

TITLE: A SYSTEMATIC REVIEW OF THE INFLUENCE OF COMMUNITY LEVEL SOCIAL FACTORS ON ALCOHOL USE

ABSTRACT

Purpose

To explore evidence on the influence of community level social factors on alcohol use among adults and adolescents.

Methods and results

Major bibliographic databases were searched for quantitative studies meeting inclusion criteria. After screening, narrative synthesis and a quality review were applied. 48 studies met the eligibility criteria. While the findings were inconclusive for associations between alcohol use and deprivation, poverty, income, unemployment, social disorder and crime, there was some indication that social capital characteristics were protective.

Conclusions

Social capital has a potentially important association with reducing alcohol use. Further studies are required to better understand social influences on alcohol use.

KEYWORDS

Alcohol; community; neighbourhood; social; deprivation, poverty, social capital, systematic review

TITLE: A SYSTEMATIC REVIEW OF THE INFLUENCE OF COMMUNITY LEVEL SOCIAL FACTORS ON ALCOHOL USE

INTRODUCTION

Alcohol is one of the leading contributors to the global burden of disease, and the leading contributor to premature death and disability worldwide in the 15–59 age group (World Health Organization, 2009, 2011). Alcohol consumption also has major psychosocial consequences, including breakdown of relationships and families, violence, crime, child neglect and abuse, and reduced individual and community productivity (Babor, Caetano, & Casswell, 2010; Cercone, 1994; Graham & West, 2001).

Many studies have attempted to identify risk- and protective-factors associated with alcohol misuse. Most of these studies have focused on individual, peer, parental and genetic correlates of alcohol use. However, an individual's behaviour may also be shaped by the physical and social environment in which they live (Chow, Lock, Teo, Subramanian, McKee, & Yusuf, 2009; Jencks & Meyer, 1990), an issue of growing interest to researchers. In a recent systematic review (Bryden, Roberts, McKee, & Petticrew, 2012) we have examined the influence of availability and advertising of alcohol within a community on the drinking behaviour of local residents. In order to provide as complete a summary as possible of evidence on potentially modifiable community-level factors, this partner paper focuses on community level social factors that may influence alcohol consumption locally. These include socio-economic factors (deprivation, income and employment), disorder and crime (including disorder, safety, violence/crime), social capital (community attachment, closeness & supportiveness and community participation) and social norms – all of which are factors that may offer scope for interventions to complement those targeted individually. There has been no previous systematic review specifically focusing on how these community level social factors influence alcohol use. In combination with its partner paper on availability and advertising of alcohol, such a review could help guide policy makers seeking to tackle hazardous drinking at a local level, as together they highlight potentially modifiable community-level factors that affect alcohol misuse.

This systematic review examines the associations between community level social factors and alcohol use. The specific research objectives were to: (i) describe the methodological and other characteristics of the studies identified following a systematic search (including study locations, populations, research methods, outcomes and exposures of interest); (ii) assess the methodological quality of the studies included, (iii) and assess the strength of the evidence that community level social factors are significantly associated with alcohol use in adults and adolescents.

METHODOLOGY

A systematic review of observational (cross-sectional and longitudinal) and intervention studies was conducted according to PRISMA systematic review guidelines (Liberati, Altman, Tetzlaff, Mulrow, Gøtzsche, Ioannidis et al., 2009); a completed checklist is provided in Web Annex 5. Primary research studies published in peer-reviewed journals or which were found in grey literature were eligible to be included. Only quantitative studies were included in order to quantify any associations between community level social factors and alcohol use.

The population of interest was adult and adolescent males and females (adolescents were included specifically because the determinants may differ from adults) (Cicchetti & Rogosch, 2002; Leventhal & Brooks-Gunn, 2003). The outcomes of interest included quantity or

frequency of alcohol consumption, binge drinking, alcohol dependency and problem drinking, with specific attention to the prevalence of drinking among adolescents as this may determine problem drinking in later life (Heron, Macleod, Munafò, Melotti, Lewis, Tilling et al., 2012).

Following an initial scoping of the literature on community level social factors, four main exposures of interest were identified: (i) socio-economic deprivation (e.g. average income, unemployment rate); (ii) disorder and crime, including social disorder (e.g. drug activity, divorce rate), physical disorder (e.g. graffiti), safety, crime & violence in the community; (iii) social capital (e.g. trust, membership, support from neighbours), and (iv) community norms about alcohol use (e.g. acceptability of drinking). Intervention studies addressing any of these community level exposures were included in the review (but not interventions addressing individual change). Some other factors that can be measured at a community level, such as ethnicity and religion, were excluded from this review. Although these can have an important influence on alcohol use, they are far less amenable to policy or practice interventions and their effects are likely to be experienced at an individual or family level rather than at a whole community level.

Communities were defined as neighbourhoods, villages, towns or residential college campuses. Exposures were included if they were specifically about a local community (e.g. asking people if they feel safe in their community) or if they were aggregated to a community level from individual level measures (e.g. average income). Studies which only explored individual level factors (e.g. individual level demographic or socio-economic characteristics), parental or peer characteristics (e.g. drinking norms among friends) or genetic characteristics (e.g. family history of harmful alcohol use) were excluded.

Search strategy

Studies were initially identified by searching the electronic databases Medline, Web of Science, IBSS and PsycInfo on 26th August 2011. Limits were applied to include titles only, but no limits were applied for language, country or publication start date. The core search strategy is shown below, and search terms were amended for use as necessary in the different databases:

(area* OR geogr* OR place OR local* OR neighborhood* OR neighbourhood* OR community OR communities OR environment OR environments OR environmental OR determinant* OR depriv* OR poverty OR disadvantage* OR economic OR socioeconomic OR income OR employment OR unemployment OR crim* OR acceptab* OR norm OR norms OR social capital) AND (alcohol* OR drink* OR liquor* OR liqor*) NOT water

Four other search terms were not included (risk, disorder, violence and safety) as they identified studies that were mostly not relevant.

Additional studies were identified by manual searches of bibliographies of included studies and review articles.

Selection of studies

There were four stages in selecting studies for inclusion in the review: (i) identification of studies from bibliographic databases and references; (ii) screening of titles and abstracts; (iii) review of full papers to identify eligibility, and (iv) in-depth review and narrative synthesis of final selected papers. Papers which failed to distinguish exposures, or separating alcohol from substance use (e.g. tobacco and drugs) in general, were deemed ineligible.

Stages 1 and 2 were independently conducted for all databases by AB & BR. Any discrepancies in screening results were discussed with reference to the eligibility criteria, and a final list of full papers to be reviewed was agreed upon.

A data extraction form was piloted using a small number of studies, refined accordingly and used subsequently to extract data from all full papers and to record any potentially relevant references. Data were extracted from each paper on study characteristics (e.g. country, year, location, study design), sample characteristics (e.g. age range of sample, sample size), exposure and outcome measures, results (including statistical significance of results) and evidence of bias or confounding. The fields in the data extraction form were based upon STROBE criteria for reporting of observational studies (Von Elm, Altman, Egger, Pocock, Gøtzsche, & Vandenbroucke, 2007). A quality assessment tool was then used to review the methodological quality of studies. This tool was adapted from the 'Quality Assessment Tool for Quantitative Studies' developed specifically to assess quantitative public health studies, which has successfully undergone testing for reliability and validity (Effective Public Health Practice Project, 1998; National Collaborating Centre for Methods and Tools, 2011; Thomas, Ciliska, Dobbins, & Micucci, 2004). Although a small number of studies were rated as 'weak' using this tool, none were excluded in order to provide a complete overview of studies in this area. However, less methodologically robust studies are highlighted in the results and in the tables. A summary of the quality assessment process is provided in Web Annex 6-9.

Data extraction and analysis

The findings of the primary studies were grouped into the four main categories of exposure (socio-economic factors, disorder and crime, social capital and social norms). Studies with multiple exposures were included in more than one category where appropriate. Due to substantial methodological diversity, differences in methodological quality and in the exposure and outcomes measures used in the primary studies, a narrative synthesis is used to describe the studies and their results. It was not possible to carry out a meta-analysis as part of this review due to the substantial heterogeneity of the studies so results are therefore only provided for individual studies. This is consistent with advice on dealing with heterogeneity in the Cochrane Handbook (The Cochrane Collaboration, 2011). The effect sizes reported in the original studies are presented in Tables 1, 2, 3 and 4 (regression coefficients, correlation coefficients, odds ratios and risk ratios). When confidence intervals were not provided in the papers these were calculated where possible. If no p value is given for a specific result it indicates that these results were only described as 'significant' or 'not significant' in the original paper. All data presented from the studies were adjusted for the influence of other variables by the authors of the primary studies unless stated otherwise.

