despite decades of study on environmental prevention efforts, these programs primarily examine short-term effects of the intervention on alcohol-related problems using a pre-post design. As one exception, the level of on-going retail compliance checks (i.e., sales to underage minors) were inversely related to alcohol-involved traffic crashes for young adults under 21 years of age over a 10-year period [6]. Understanding the long-term sustainability on reductions of harm from these efforts, regardless of whether these prevention efforts are maintained, is critical for supporting the long-term health and well-being of residents where these interventions occur.

Physical and economic availability of alcohol are related to rates of child abuse and neglect (CAN) [7–9], suggesting alcohol environmental interventions might be successful in reducing maltreatment. A 1% higher consumption of volume of alcohol per capita in Sacramento was related to 3.2% more alcohol-related foster care entries (FCE) [10]. Yet, the Sacramento Neighborhood Alcohol Prevention Project (SNAPP) showed mixed results whereby rates of alcohol-related FCE were reduced in the North area, but increased in the South area [11], possibly due to differential implementation of study components [12]. SNAPP was an environmental intervention to reduce high-risk drinking and alcohol-related problems implemented from 1999 to 2003 in two racially and ethnically diverse neighbourhood areas in Sacramento, California [2, 5]. Both neighbourhoods receiving the intervention had experienced geographic clusters of serious incidents of abuse and neglect, resulting in hospitalisation or death [13]. The effects of alcohol environmental interventions on CAN have generally not been assessed, despite the enduring relationship between alcohol use and child maltreatment. Although the original data were collected 20 years ago, intervention components for environmental approaches to prevent alcohol-related problems have remained largely the same. We examined whether the mixed initial effects of SNAPP on CAN were maintained 7 years post-intervention.

2 | METHODS

SNAPP used a quasi-experimental non-equivalent control group design (Table 1), where intervention activities occurred in the South area, followed by those in the North area 2 years later [5]. Our sample size is 3912 space–time units (326 census block groups × 12 years [1999–2010]). The South area had 21 CBGs, the North had 16 CBGs, and the 'At-Large' (the remaining) area of Sacramento contained 289 CBGs. Census block groups in our study have approximately 1500 residents. Intervention activities included community mobilisation of local leaders, community awareness activities directed towards neighbourhood residents, responsible beverage service, enforcement of alcohol sales to underage youth, and on-premise outlet compliance checks and enforcement of sales to intoxicated patrons (see Supporting Information for more information) [2, 5].

We measured two outcomes using administrative data from the Department of Children and Family Services in Sacramento County, California. Outcomes were measured at the household level and include: (i) total FCE; and (ii) alcohol-related FCE. When child abuse and neglect has been established by Child Protective Services, caseworkers must determine whether a child(ren) is at imminent risk for harm. If they are, they will be removed from their home and placed out-of-home (commonly called foster care). Alcohol-related FCE are a subset of total FCE where the case plan, determined by the courts, required a parent to receive treatment for alcohol use before a child(ren) could be reunified with their parent(s). Our independent variables are study area, where we included effects coded North and South areas beginning during the intervention year for each neighbourhood.

We obtained data on alcohol outlets from the California Department of Alcoholic Beverage Control that maintains all records on those establishments licenced to sell alcohol. Bars and pubs are determined by those establishments having licence types 23, 40, 42, 48, 61 and 75. Licence types 20 and 21 denote off-premise outlets (i.e., establishments where alcohol can be purchased but not

TABLE 1 Quasi-experimental design of the Sacramento Neighborhood Alcohol Prevention Project intervention.

Study area	Year 1	Year 2	Year 3	Year 4	Year 5
South	O_1	X	O_2		O_3
North	O_1		O_2	X	O_3
At-Large	O_1		O_2		O_3

Note: O stands for observation, where the subscript refers to the observation time period. X is when the intervention was conducted.

consumed). Restaurants that serve alcohol have licence types 41 and 47. We included sociodemographic control variables. These included the percentages of individuals who were Black or African American, individuals who were Hispanic, households with income ≥$25,000, individuals ≥16 years old who were unemployed and vacant housing units. These data were obtained from the 1990 census, 2000 census and Geolytics professional estimates (for 2001–2010). Data for 1999 were obtained by subtracting values in the 1990 census from the 2000 census and divided by 10 then multiplied by 9.

Data were analysed using Bayesian conditionally autoregressive (CAR) space–time models [14, 15]. We assumed an underlying Poisson distribution for our outcome variables, as they represent counts of the events (e.g., FCE), with large numbers of 0s. A term for correlated heterogeneity addresses issues of spatial autocorrelation, smooth estimates across neighbouring areas through use of the CAR model, and gives information about the magnitude of the spatial structure in the data [10, 11]. Adjacencies were those CBGs that shared a boundary (rook's cases). The precision parameters controlling the degrees of spatial smoothing and the space–time interaction were modelled a priori with vague gamma prior distributions. A proper but vague uninformative prior was given to the time trend variable and the intercept was given a flat prior. 'Vague uninformative' means we did not include information on prior estimates of the relationship of our independent variables and error terms on our outcome variables. Each model had a burn-in period of 50,000 Monte Carlo Markov chain iterations, with posterior estimates based on an additional 50,000 iterations.