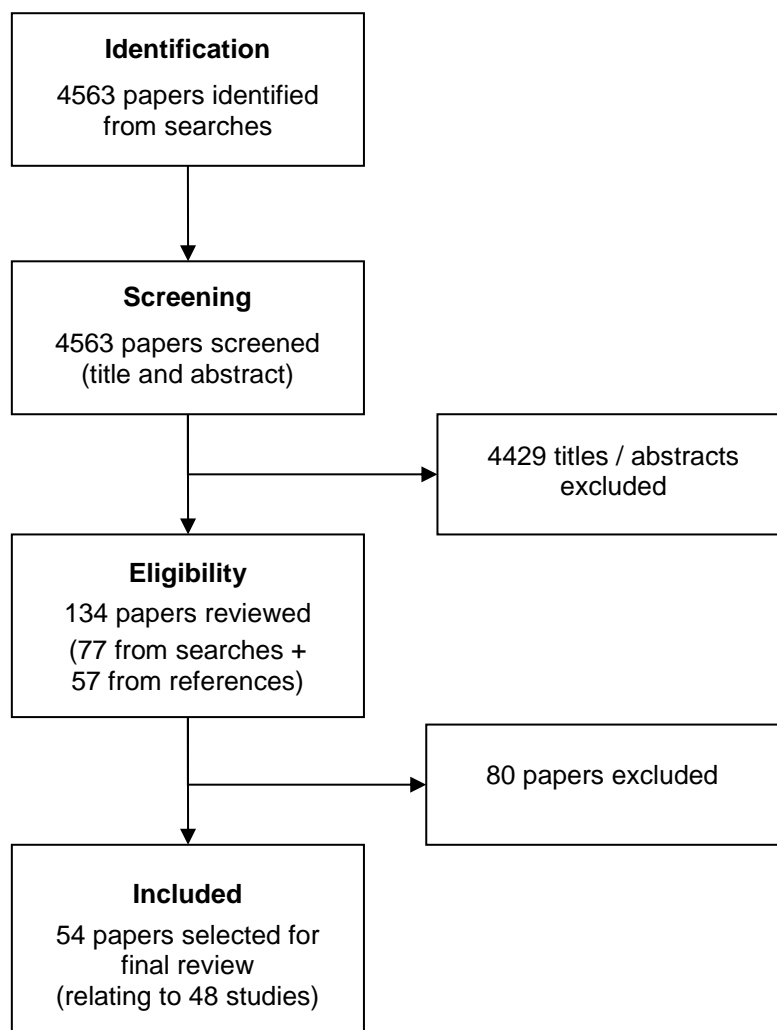
Duplicate data were excluded, for example if there were multiple papers from the same study reporting the same results. However, if there were papers that related to the same studies but used different measures of exposure or outcome and/or time periods, then both papers were included. Based on the details given in the papers, there appear to be six studies with more than one paper included in this review. These were a study of adolescents in rural communities in the U.S (De Haan, Boljevac, & Schaefer, 2009; DeHaan & Boljevac, 2010); a study of a community trial on enforcing underage drinking laws in the U.S (Reboussin, Preisser, Song, & Wolfson, 2010; Song, Reboussin, Foley, Kaltenbach, Wagoner, & Wolfson, 2009); a study on mental health after the 2001 attacks in New York (Bernstein, Galea, Ahern, Tracy, & Vlahov, 2007; Galea, Ahern, Tracy, & Vlahov, 2007); a study from a national U.S. college alcohol survey (Elissa R. Weitzman & Chen, 2005; E. R. Weitzman & Kawachi, 2000); a study of adults in New York (Ahern, Galea, Hubbard, Midanik, & Syme, 2008; Le, Ahern, & Galea, 2010); and a longitudinal study of adults in Michigan State (A. Buu, Mansour, Wang, Refior, Fitzgerald, & Zucker, 2007; Anne Buu, Wang, Wang, Puttler, Fitzgerald, & Zucker, 2011).

RESULTS

Results of study selection process

The study selection process is summarised in Figure 1. A total of 4,563 papers (excluding duplicates) were identified by the database searches (Stage 1). Of these, 4,429 studies were excluded based on their titles and abstracts (Stage 2). The use of combined exposure or outcome measures resulted in some studies being rejected at this stage. For example, some studies focused on all substance use (including alcohol, tobacco and drugs). 134 full papers were eligible for preliminary review (Stage 3), consisting of 77 papers from the database searches and 57 additional papers identified from references. It was not possible to access one of these papers (Dembo, Schmeidler, Burgos, & Taylor, 1985) and another paper from the same study was excluded as it used a combined outcome measure. One paper could only be accessed in a poster format, but this provided enough information to be included in the review (Reyes, Colon, Robles, Negron, Marrero, Matos et al., 2006). The main reasons for rejecting studies at this stage were that they were not carried out at a community level or that outcome variables other than alcohol use were used (e.g. drink driving or alcohol-related deaths). After completing the data extraction forms, a total of 54 papers (relating to 48 studies) met the eligibility criteria and were included in the detailed review (Stage 4). A list of excluded studies is available from the lead author.

Figure 1. Results of study selection process



Results of studies included

The 48 studies selected were carried out between 1973 and 2011. Thirty-six were cross-sectional, ten were longitudinal and two were before-after intervention studies. Twenty-four studied adults, 26 adolescents and two students, with some including both adults and adolescents.

All of the studies were carried out in high-income settings except for one which was conducted in a low-income setting (Amazonian villages in Bolivia). Thirty-three studies were carried out in the United States, three in Canada, three in United Kingdom and nine in other countries. A range of community types were included in the studies, with 26 in urban communities, two in rural and 17 in mixed urban-rural communities. A further two studies were conducted on residential college campuses and one on an American Indian reservation. Most studies used multi-level regression models or correlation calculations to analyse associations between variables. Further details of each of the final studies selected are provided in Web Annex 1, 2 and 3.

The outcome, alcohol use, was measured in a variety of ways but these can be grouped into three broad categories.

- The first category was the quantity and/or frequency of drinking, which we have labelled as ‘increased drinking’ in the results tables. These measures were used in studies of both adolescents and adults as an indication of the impact of community level social factors on how much, or how frequently, alcohol is consumed. They were constructed in various ways – for example, quantity was assessed by the number of drinks or units per week; frequency was assessed by the number of days in the past week or month that alcohol was consumed or how many times adolescents had consumed alcohol in their lifetime. Some studies combined quantity and frequency.
- The second category was heavy or problem drinking. Binge drinking (usually defined as 5 or more drinks on one occasion) was the most common measure used, among both adults and adolescents. Some studies also used measures such as drinking more than the recommended number of units, drunkenness (whether, or how often, people get drunk), ‘problem drinking’ (e.g. using the CAGE questionnaire (Ewing, 1984) or ‘alcohol abuse symptoms’; all of these were defined in various ways.
- The third was prevalence of drinking, which we have reported for adolescents only, as this may indicate problem drinking in later life (Heron et al., 2012). This was often separated into whether individuals had ever had an alcoholic drink (lifetime prevalence) and whether they had had an alcoholic drink in the past month (current prevalence) in the studies.

For clarity and simplicity, outcomes are presented in the results tables as ‘increased drinking’, ‘problem drinking’ or ‘prevalence’ (for adolescents only).

Socio-economic factors

This review found a total of 28 studies (30 papers) on the association between community level socio-economic factors and alcohol use, summarised in Table 1. The specific measures of deprivation are described in Web Annex 1. Using the quality assessment tool, 26 papers on socio-economic factors were rated as ‘medium’ quality and four papers were rated as ‘strong’ (see Web Annex 6). No papers were rated as ‘weak’. Overall, the findings provided inconclusive results for the association between community-level socio-economic factors and alcohol use, with some indication that alcohol use may be greater in high-income communities but also in communities with higher unemployment levels. The findings are differentiated below according to deprivation, income, and employment.

Deprivation

Eighteen studies (20 papers with 36 effect estimates) examined the association between deprivation and alcohol use. In both adults and adolescents, they produced inconclusive results.

Adults:

Among adults, six studies found no significant association between alcohol use and the level of deprivation in a community, all of which investigated heavy or problematic drinking. These studies included one in New York rated as 'strong' in the quality assessment (Fauth, Leventhal, & Brooks-Gunn, 2004); one in Australia with a very large (sample size >10,000) and randomly selected sample population (Livingston, Laslett, & Dietze, 2008), a study in Scotland (Ecob & Macintyre, 2000); a study in the United States (Carpiano, 2007), and two studies with relatively small sample sizes (< 1000) – one in the U.S.A. with a very restricted sample (Anne Buu et al., 2011) and one in London with a low response rate and no detailed results (Steptoe & Feldman, 2001).

One study found that men were significantly more likely to experience alcoholism symptoms if they had lived in a more deprived community ($b = 0.77$) (A. Buu et al., 2007). This study had a very high follow-up rate but the sample size was relatively small and the sample was very restricted.

A study of a random sample of pairs of adolescents and their parents from across the U.S. found that the daily quantity of alcohol consumed by adults was significantly lower in more deprived communities ($r = -0.14$), but the results were not adjusted for any potential confounders (Chuang, Ennett, Bauman, & Foshee, 2005).

Three studies of adults found mixed results for different exposures or outcomes. A study of young adults in the U.S. that was rated as 'strong' in the quality assessment found that females were less likely to drink alcohol in more affluent communities ($b = -0.091$) but there was no significant association for males (Kling, Liebman, & Katz, 2007). In a longitudinal study of urban adults in the U.S.A., cumulative exposure to community level poverty over the course of the study was associated with a 53% increase in the number of drinks consumed per week ($RR = 1.53$), but was not significantly associated with binge drinking ($RR = 1.60$) (Cerdeira, Diez-Roux, Tchetgen, Gordon-Larsen, & Kiefe, 2010). In the same study, currently living in a community with higher levels of poverty was associated with an 86% increase in the odds of binge drinking ($RR = 1.86$) but was not significantly associated with the weekly amount of alcohol consumed ($RR = 1.29$). A study of randomly selected adults in California found that living in the least deprived communities was associated with a 32% increase in the likelihood of drinking above recommended limits ($OR = 1.32$), but the likelihood of drinking above recommended limits was not significantly lower in the most deprived communities ($OR = 0.99$), compared to moderately deprived communities (Pollack, Cubbin, Ahn, & Winkleby, 2005).

Adolescents:

Among adolescents, five studies found no significant association between alcohol use and the level of deprivation in a community. These were a study in the U.S. that used a combined measure, rated as 'strong' in the quality assessment (Tobler, Komro, & Maldonado-Molina, 2009); a study with a relatively small sample size in Michigan focused on the change in alcohol use over time (Brenner, Bauermeister, & Zimmerman, 2011); two studies in the U.S. on lifetime prevalence (ever tried) or current prevalence (Ennett, Flewelling, Lindrooth, & Norton, 1997; Song et al., 2009), one of which had a very high response rate but did not adjust the results for any potential confounders (Ennett et al.,

1997); and a study of drinking frequency among Native American adolescents (HeavyRunner-Rioux & Hollist, 2010).

A study of pairs of adolescents and their parents (as above) found that the amount of alcohol ever consumed by adolescents was statistically significantly lower in more deprived communities ($r = -0.11$), but the results were not adjusted for any potential confounders (Chuang et al., 2005).

Four studies of adolescents found mixed results for different exposures or outcomes. A longitudinal study of familial alcoholism in the U.S. that was rated as 'strong' found that living in a less affluent community was associated with a higher rate of increase in the amount of alcohol consumed among children of alcoholics over time ($b = -0.20$), but the opposite association was found for children of non-alcoholics ($b = 0.19$) (Trim & Chassin, 2008). A very large study of adolescents and young adults in the U.S. found that drunkenness was most common in communities with the lowest poverty rates, but there was no significant association with the prevalence of drinking or binge drinking (Reboussin et al., 2010). A study of rural adolescents in the U.S.A. found that living in a deprived community was associated with a 23% increase in the frequency of drinking, but frequency was not significantly different in the least deprived communities and there were no significant associations with lifetime prevalence (ever tried) (De Haan et al., 2009). A study of a random sample of adolescents in New Zealand found that the quantity of alcohol consumed was higher in more deprived communities ($b = 0.002$), but found no significant association with the frequency of drinking ($b = 0.001$) (Huckle, Huakau, Sweetsur, Huisman, & Casswell, 2008).

Income

Nine studies (ten papers with 22 effect estimates) examined the association between community income levels and alcohol use. The studies generated mixed results but there is some indication that higher quantities and frequencies of drinking are more likely among adults living in communities with higher income levels.

Adults:

Two studies found no significant association between adult alcohol use and income. One, looking at urban adults in Australia, compared the proportion of low-income households and a high frequency or quantity of drinking (Giskes, Turrell, Bentley, & Kavanagh, 2011). A study in New York compared median household income and the quantity of drinking (Le et al., 2010).

Three studies found that adult alcohol use and alcohol problems were significantly more likely in wealthier communities. A study of a random sample of adults in New York found a higher frequency of drinking ($b = 3.01$) in higher-income communities (Galea et al., 2007); urban adults from lower-income communities in Ontario, Canada were less likely to consume more than the recommended amount of alcohol (OR = 0.81) (Locker, Payne, & Ford, 1996), and in a representative sample of adults in Belgium, problem drinking was more likely to occur in higher-income communities ($b = 1.875$) (van Praag, Bracke, Christiaens, Levecque, & Pattyn, 2009).

There were mixed findings on adult alcohol use from the three studies that focused specifically on income inequality within communities. A study of randomly selected adults in New York found that greater income inequality was significantly associated with a greater frequency of drinking ($b = 159.46$) (Galea et al., 2007), but another study in New York found no significant association between income inequality and quantity of drinking (Le et al., 2010). In a relatively small study in a very different population, greater income inequality

within Amazonian villages was significantly associated with a lower frequency of drinking ($b = -2.39$) (Godoy, Reyes-Garcia, McDade, Huanca, Leonard, Tanner et al., 2006). The authors of this last study explained that this finding could be due to traders contacting the more remote and egalitarian villages exchanging alcohol for forest and farm goods.

Adolescents:

Among adolescents, two studies in urban areas found no significant association between alcohol use and community level income. The first study investigated prevalence of drinking and binge drinking in a randomly selected, representative sample in the U.S. (Truong & Sturm, 2009). The second study investigated the frequency of drinking in Canada, but provided no information on the sample size (Smart, Adlaf, & Walsh, 1994).

A study of urban adolescents and young adults in the U.S.A. found different results for different outcomes. This large study found that a higher median income in a community was associated with a greater clustering of drunkenness, but found no significant association with prevalence of drinking in the past month or with binge drinking (Reboussin et al., 2010). This study also found that adolescents in high income areas had a 68% greater likelihood of drinking within the past month ($OR = 1.68$), but found no significant association with binge drinking (Song et al., 2009).

Employment

Five studies (six papers with 17 effect estimates) were identified which reported on the association between community employment levels and alcohol use, most being studies of adolescents. The studies provided mixed results, but there is some indication that alcohol use may be higher in communities with higher unemployment levels.

Adults:

Only one study on community level employment rates was carried out in an adult population – a very large randomly selected, representative survey of older adolescents and adults in Belgium found that problem drinking was more likely in communities with high unemployment ($b = 0.060$) (van Praag et al., 2009).

Adolescents:

Two studies of urban adolescents and young adults in Canada and the U.S. found no significant associations of employment in the community with prevalence, frequency, binge drinking or drunkenness – one of these had a very large sample size (Reboussin et al., 2010) but it was not possible to find any information on the sample size for the other study (Smart et al., 1994).

Three studies of adolescents obtained varied results for different exposures or outcomes. A very large study of adolescents in Sweden found that a higher unemployment rate was significantly associated with a lower frequency of drinking and binge drinking among girls (borderline significant), but not among boys (Svensson & Hagquist, 2010). This effect seems to occur at lower levels of drinking, with more adolescents not drinking at all in communities with a high unemployment rate, and was not associated with numbers of adolescents who drink regularly. A study in the U.S.A. found that urban adolescents and young adults were 29% less likely to be drinkers in communities with higher employment rates ($OR = 0.71$), but found no significant associations with binge drinking (Song et al., 2009). A study of a representative sample of adolescents in Finland found that prolonged unemployment in a community was associated with a tripling of the likelihood of drunkenness among boys ($OR = 3.26$), but found no significant association of prolonged unemployment and drunkenness among girls or the frequency of alcohol consumption, and also found no significant associations for unemployment rates (Karvonen & Rimpela, 1997).

Table 1: The influence of community level socio-economic factors on alcohol use, by exposure type

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
Exposure: Deprivation							
Adults							
Buu et al, 2007	US (Michigan)	Mixed	206 men	Disadvantage	Problem drinking	b = 0.77 (0.12-1.42)	<0.01*
Buu et al, 2011	US (Michigan)	Mixed	273 women	Disadvantage	Problem drinking	---	>0.05
Carpiano, 2007	US (Los Angeles)	Mixed	2620 adults	Disadvantage	Problem drinking	OR = 0.96 (0.70-1.32)	>0.05
Cerdeña et al, 2010	US	Urban	5115 adults	Cumulative poverty	Increased drinking	RR = 1.53 (1.02-2.27)	<0.05*
				Current poverty	Increased drinking	RR = 1.29 (0.92-1.80)	>0.05
				Cumulative poverty	Problem drinking	RR = 1.60 (0.87-2.95)	>0.05
				Current poverty	Problem drinking	RR = 1.86 (1.14-3.03)	<0.05*
Chuang et al, 2005	US	Mixed	959 pairs of adolescents & their parents	Low SES	Adults – increased drinking	r = - 0.14 ^	<0.05*
Ecob & Macintyre, 2000	Scotland (Glasgow area)	Urban	3036 adults	Deprivation	Increased drinking	b = 0.053 (-0.04 – 0.14)	>0.05
				Deprivation	Problem drinking	b = 0.054 (-0.04 – 0.15)	>0.05
Fauth et al, 2004	US (New York)	Urban	315 adults	Disadvantage	Problem drinking	OR = 0.48 (0.23-1.05)	>0.05

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
Pollack et al, 2005	US (California)	Urban	8197 adults	Most deprived	Problem drinking	OR = 0.99 (0.74-1.33)	>0.05
				Least deprived	Problem drinking	OR = 1.32 (1.09-1.59)	<0.05*
Step toe & Feldman, 2001	England (London)	Urban	654 adults	Socio-economic status	Problem drinking	---	>0.05
Adolescents							
Brenner et al, 2011	US (Michigan)	Urban	711 adolescents	Disadvantage	Increased drinking	b = 0.03	>0.05
Chuang et al, 2005	US	Mixed	959 pairs of adolescents & their parents	Low SES	Adolescents – increased drinking	r = - 0.11 ^	<0.05*
De Haan et al, 2009	US (Wisconsin, South Dakota, Wyoming)	Rural	1424 adolescents	Concentrated disadvantage	Increased drinking	OR = 1.23 (1.06-1.42)	<0.01*
				Concentrated advantage	Increased drinking	---	>0.05
				Concentrated disadvantage & advantage	Prevalence	---	>0.05
Ennett et al, 1997	US (mid-western state)	Mixed	1801 adolescents	Deprivation	Prevalence (ever tried)	r = - 0.10 ^	>0.05
				Deprivation	Prevalence (in past month)	r = 0.01 ^	>0.05
HeavyRunner-Rioux & Hollist (2010)	US (Montana)	Mixed	1341 adolescents	Poverty	Increased drinking (in past month)	b = -0.022	>0.05
Huckle et al, 2008	New Zealand	Mixed	1179 adolescents	Deprivation	Increased drinking (frequency)	b = 0.001	>0.05
				Deprivation	Increased drinking (quantity)	b = 0.002	<0.05*

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
Kling et al, 2007	US (Baltimore, Boston, Chicago, Los Angeles, and New York)	Urban	1807 older adolescents and young adults	Poverty rate	Females – prevalence	b = -0.091 (-0.02 – -0.17)	<0.05*
				Poverty rate	Males – prevalence	---	>0.05
Livingston et al, 2008	Australia (Victoria)	Mixed	10879 older adolescents and young adults	Least vs. most disadvantaged	Problem drinking	OR = 0.944 (0.770-1.156)	>0.05
Reboussin et al, 2010	US	Urban	18730 adolescents and young adults	Poverty	Prevalence	---	0.2633
				Poverty	Problem drinking (binge drinking)	---	0.8597
				Poverty	Problem drinking (drunkenness)	---	0.0366*
Song et al, 2009	US	Urban	6636 adolescents and young adults	Poverty	Prevalence	---	>0.05
				Poverty	Problem drinking	---	>0.05
Tobler et al, 2009	US (Chicago)	Urban	5655 adolescents	Deprivation	Problem drinking	---	>0.05
Trim & Chassin, 2008	US (Arizona)	Urban	361 adolescents	Socio-economic status	Children of non- alcoholics – increased drinking	b = 0.19	<0.05*
				Socio-economic status	Children of alcoholics – increased drinking	b = - 0.20	<0.05*