3 | RESULTS

In the unadjusted models (not shown), FCE were reduced by 13.9% (relative rate [RR] = 0.861, 95% credible interval [CrI] 0.779, 0.954) in the North compared to the At-Large area, but effects were not well-supported in the South (RR = 1.059, 95% CrI 0.942, 1.197) 7 years post-SNAPP intervention period. The long-term effects of SNAPP on alcohol-related FCE were mixed in the unadjusted models. These were 12.5% lower in the North (RR = 0.875, 95% CrI 0.780, 0.984), compared to the At-Large. However, in the South, we find that alcohol-related FCE are 18.5% higher (RR = 1.185, 95% CrI 1.003, 1.399) 7 years post-intervention compared to the At-Large area. In our adjusted models (Table 2), the North area saw an 11.8% reduction in FCE (RR = 0.882, 95% CrI 0.795, 0.980) and 11.2% reduction in alcohol-related FCE (RR = 0.888, 95% CrI 0.791, 0.997). No intervention effects were found in the South area for FCE or alcohol-related FCE. Off-premise alcohol outlets were positively related to FCE, while number of bars was negatively related to FCE. Higher percentages of Black, Hispanic, households with income less than $25,000, unemployment and vacant housing units were related to higher total and alcohol-related FCE. The time trend

TABLE 2 Adjusted relative risks of effects of the Sacramento Neighborhood Alcohol Prevention Project intervention foster care entries (FCE) and alcohol-related FCE over 12 years using conditionally autoregressive Bayesian analyses ($N = 3912$).

	Model 1: FCE		Model 2: Alcohol-related FCE	
	RR	95% credible interval	RR	95% credible interval
Constant	0.0004	(0.0003, 0.0005)[a]	0.0002	(0.0002, 0.0003)[a]
North	0.882	(0.795, 0.980)[a]	0.888	(0.791, 0.997)[a]
South	1.049	(0.938, 1.169)	1.128	(0.975, 1.307)
Bars or pubs	0.899	(0.823, 0.980)[a]	0.929	(0.837, 1.028)
Off-premise outlets	1.060	(1.003, 1.121)[a]	1.047	(0.985, 1.113)
Restaurants	1.011	(0.989, 1.034)	1.004	(0.976, 1.032)
% Black or African American	1.026	(1.017, 1.035)[a]	1.028	(1.019, 1.038)[a]
% Hispanic	1.027	(1.019, 1.035)[a]	1.028	(1.020, 1.036)[a]
% ≤ $25,000	1.011	(1.004, 1.018)[a]	1.009	(1.003, 1.016)[a]
% Unemployment	1.019	(1.011, 1.027)[a]	1.016	(1.008, 1.025)[a]
% Vacant housing units	1.027	(1.008, 1.046)[a]	1.028	(1.009, 1.048)[a]
Time trend	0.967	(0.955, 0.979)[a]	0.960	(0.946, 0.974)[a]
Correlated (spatial) heterogeneity	3.869	(3.241, 4.674)[a]	3.586	(2.986, 4.397)[a]
Space–time trend	1.099	(1.065, 1.135)[a]		

[a]Indicates findings that are well-supported by the data as evidenced by credible intervals that exclude one for relative rates (RR).

variable shows well-supported decreases in total and alcohol-related FCE throughout the 12 years. Spatial heterogeneity terms were large for all outcomes. Spatiotemporal correlated heterogeneity was positive and well supported across for our outcomes.

4 | DISCUSSION

Reductions in total and alcohol-related FCE found at the end of the initial study period remained 7 years post-intervention, although the magnitude was smaller. For example, in the North, alcohol-related foster care decreased by 24% [11] immediately post-intervention, but the reduction was only 11.2% 7 years later. This provides evidence that effects of environmental prevention efforts can be maintained for a significant period of time post-implementation.

Although we found increases in alcohol-related FCE in the South in the years immediately following the intervention, those effects did not persist 7 years post-implementation when controlling for other neighbourhood factors. A cluster of serious CAN incidents resulting in hospitalisation or death for children less than 6 years old occurred in part of the South area during 2002–2003, the South sustainment period [13]. Caseworkers in the South area may have heightened awareness about the harms of drinking to children and be more likely to place children where a parent is misusing alcohol into FCE during this time period. However, that awareness may have faded with time or as new caseworkers began working in the neighbourhood. Further, the 11 September 2001 attacks on the World Trade Center occurred immediately after the South intervention period which is known to have increased drinking behaviours [16–18]. This may have affected the efficacy of the intervention in the South area [11].

Our study is limited in that the characteristics of the intervention and control areas were not equivalent at baseline. The study neighbourhoods were purposively chosen to test the effects of environmental prevention efforts in two racially and ethnically diverse areas [1]. This non-equivalence could be a reason we see differential effects of the intervention. Further, both neighbourhoods had significantly higher rates of CAN at baseline, compared to the At-Large area [11]. The initial intervention occurred 20 years ago. During this time, alcohol availability has changed with delivery services and via restaurant takeout. Thus, environmental interventions may need different components to address these changes in availability. We cannot discount regression to the mean as a possible explanation for the reductions in total and alcohol-related FCE in the North area. Despite rich data on implementation of the intervention components, we did not have information on steps taken to ensure sustainability of the intervention components. This is an area for future research to better understand the context of sustainability of these efforts.

This study extends the analysis of the effects of environmental prevention activities 7 years post-intervention. We show that it is possible to retain reductions in CAN over this time period, but this enthusiasm is dampened as these effects were not uniform across all intervention neighbourhoods. Environmental interventions provide community-level primary prevention strategies that are in contrast to the individual-level interventions that are typically used. These interventions could be more easily sustained and more cost effective than individual-level interventions [19]. Implementation science approaches to understanding sustainability should be utilised to better identify and understand long-term effects of these interventions [20]. In addition, we need to identify through what mechanisms the reductions were achieved in order to replicate in other areas. Although the findings here are promising, more studies are needed examining whether alcohol environmental prevention efforts are a viable intervention to reduce and prevent FCE.

AUTHOR CONTRIBUTIONS

Each author certifies that their contribution to this work meets the standards of the International Committee of Medical Journal Editors.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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