Exposure: Income

Adults

Galea et al, 2007	US (New York)	Urban	1355 adults	Median income	Increased drinking	b = 3.01 (0.64-5.39)	0.01*
				Income inequality	Increased drinking	b = 159.46 (47-272)	0.01*
Giskes et al, 2011	Australia (Melbourne)	Urban	2349 adults	% low income	Males - Problem drinking	OR = 0.70 (0.44-1.12)	>0.05
				% low income	Females - Problem drinking	OR = 0.77 (0.47-1.28)	>0.05
				% low income		OR = 1.20 (0.80-1.77)	>0.05

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
				% low income	Males – Increased drinking (quantity per session)	OR = 0.68 (0.46-1.02)	>0.05
				% low income	Females – Increased drinking (quantity per session)	OR = 1.11 (0.53-2.32)	>0.05
				% low income	Males – Increased drinking (quantity per week)	OR = 0.93 (0.44-1.95)	>0.05
					Females – Increased drinking (quantity per week)		
Godoy et al, 2006	Bolivia	Rural	655 adults	Income inequality	Increased drinking	b = - 2.39 (-0.88 – -3.90)	<0.01*
Le et al, 2010	US (New York)	Urban	4000 adults	Median household income	Increased drinking	OR = 1.00 (0.89, 1.13)	>0.05
				Income inequality	Increased drinking	OR = 1.07 (1.02, 1.12)	>0.05
Locker et al, 1996	Canada (Ontario)	Urban	1050 adults	Median income	Problem drinking	OR = 0.81	0.0075*
Adolescents							
Reboussin et al, 2010	US	Urban	18730 adolescents and young adults	Median income	Prevalence	---	0.0711
				Median income	Problem drinking (binge drinking)	---	0.3947
				Median income	Problem drinking (drunkenness)	---	0.0043*
Smart et al, 1994	Canada	Urban	?? adolescents	% low income	Increased drinking	b = 0.00	>0.05
				Average income	Increased drinking	b = 0.00	>0.05
Song et al, 2009	US	Urban	6636 adolescents and young adults	Median income	Prevalence	OR = 1.68 (1.40-2.02)	<0.01*
				Median income	Problem drinking	---	>0.05
Truong & Sturm, 2009	US (California)	Urban	3660 adolescents	Median income	Prevalence	OR = 0.94 (0.62-1.43)	>0.05
				Median income	Problem drinking	OR = 1.02 (0.50-2.08)	>0.05
Van Praag et al, 2009	Belgium	Mixed	21367 older adolescents & adults	Median income	Problem drinking	b = 1.875 (0.67-3.08)	<0.01*

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
Exposure: Employment							
Adolescents							
Karvonen & Rimpela, 1997	Finland (Helsinki)	Urban	1048 adolescents	Unemployment & prolonged unemployment	increased drinking	--- ^	>0.05
				Unemployment Prolonged unemployment (boys)	Problem drinking Problem drinking	--- ^ OR = 3.26	>0.05 <0.05*
				Prolonged unemployment (girls)	Problem drinking	--- ^	>0.05
Reboussin et al, 2010	US	Urban	18730 adolescents and young adults	Employment	Prevalence	---	0.5694
				Employment	Problem drinking (binge drinking)	---	0.9136
				Employment	Problem drinking (drunkenness)	---	0.3570
Smart et al, 1994	Canada	Urban	?? adolescents	Unemployment	Increased drinking	b = 0.00	>0.05
Song et al, 2009	US	Urban	6636 adolescents and young adults	Employment	Prevalence	OR = 0.71 (0.61-0.83)	<0.05*
				Employment	Problem drinking	---	>0.05
				Unemployment	Prevalence	--- ^	>0.05
Svensson & Hagquist, 2010	Sweden	Mixed	15,206 adolescents	Unemployment	Males – Increased drinking	OR = 0.99 (0.94-1.04)	>0.05
				Unemployment	Females – Increased drinking	OR = 0.95 (0.90-0.99)	<0.05*
				Unemployment	Males - Problem drinking	OR = 0.99 (0.93-1.05)	>0.05
				Unemployment	Females - Problem drinking	OR = 0.91 (0.86-0.97)	<0.05*
Van Praag et al, 2009	Belgium	Mixed	21367 older adolescents & adults	Unemployment	Problem drinking	b = 0.060 (0.02-0.10)	<0.001*

* Denotes statistical significance at the 5% level
^ Denotes that result was not adjusted for potential confounders
b Regression coefficient
r Correlation coefficient

OR Odds Ratio

RR Relative Risk

Studies in italics those which were assessed as being of 'weak' quality

Please see Web Annex 1 for full details of each paper

Disorder & crime

The review identified 19 studies on the association between community level disorder/crime and alcohol use; the findings are presented in Table 2. The specific measures used are described in Web Annex 2. Using the quality assessment tool, 13 papers on disorder and crime were rated as 'medium' quality, one paper was rated as 'strong' and five papers were rated as 'weak' (see Web Annex 7). Overall, the studies provided some indication that alcohol use may be higher in communities with greater social disorder and that community safety may have a protective effect.

Disorder

Sixteen studies (16 papers with 29 effect estimates) investigated the association between social and physical disorder and alcohol use. The exposure measures for disorder varied greatly between studies and were often based on combinations of factors, for example neighbourhood problems, single-parent families, drug activity and groups that don't get along. The studies generated mixed results, but there is some indication that alcohol use among both adults and adolescents may be higher in communities experiencing greater social disorder.

Adults:

Among adults, one study found no significant association between neighbourhood problems (including noise and antisocial behaviour) and regular heavy drinking in London, but this had a low response rate and gave no detailed results (Steptoe & Feldman, 2001). In two studies of women in deprived areas in the U.S.A., drunkenness and problem drinking were more likely to occur in urban communities experiencing greater disorder (including assaults and teenage pregnancy) ($b = 0.007$ (Hill & Angel, 2005); $OR = 1.94$ (Mulia, Schmidt, Bond, Jacobs, & Korcha, 2008)). The latter study was rated as 'strong' in the quality assessment, although the sample size was relatively small, and psychological distress was found to explain most of the association in this study (Mulia et al., 2008). Another study among adults in the U.S.A. and rated as 'weak' in the quality assessment found that a higher level of drug activity in the neighbourhood was significantly associated with binge drinking (Kadushin, Reber, Saxe, & Livert, 1998). A study of physical disorder in New York found that half of the environmental measures included were associated with increased binge drinking ($OR = 2.02 - 2.55$) (Bernstein et al., 2007).

Adolescents:

Among studies of adolescents, there were mixed results on the association between community disorder and alcohol use. Five studies found no significant association between disorder and alcohol use. Two were very large studies investigating prevalence of drinking among adolescents and young adults in the U.S.A. (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002; Reboussin et al., 2010), but the results of one of these were not adjusted and no tests of statistical significance were conducted (Arthur et al., 2002); two studies in New York investigated frequency and quantity of drinking (Blount & Dembo, 1984; Byrnes, Chen, Miller, & Maguin, 2007), one of which had a relatively small sample size (Byrnes et al., 2007), and another study in the U.S.A. focused on prevalence, but the results were not adjusted for any potential confounders (Ennett et al., 1997). However, six other studies of adolescents found that alcohol use was significantly higher in communities with greater disorder. In a very large comparative study, adolescents in the U.S.A. ($OR = 1.46$) and in Australia ($OR = 1.36$) used alcohol more frequently in communities with greater disorganisation (including high population density and crime) (Beyers, Toumbourou, Catalano, Arthur, & Hawkins, 2004). In studies of adolescents in the U.S.A., prevalence and frequency of drinking were higher in communities with greater drug activity in New Jersey ($OR = 1.8$) (Abdelrahman, Rodriguez, Ryan, French, & Weinbaum, 1999) and in Baltimore ($r = 0.21$) (Lambert, Brown, Phillips, & Jalongo, 2004). However, the sample size in the latter

study was relatively small and the results were not adjusted for any potential confounders (Lambert et al., 2004). Adolescents in the U.S. were also more likely to drink if they experienced greater stress from neighbourhood disorder (Scheier, Botvin, & Miller, 1999). A study rated as 'weak' found that prevalence was higher among adolescents in the U.S.A. in communities with higher levels of disorder (e.g. if they had seen someone getting robbed) (Wilson, Syme, Boyce, Battistich, & Selvin, 2005). A relatively small study of urban adolescents in Puerto Rico that was rated 'weak' in the quality assessment found that social disorder was associated with an increase in the prevalence of alcohol use but there was no significant association with physical disorder (Reyes et al., 2006). However, the full version of this paper could not be obtained and the associated poster included little information about how the sample was selected.

Safety

This review found four studies (four papers and six effect estimates) on the association between community safety and alcohol use, all from the United States. The studies provided some indication that greater community safety is associated with lower alcohol use.

Adults:

There was only one study of the association between community safety and alcohol use among adults – a study of U.S. air force personnel that was rated as 'weak' found an association between neighbourhood safety and lower hazardous drinking (Foran, Heyman, Slep, & Usaf, 2011).

Adolescents:

Among adolescents, a study in the U.S.A. found no significant association between lifetime prevalence (ever tried) or current prevalence (in past month) and how safe adolescents feel in their neighbourhood (Ennett et al., 1997). However, two other studies of adolescents found an association between neighbourhood safety and lower alcohol use, but the results were not adjusted for any potential confounders. A relatively small study in an urban adolescent population in the USA. found that the less safe adolescents felt in their neighbourhood, the more frequently they used alcohol ($r = -0.13$) (Lambert et al., 2004). A study rated as 'weak' in the quality assessment found an association between neighbourhood safety and a lower prevalence of drinking among Native American adolescents living on a reservation (Nalls, Mullis, & Mullis, 2009).

Violence & crime

Adolescents:

There were three studies (three studies with six effect estimates) on the association between community level violence/crime and adolescent alcohol use (none on adults). The studies were all carried out in urban communities in the U.S.A. and provided mixed results. One study found that the frequency of alcohol use was significantly higher among adolescents in communities that were perceived to have higher levels of violence ($r = 0.17$), but the sample size was relatively small and the results were not adjusted for any potential confounders (Lambert et al., 2004). A very large study of adolescents and young adults found that lower levels of crime in a community were associated with greater clustering of drinking and drunkenness among adolescents, but found no significant association with binge drinking (Reboussin et al., 2010). Another study in an urban adolescent population had a relatively small sample size and found that higher levels of witnessing violence in the community were associated with a greater likelihood of initiating alcohol use ($b = 0.379$), whereas being a victim of violence was associated with a lower likelihood ($b = -0.375$) (Mrug & Windle, 2009).

Table 2: The influence of community level disorder & crime on alcohol use, by exposure type

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
Exposure: Disorder							
Adults							
Bernstein et al, 2007	US (New York)	Urban	1355 adults	Window problems	Problem drinking	OR = 2.05 (1.03-4.09)	<0.05*
				Stairway problems	Problem drinking	OR = 2.34 (1.13-4.86)	<0.05*
				>3 heating breakdowns in winter	Problem drinking	OR = 2.42 (1.33-4.43)	<0.05*
				Additional heat needed in winter	Problem drinking	OR = 2.18 (1.21-3.93)	<0.05*
				Peeling paint or plaster	Problem drinking	OR = 2.02 (1.18-3.46)	<0.05*
				Water leakage	Problem drinking	OR = 2.55 (1.61-4.05)	<0.05*
				Other environment measures	Problem drinking	---	>0.05
Hill & Angel, 2005	US (Boston, Chicago & San Antonio)	Urban	2400 women	Neighbourhood disorder	Problem drinking	b = 0.007 (0.001-0.013)	<0.01*
Kadushin et al, 1998	US	Urban	9762 adults	Drug activity	Problem drinking	b = 0.2112	0.001*
Mulia et al, 2008	US (California)	Urban	392 women	Neighbourhood disorder	Problem drinking	OR = 1.94 (1.24-3.03)	<0.01*
Steptoe & Feldman, 2001	England (London)	Urban	654 adults	Neighbourhood problems	Problem drinking	---	>0.05
Adolescents							
Abdelrahman et al, 1999	US (New Jersey)	Mixed	2849 adolescents	Drug activity	Prevalence	OR = 1.8 (1.3-2.3)	<0.01*

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
Arthur et al, 2002	US (Oregon)	Mixed	11162 adolescents	Community disorganisation	Prevalence (ever tried)	r = 0.13 ^	---
				Community disorganisation	Prevalence (in past month)	r = 0.15 ^	---
Beyers et al, 2004	US (Maine & Oregon)	Mixed	16,861 adolescents in Maine; 15,542 in Oregon	Community disorganisation	Increased drinking	OR = 1.46	<0.01*
	Australia (Victoria)			8442 adolescents	Community disorganisation	Increased drinking	OR = 1.36
Blount & Dembo, 1984	US (New York)	Urban	1045 adolescents	Low toughness/drug use	Increased drinking	b = 0.022	>0.05
				High toughness/drug use	Increased drinking	b = 0.092	>0.05
Byrnes et al, 2007	US (New York)	Urban	499 adolescents	Neighbourhood problems	Increased drinking	---	>0.05
Ennett et al, 1997	US (mid-western state)	Mixed	1801 adolescents	Social disorganisation	Prevalence (ever tried)	r = - 0.15 ^	>0.05
				Social disorganisation	Prevalence (in past month)	r = 0.18 ^	>0.05
Lambert et al, 2004	US (Baltimore)	Urban	521 adolescents	Drug activity	Increased drinking	r = 0.21 ^	<0.01*
Reboussin et al, 2010	US	Urban	18730 adolescents and young adults	Vacant housing units	Prevalence	---	0.1652
				Vacant housing units	Problem drinking (binge drinking)	---	0.4707
				Vacant housing units	Problem drinking (drunkenness)	---	0.3424
Reyes et al, 2006	Puerto Rico	Urban	691 adolescents	High vs. low social disorder	Prevalence	OR = 18.1 (5.7-57.8)	p<0.001*
				High vs. low physical disorder	Prevalence	OR = 0.8 (0.3-1.9)	0.618
Scheier et al, 1999	US	Urban	1138 adolescents	Neighbourhood stress	Increased drinking	b = 0.08-0.16	<0.05
Wilson et al, 2005	US	Mixed	369 adolescents	Neighbourhood disorder	Prevalence	b = 0.09 (0.03-0.15)	0.01*

Exposure: Safety

Adults

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
<i>Foran et al, 2011</i>	<i>US air force bases (worldwide)</i>	<i>Mixed</i>	<i>52,780 adults (air force members)</i>	<i>Neighbourhood safety Neighbourhood safety</i>	<i>Males - Problem drinking Females - Problem drinking</i>	<i>r = - 0.12 ^ r = - 0.14 ^</i>	<i><0.001* <0.001*</i>
Adolescents							
Ennett et al, 1997	US (mid-western state)	Mixed	2548 adolescents	Neighbourhood safety Neighbourhood safety	Prevalence (ever tried) Prevalence (in past month)	b = 0.01 r = 0.03 ^	>0.05 >0.05
Lambert et al, 2004	US (Baltimore)	Urban	521 adolescents	Neighbourhood safety	Increased drinking	r = - 0.13 ^	<0.01*
<i>Nalls et al, 2009</i>	<i>US (south-western state)</i>	<i>Reservation</i>	<i>148 American Indian adolescents</i>	<i>Neighbourhood safety (feeling less safe)</i>	<i>Prevalence</i>	<i>OR = 1.18 (1.03-1.36)</i>	<i>0.015*</i>

Exposure: Violence & crime

Adolescents

Lambert et al, 2004	US (Baltimore)	Urban	521 adolescents	Violence	Increased drinking	r = 0.17 ^	<0.001*
Mrug & Windle, 2009	US (Alabama)	Urban	603 adolescents	Witness of violence Victim of violence	Prevalence Prevalence	b = 0.379 b = - 0.375	<0.01* <0.01*
Reboussin et al, 2010	US	Urban	18730 adolescents and young adults	Crime Crime Crime	Prevalence Problem drinking (binge drinking) Problem drinking (drunkenness)	--- --- ---	0.0488* 0.2236 0.0206*

* Denotes statistical significance at the 5% level

^ Denotes that result was not adjusted for potential confounders

b Regression coefficient

r Correlation coefficient

OR Odds Ratio

RR Relative Risk

Studies in italics are those which were assessed as being of 'weak' quality

Please see Web Annex 2 for full details of each paper

Social capital

This review identified 11 studies (13 papers) on the association between community level social capital and alcohol use, with findings presented in Table 3. The specific measures of social capital are described in Web Annex 3. Using the quality assessment tool, 11 papers were rated as 'medium' quality, one paper was rated as 'strong' and one paper rated as 'weak' (see Web Annex 8). The studies used a variety of measures, often combining a number of factors, and focused on aspects such as community attachment and community participation. The studies mainly focused on adolescent and student alcohol use. Overall, the studies provided some indication of a protective effect of social capital on alcohol use.

Community attachment, closeness & supportiveness

Ten studies (ten papers and 26 effect estimates) were found on the association between community attachment, closeness and supportiveness and alcohol use. The findings of these studies generally indicated a protective effect.

Adults:

Among adults, a study in Taiwan found that community closeness was associated with a 43% reduction in the frequency of drinking (OR = 0.57), but found no significant association for social trust (OR = 0.86) (Chuang & Chuang, 2008). A study of adults in the U.S.A. found that higher levels of social support were significantly associated with an increased odds of binge drinking (OR = 1.79) but higher levels of informal social control (e.g. neighbours would do something about local children skipping school or spraying graffiti) were associated with a decreased odds (OR = 0.44) (Carpiano, 2007). In this study, no significant associations were found for social leverage (neighbours asking each other for advice) or social cohesion. A study in England found that living in a community where neighbours look after each other was associated with a 52% increase in the odds of moderate drinking (OR = 1.52), compared to heavier drinking, but found no significant association with the likelihood of not drinking at all (OR = 0.49) (Poortinga, 2006). A study of U.S. air force members that was 'rated' as weak in the quality assessment found that higher levels of community cohesion were significantly correlated with reduced levels of hazardous drinking, but higher levels of support from neighbours were significantly correlated with reduced levels of hazardous drinking in men only (Foran et al., 2011). A relatively small study in Amazonian villages found that the average number of acts of generosity was found to be protective – an increase of one act in a village per week was associated with 0.22 fewer times drinking alcohol in a week ($b = -0.22$) (Godoy et al., 2006).

Adolescents:

Among adolescents, two studies in the U.S. found no significant association between community attachment and the prevalence of drinking (Arthur et al., 2002; Ennett et al., 1997), but one of these studies had a very large sample size and its results were not adjusted for any potential confounders and no tests of statistical significance were conducted (Arthur et al., 2002). However, two other studies of adolescents found an association with lower alcohol use. The first, on urban adolescents in the U.S.A., that was rated as 'strong' in the quality assessment, found that neighbourhood strength (a combination of community identity, action to prevent adolescent alcohol use and drug activity) was associated with a decrease in drinking among adolescents ($b = -0.078$) (Tobler et al., 2009). In a very large comparative study of adolescents in the U.S.A. and Australia, low community attachment was associated with around a 20% increase in the risk of regular drinking (OR = 1.19-1.22) (Beyers et al., 2004). A study of rural communities in the U.S.A. found that community supportiveness (as assessed by adolescents) was associated with an 18% reduction in the likelihood of having ever tried alcohol (OR = 0.82) and a 54% reduction in the frequency of drinking (OR = 0.46). However, community supportiveness, as assessed by adults, and

collective efficacy (social cohesion and taking actions against disorder) were not significantly associated with adolescent alcohol use (De Haan et al., 2009).

Community participation

The review found six studies (seven papers and 19 effect estimates) on the association between community participation and alcohol use. In general, these studies found a protective effect.

Adults:

Among adults, a study in the U.S. found no association between participating in neighbourhood meetings and binge drinking (Carpiano, 2007). A study in Taiwan found that greater social participation was significantly associated with a 43% increased frequency of drinking (OR = 1.43), but found no significant association for social contact or political influence (Chuang & Chuang, 2008).

Adolescents:

Among adolescents and students, a very large study of college students in the U.S. found no association between volunteering and binge drinking, drunkenness or frequency of drinking (Theall, DeJong, Scribner, Mason, Schneider, & Simonsen, 2009). A very large study of a randomly selected and representative sample of students in the U.S. found that high volunteering rates on college campuses were significantly associated with a 32% increase in the likelihood of typical light drinking (low quantity of alcohol consumed) (OR = 1.32) and a 25% reduction in the likelihood of binge drinking (OR = 0.75) (E. R. Weitzman & Kawachi, 2000). Another very large study in the U.S. found that adolescents were less likely to drink if they lived in communities where they perceived there to be greater rewards for involvement ($r = -0.19 - -0.22$), but the results were not adjusted for any potential confounders and no tests of statistical significance were carried out (Arthur et al., 2002). A very large study of a randomly selected and representative sample of students in the U.S.A. found that binge drinking (OR = 0.38) and drunkenness (OR = 0.58) were significantly lower in college campuses with high volunteering rates, but found no significant association for frequent drinking (OR = 0.90) or for regular binge drinking (OR = 0.72) (Elissa R. Weitzman & Chen, 2005). In another very large study, rewards and opportunities for community involvement were significantly associated with a reduced frequency of drinking among adolescents in the U.S. (OR = 0.69-0.86) but not in Australia (OR = 0.91-0.99) (Beyers et al., 2004).

Table 3: The influence of community level social capital on alcohol use, by exposure type

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
Exposure: Community attachment, closeness & supportiveness							
Adults							
Carpiano, 2007	US (Los Angeles)	Mixed	2620 adults	Social support	Problem drinking	OR = 1.79 (1.24, 2.60)	<0.01*
				Informal social control	Problem drinking	OR = 0.44 (0.29, 0.67)	<0.01*
				Social leverage	Problem drinking	OR = 0.92 (0.75, 1.12)	>0.05
				Social cohesion	Problem drinking	OR = 1.34 (0.98, 1.82)	>0.05
Chuang & Chuang, 2008	Taiwan	Mixed	3713 adults	Trust	Increased drinking	OR = 0.86 (0.63-1.17)	>0.05
				Closeness	Increased drinking	OR = 0.57 (0.41-0.81)	<0.01*
Adolescents							
Foran et al, 2011	US air force bases (worldwide)	Mixed	52,780 adults (air force members)	Community cohesion	Males - Problem drinking	$r = -0.16^{\wedge}$	$p < 0.001^*$
				Community cohesion	Females - Problem drinking	$r = -0.15^{\wedge}$	$p < 0.001^*$
				Support from neighbours	Males - Problem drinking	$r = -0.13^{\wedge}$	$p < 0.001^*$
				Support from neighbours	Females - Problem drinking	$r = -0.05^{\wedge}$	$p > 0.001$
Godoy et al, 2006	Bolivia	Rural	655 adults	Acts of generosity	Increased drinking	$b = -0.22$ (-0.08 – -0.36)	<0.01*
Poortinga, 2006	England	Mixed	7394 adults	Neighbours look after each other	Increased drinking (moderate vs. heavier drinking)	OR = 1.52 (1.07-2.14)	<0.01*
				Neighbours look after each other	Increased drinking (none vs. heavier drinking)	OR = 0.49 (0.20-1.20)	>0.05
Adolescents							
Arthur et al, 2002	US (Oregon)	Mixed	11,162 adolescents	Low attachment	Prevalence (ever tried)	$r = 0.16^{\wedge}$	---
				Low attachment	Prevalence (in past month)	$r = 0.16^{\wedge}$	---

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
Beyers et al, 2004	US (Maine & Oregon)	Mixed	16,861 adolescents in Maine; 15,542 in Oregon	Low attachment	Increased drinking	OR = 1.22	<0.01*
	Australia (Victoria)		8442 adolescents	Low attachment	Increased drinking	OR = 1.19	<0.01*
De Haan et al, 2009	US (Wisconsin, South Dakota, Wyoming)	Rural	1424 adolescents	Supportiveness (adolescent assessed)	Prevalence	OR = 0.82 (0.72-0.94)	<0.01*
				Supportiveness (adolescent assessed)	Increased drinking	OR = 0.46 (0.32-0.65)	<0.001*
				Supportiveness (adult assessed)	Prevalence	OR = 0.97 (0.80-1.16)	>0.05
				Supportiveness (adult assessed)	Increased drinking	OR = 0.91 (0.78-1.05)	>0.05
				Collective efficacy	Prevalence	OR = 1.72 (0.21-13.86)	>0.05
			Collective efficacy	Increased drinking	OR = 0.34 (0.07-1.53)	>0.05	
Ennett et al, 1997	US (mid-western state)	Mixed	1801 adolescents	Attachment	Prevalence (ever tried)	b = - 0.01	>0.05
				Attachment	Prevalence (in past month)	r = 0.22 ^	>0.05
Tobler et al, 2009	US (Chicago)	Urban	5655 adolescents	Neighbourhood strength	Problem drinking	b = - 0.078	<0.05*

Exposure: Community participation

Adults

Carpiano, 2007	US (Los Angeles)	Mixed	2620 adults	Neighbourhood organization participation	Problem drinking	OR = 1.03 (0.91, 1.16)	>0.05
Chuang & Chuang, 2008	Taiwan	Mixed	3713 adults	Political influence	Increased drinking	OR = 1.14 (0.84-1.56)	>0.05
				Social contact	Increased drinking	OR = 1.08 (0.80-1.45)	>0.05
				Social participation	Increased drinking	OR = 1.43 (1.07-1.92)	<0.05*

Adolescents

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
Arthur et al, 2002	US (Oregon)	Mixed	11162 adolescents	Rewards for involvement	Prevalence (ever tried)	$r = -0.22$ ^	---
				Rewards for involvement	Prevalence (in past month)	$r = -0.19$ ^	---
Beyers et al, 2004	US (Maine & Oregon)	Mixed	16,861 adolescents in Maine; 15,542 in Oregon	Rewards for involvement	Increased drinking	OR = 0.69	<0.01*
				Opportunities for involvement	Increased drinking	OR = 0.86	<0.01*
	Australia (Victoria)		8442 adolescents in Victoria	Rewards for involvement	Increased drinking	OR = 0.91	>0.05
				Opportunities for involvement	Increased drinking	OR = 0.99	>0.05
Theall et al, 2009	US	Campus	15875 students	Volunteering	Increased drinking	OR = 0.32 (0.02-5.19)	>0.05
				Volunteering	Problem drinking (binge drinking)	OR = 0.36 (0.02-6.08)	>0.05
				Volunteering	Problem drinking (drunkenness)	OR = 0.95 (0.04-21.02)	>0.05
Weitzman & Chen, 2005	US	Campus	27687 students	Volunteering	Increased drinking	OR = 0.90 (0.55-1.47)	>0.05
				Volunteering	Problem drinking (binge drinking)	OR = 0.38 (0.20-0.69)	<0.01*
				Volunteering	Problem drinking (frequent binge drinking)	OR = 0.72 (0.44-1.19)	>0.05
				Volunteering	Problem drinking (drunkenness)	OR = 0.58 (0.34-0.98)	<0.05*
Weitzman & Kawachi, 2000	US	Campus	17592 students	Volunteering	Increased drinking	OR = 1.32 (1.14-1.53)	<0.001*
				Volunteering	Problem drinking	OR = 0.75 (0.65-0.86)	<0.001*

* Denotes statistical significance at the 5% level
^ Denotes that result was not adjusted for potential confounders
b Regression coefficient
r Correlation coefficient
OR Odds Ratio
RR Relative Risk
Studies in italics are those which were assessed as being of 'weak' quality

Please see Web Annex 3 for full details of each paper

Social norms

This review identified three studies (four papers and 13 effect estimates) on the association between community level social norms and alcohol use, with findings presented in Table 4. The specific measures of social norms are described in Web Annex 4. Using the quality assessment tool, all four papers were rated as 'medium' quality (see Web Annex 9). The studies used measures which focused on aspects such as the tolerance of communities toward alcohol use and the acceptability of drinking and drunkenness. The study populations were both adolescents and adults. The studies produced varied results, but there is some indication that the prevalence of alcohol use among adolescents may be lower in communities that are less tolerant of drinking.

Adults:

One study of adults (two papers) found mixed results on the association between social norms and alcohol use. After controlling for social network and individual norms, permissive drunkenness norms were associated with higher levels of binge drinking (OR = 1.58) but not with moderate drinking (OR = 1.14), and no associations were found between drinking and communities having permissive drinking norms (where drinking and getting drunk are not seen as unacceptable behaviours) (Ahern et al., 2008). Using the same study population, no association was found between restrictive drinking norms and the quantity of alcohol consumed (Le et al., 2010).

Adolescents:

Among adolescents, a study of a random sample of schools in Canada found that adolescent alcohol use was significantly lower in communities that were less tolerant of drinking ($r = -0.010$ for prevalence; $r = -0.253$ for alcohol abuse), although this paper provided no information on how the exposure was measured (Rootman & Oakey, 1973). A study of rural adolescents in the U.S. found mixed results – living in a community that they perceived to have a lower tolerance of drinking was associated with a 28% reduction in the odds of having tried alcohol (OR = 0.72) but an increase in the frequency of drinking ($b = 1.51$), and there were no significant associations with the acceptability of adolescent drinking (DeHaan & Boljevac, 2010).

Table 4: The influence of community level social norms on alcohol use, by exposure type

Paper	Location	Community	Sample	Exposure measure	Outcome measure	Results (95% CI)	P
Exposure: Social norms							
Adults							
Ahern et al, 2008	US (New York)	Urban	4000 adults	Permissive drinking norms	Increased drinking	OR = 1.03 (0.86-1.25)	>0.05
				Permissive drinking norms	Problem drinking	OR = 0.98 (0.62-1.54)	>0.05
				Permissive drunkenness norms	Increased drinking	OR = 1.14 (0.99-1.30)	>0.05
				Permissive drunkenness norms	Problem drinking	OR = 1.58 (1.20 -2.08)	<0.05*
Le et al, 2010	US (New York)	Urban	4000 adults	Restrictive norms	Increased drinking	OR = 0.88 (0.76, 1.01)	>0.05
Adolescents							
DeHaan & Boljevac, 2010	US (Wisconsin, South Dakota, Wyoming)	Rural	1424 adolescents	Acceptability	Prevalence	OR = 0.50 (0.23-1.09)	>0.05
				Acceptability	Increased drinking	b = 0.48 (0.06-4.01)	>0.05
				Tolerance (adolescent assessed)	Prevalence	OR = 0.72 (0.63-0.82)	<0.001*
				Tolerance (adolescent assessed)	Increased drinking	b = 1.51 (1.07-2.14)	<0.05*
				Tolerance (adult assessed)	Prevalence	OR = 1.02 (0.95-1.11)	0.55
				Tolerance (adult assessed)	Increased drinking	b = 0.69 (0.56-0.86)	<0.001*
Rootman & Oakey, 1973	Canada (Alberta)	Mixed	4724 adolescents	Proscriptive norms	Prevalence	r = - 0.010	<0.05*
				Proscriptive norms	Problem drinking	r = - 0.253	<0.05*

* Denotes statistical significance at the 5% level
 ^ Denotes that result was not adjusted for potential confounders
 b Regression coefficient
 r Correlation coefficient
 OR Odds Ratio
 RR Relative Risk
 Studies in italics are those which were assessed as being of 'weak' quality

Please see Web Annex 3 for full details of each paper

DISCUSSION

This is, to our knowledge, the first systematic review of the association between alcohol use and community level social factors. The study included a wide range of exposure variables and four databases were searched, along with an extensive search of cited references. The selected studies included a wide variety of community settings and countries and were conducted among adolescent, student and adult populations.

There were inconclusive results on the associations between socio-economic factors and alcohol use, especially among studies that focused on deprivation and poverty. There was some indication that alcohol use is higher in communities with higher income levels, but also in communities with lower employment levels.

All of the studies on disorder and crime were carried out in the United States. Their results were also inconclusive, but suggest that alcohol use may be higher in communities with greater social disorder and where adolescents feel less safe. Harmful drinking may occur as a result of stress from living in a community with high levels of disorder. High social capital was generally found to be associated with lower alcohol use, mostly in studies of adolescents and students that focused on community attachment, closeness and supportiveness as well as community involvement. This finding supports previous research in which social capital in a community seems to be protective against mental ill health (De Silva, McKenzie, Harpham, & Huttly, 2005). No clear result was found for the association between social norms and alcohol use, but there is some indication that the prevalence of alcohol use among adolescents may be lower in communities that are less tolerant of drinking. This supports the need for research that focuses on social norms at a social- or community-level and their influence on health behaviours (Sorensen, Barbeau, & Hunt, 2004).

A key weakness of the evidence base is the lack of information on causality. Most of the evidence collected in this review was from cross-sectional studies. Such data cannot show the direction of the relationship between alcohol consumption and community-level influences. For example, harmful drinking may occur as a result of stress from living in a community with high levels of disorder but harmful drinking may also contribute to community disorder. Heavy drinkers may also migrate to more deprived communities or those with greater disorder. There were only a limited number of longitudinal studies in our review and no discernible differences were observed on the association of community-level social influences on alcohol use between them and the cross-sectional studies which could have strengthened understanding on the issue of temporality. More longitudinal data are required that follow people and communities over time to better estimate temporal associations between alcohol consumption and community level social factors. Approaches such as instrumental variable analysis can also help to address causal inference in cross-sectional studies.

The difficulty in assessing causality, coupled with the lack of interventional studies and the often conflicting results make it difficult to make firm policy recommendations. However, a few lessons emerge. One is the need for a gendered perspective, especially when considering adolescents. There were a number of studies where the behaviour of boys and girls differed. The study by Kling et al. (2007) also looked at a range of other measures and showed that this gender difference was not confined to alcohol. As this was a randomised study in which families moved to different areas it provides strong evidence that there is a true difference. The second, again most relevant to adolescents, is the need to consider clustering of hazardous behaviours, with several studies finding a link between hazardous drinking and drug use. Unfortunately, in many places, those addressing different health issues inhabit separate silos. The third relates to the association between disorder and drinking. As noted, it is not possible with the available data to determine the direction of causality but it is likely to be bidirectional. This implies a need for close collaboration between public health organisations and those responsible for the criminal justice system.

There were also a number of additional limitations in the evidence base. The cross-sectional design of most of the studies, and the variety of exposure and outcome measures examined in the studies, also means that it is very difficult to estimate the size of the overall effect that these community level factors may have on alcohol use. Most studies were carried out in the United States and there remains very limited evidence

on the influence of community level factors on alcohol use in low- and middle-income countries, despite their high levels of alcohol consumption and related burden of disease (World Health Organization, 2009, 2011). Studies have focused predominantly on the influence of socio-economic factors, disorder and social capital on alcohol use. Only a few have examined the influence of safety, violence, crime and social norms on alcohol use so it is difficult to draw robust conclusions about these factors. There were a number of common methodological issues in the included studies, and there was variation in the methodological quality of studies. All of the studies used self-reported alcohol use data, which may have implications for the validity of the outcome measures, particularly due to possible underreporting in communities that are less tolerant of alcohol consumption. It has been shown that respondents tend to understate alcohol consumption (Stockwell, Donath, Cooper-Stanbury, Chikritzhs, Catalano, & Mateo, 2004), but this is clearly context dependent. It may also not be true for adolescents who might overstate alcohol use (Lundborg, 2002). A number of studies also relied on a limited number of questions on alcohol consumption. Some studies had relatively low response rates (range of 24-97%), with possible respondent bias, such as the heaviest drinkers not participating in surveys. In addition, the heaviest drinkers may have died prematurely. To address this bias, alternative methodologies could be employed in future studies such as the collection of information from a relative of the deceased on alcohol consumption by the deceased (as used elsewhere) (Leon, Saburova, Tomkins, Andreev, Kiryanov, & McKee, 2007). Some studies did not adjust their results for any potential confounders. Many also failed to report confidence intervals or specific p values, although most authors stated whether the result was statistically significant at the 5% level.

There are also potential biases associated with the means of rating some of the exposure variables, such as neighbourhood disorder. However, research on neighbourhood characteristics has shown that both objective measures and subjective perceptions have explanatory power for health related behaviours, although capturing different aspects (Chow et al., 2009). For example, evidence suggests that personal perceptions of vulnerability, particularly amongst certain groups such as women and the elderly may be more inclined to rate their neighbourhood environment negatively, or to recall witnessing violence/crime at a greater rate; and that concerns about neighbourhood disorder and crime can reflect broader concerns about social and economic change (Clark, Ryan, Kawachi, Canner, Berkman, & Wright, 2008; Hale, 1996; Sutton & Farrall, 2009).

Although the results of the studies were largely adjusted for the influence of potential confounders, this review did not explore the causal pathways as this would have substantially complicated the presentation and interpretation of results. A number of studies did attempt to develop causal pathways by examining intermediate factors (e.g. psychological distress from community disorder). However, measuring these intermediate factors was beyond the scope of the review, particularly as attribution is a major challenge in examining indirect associations. The results of this review may therefore not capture the totality of associations between community level factors and alcohol use, and further research should examine the range of causal pathways. The findings of qualitative studies should also be reviewed in order to further understanding of the results of this review – for example, to better understand the ways in which social capital and employment levels influence individual decisions on alcohol use.

Future research should also address the less frequently studied social factors, such as safety, violence, crime and social norms. As this area of research is dominated by studies from the U.S.A., more research is needed from elsewhere. Future studies on alcohol use should also consider the health and policy implications of their findings, which have implications for the outcome measures used. For example, prevalence data on whether adults consume or do not consume alcohol is not particularly useful without accompanying data on the patterns of alcohol consumption (e.g. frequency, quantity, type, problem drinking).

The strength of this review is that it disentangles the results of varied and complex studies in order to describe the current evidence on the overall relationships between community level social factors and alcohol use. Although a meta-analysis was not possible due to the heterogeneity of the studies, this review systematically identified, organised, and evaluated relevant studies. Prosperous, supportive, active and safe communities clearly bring many benefits to their inhabitants. The findings from this review provide some evidence that these additional benefits may include healthier patterns of alcohol use. Policy makers

should be aware of these potential benefits of healthier alcohol use and seek to maximise them when developing policies aiming to strengthen communities and also alcohol control and treatment programmes. The findings also suggest that a comprehensive approach is required to addressing community-level influences on alcohol use which recognises the influence of social factors as well as the availability and marketing of alcohol (Bryden et al., 2012).

Conclusions

This is the first systematic review of community level social influences on alcohol use. It found inconclusive results on the influence on alcohol use of socio-economic factors such as deprivation, poverty, income and unemployment. Similarly inconclusive findings were found for the influence of social disorder and crime on alcohol use. These findings reflect the varied outcome and exposure methods used and the broader limitations with the evidence-base. Clearer associations were found for social capital measures, such as community attachment, supportiveness and participation, and these factors seem to be protective against elevated or harmful alcohol use. Although the limitations of the current evidence base should be recognised, policy makers should be aware of the importance of a supportive and active community on preventing harmful alcohol use, particularly among adolescents.

FUNDING SOURCE

No external funding was used to conduct this review.

REFERENCES

- Abdelrahman, A. I., Rodriguez, G., Ryan, J. A., French, J. F., & Weinbaum, D. (1999). The Epidemiology of Substance Use among Middle School Students: The Impact of School, Familial, Community, and Individual Risk Factors. *Journal of Child and Adolescent Substance Abuse*, 8(1), 55-75.
- Ahern, J., Galea, S., Hubbard, A., Midanik, L., & Syme, S. L. (2008). "Culture of drinking" and individual problems with alcohol use. *Am. J. Epidemiol*, 167, 1041-1049.
- Arthur, M. W., Hawkins, J. D., Pollard, J. A., Catalano, R. F., & Baglioni, A. J. (2002). Measuring risk and protective factors for substance use, delinquency, and other adolescent problem behaviors: The Communities That Care Youth Survey. *Evaluation review*, 26, 575-601.
- Babor, T. F., Caetano, R., & Casswell, S. (2010). *Alcohol: No Ordinary Commodity: Research and Public Policy*: Oxford University Press.
- Bernstein, K. T., Galea, S., Ahern, J., Tracy, M., & Vlahov, D. (2007). The built environment and alcohol consumption in urban neighborhoods. *Drug Alcohol Depend*, 91(2-3), 244-252.
- Beyers, J. M., Toumbourou, J. W., Catalano, R. F., Arthur, M. W., & Hawkins, J. D. (2004). A cross-national comparison of risk and protective factors for adolescent substance use: the United States and Australia. *J. Adolesc. Health*, 35, 3-16.
- Blount, W. R., & Dembo, R. (1984). The effect of perceived neighborhood setting on self-reported tobacco, alcohol, and marijuana use among inner-city minority junior high school youth. *Int J Addict*, 19(2), 175-198.
- Brenner, A. B., Bauermeister, J. A., & Zimmerman, M. A. (2011). Neighborhood Variation in Adolescent Alcohol Use: Examination of Socioecological and Social Disorganization Theories. *Journal of Studies on Alcohol and Drugs*, 72(4), 651-659.

- Bryden, A., Roberts, B., McKee, M., & Petticrew, M. (2012). A systematic review of the influence on alcohol use of community level availability and marketing of alcohol. *Health & Place*, 18, 349-357.
- Buu, A., Mansour, M., Wang, J., Refior, S. K., Fitzgerald, H. E., & Zucker, R. A. (2007). Alcoholism effects on social migration and neighbourhood effects on alcoholism over the course of 12 years. *Alcoholism: Clinical and Experimental Research*, 31, 1545-1551.
- Buu, A., Wang, W., Wang, J., Puttler, L. I., Fitzgerald, H. E., & Zucker, R. A. (2011). Changes in women's alcoholic, antisocial, and depressive symptomatology over 12 years: A multilevel network of individual, familial, and neighborhood influences. *Development and Psychopathology*, 23(1), 325-337.
- Byrnes, H. F., Chen, M. J., Miller, B. A., & Maguin, E. (2007). The relative importance of mothers' and youths' neighborhood perceptions for youth alcohol use and delinquency. *Journal of Youth and Adolescence*, 36(5), 649-659.
- Carpiano, R. M. (2007). Neighborhood social capital and adult health: An empirical test of a Bourdieu-based model. *Health & Place*, 13, 639-655.
- Cercone, J. (1994). Alcohol-related problems as an obstacle to the development of human capital. Washington, DC: World Bank.
- Cerda, M., Diez-Roux, A. V., Tchetgen, E. T., Gordon-Larsen, P., & Kiefe, C. (2010). The relationship between neighborhood poverty and alcohol use: estimation by marginal structural models. *Epidemiology*, 21(4), 482-489.
- Chow, C. K., Lock, K., Teo, K., Subramanian, S. V., McKee, M., & Yusuf, S. (2009). Environmental and societal influences acting on cardiovascular risk factors and disease at a population level: a review. *International Journal of Epidemiology*, 38, 1580-1594.
- Chuang, Y.-c., & Chuang, K. Y. (2008). Gender differences in relationships between social capital and individual smoking and drinking behavior in Taiwan. *Social Science and Medicine*, 67 no. 8, 1321-1330.
- Chuang, Y.-C., Ennett, S. T., Bauman, K. E., & Foshee, V. A. (2005). Neighborhood Influences on Adolescent Cigarette and Alcohol Use: Mediating Effects through Parent and Peer Behaviors. *Journal of Health and Social Behavior*, 46(2), 187-204.
- Cicchetti, D., & Rogosch, F. A. (2002). A developmental psychopathology perspective on adolescence. *Journal of Consulting and Clinical Psychology*, 70, 6-20.
- Clark, C., Ryan, L., Kawachi, I., Canner, M. J., Berkman, L., & Wright, R. J. (2008). Witnessing community violence in residential neighbourhoods: A mental health hazard for urban women. *Journal of Urban Health: Bulletin of the new York Academy of Medicine*, 85, 22-38.
- De Haan, L., Boljevac, T., & Schaefer, K. (2009). Rural Community Characteristics, Economic Hardship, and Peer and Parental Influences in Early Adolescent Alcohol Use. *Author manuscript for Journal of Early Adolescence*, 30(5), 629-650.
- De Silva, M. J., McKenzie, K., Harpham, T., & Huttly, S. R. (2005). Social capital and mental illness: a systematic review. *Journal of Epidemiology & Community Health*, 59(8), 619-627.
- DeHaan, L., & Boljevac, T. (2010). Alcohol Prevalence and Attitudes Among Adults and Adolescents: Their Relation to Early Adolescent Alcohol Use in Rural Communities. *Journal of Child & Adolescent Substance Abuse*, 19(3), 223-243.

- Dembo, R., Schmeidler, J., Burgos, W., & Taylor, R. (1985). Environmental Setting and Early Drug Involvement among Inner-City Junior High School Youths. *International Journal of the Addictions*, 20, 1239-1255.
- Ecob, R., & Macintyre, S. (2000). Small area variations in health related behaviours; do these depend on the behaviour itself, its measurement, or on personal characteristics? . *Health & Place*, 6, 261-274.
- Effective Public Health Practice Project. (1998). Quality Assessment Tool For Quantitative Studies.
- Ennett, S. T., Flewelling, R. L., Lindrooth, R. C., & Norton, E. C. (1997). School and neighborhood characteristics associated with school rates of alcohol, cigarette, and marijuana use. *J Health Soc Behav*, 38(1), 55-71.
- Ewing, J. (1984). Detecting alcoholism. The CAGE questionnaire. *JAMA*, 252(14), 1905-1907.
- Fauth, R. C., Leventhal, T., & Brooks-Gunn, J. (2004). Short-term effects of moving from public housing in poor to middle-class neighborhoods on low-income, minority adults' outcomes. *Social Science & Medicine*, 59, 2271-2284.
- Foran, H. M., Heyman, R. E., Slep, A. M. S., & Usaf (2011). Hazardous Drinking and Military Community Functioning: Identifying Mediating Risk Factors. *Journal of Consulting and Clinical Psychology*, 79(4), 521-532.
- Galea, S., Ahern, J., Tracy, M., & Vlahov, D. (2007). Neighborhood income and income distribution and the use of cigarettes, alcohol, and marijuana. *Am J Prev Med*, 32(6 Suppl), S195-202.
- Giskes, K., Turrell, G., Bentley, R., & Kavanagh, A. (2011). Individual and household-level socioeconomic position is associated with harmful alcohol consumption behaviours among adults. *Aust NZ J Public Health*, 35(3), 270-277.
- Godoy, R. A., Reyes-Garcia, V., McDade, T., Huanca, T., Leonard, W. R., Tanner, S., et al. (2006). Does village inequality in modern income harm the psyche? Anger, fear, sadness, and alcohol consumption in a pre-industrial society. *Social Science & Medicine*, 63(2), 359-372.
- Graham, K., & West, P. (2001). Alcohol and crime. In N. Heather, T. J. Peters & T. Stockwell (Eds.), *International Handbook of Alcohol Dependence and Problems* pp. 439-470. London: John Wiley & Sons.
- Hale, C. (1996). Fear of Crime: A Review of the Literature. *International Review of Victimology*, 4, 79-150.
- HeavyRunner-Rioux, A. R., & Hollist, D. R. (2010). Community, family, and peer influences on alcohol, marijuana, and illicit drug use among a sample of Native American youth: An analysis of predictive factors. *Journal of Ethnicity in Substance Abuse*, 9(4), 260-283.
- Heron, J., Macleod, J., Munafò, M. R., Melotti, R., Lewis, G., Tilling, K., et al. (2012). Patterns of alcohol use in early adolescence predict problem use at age 16. *Alcohol & Alcoholism*, 47(2), 169-177.
- Hill, T. D., & Angel, R. J. (2005). Neighborhood disorder, psychological distress, and heavy drinking. *Soc Sci Med*, 61(5), 965-975.
- Huckle, T., Huakau, J., Sweetsur, P., Huisman, O., & Casswell, S. (2008). Density of alcohol outlets and teenage drinking: living in an alcogenic environment is associated with higher consumption in a metropolitan setting. *Addiction*, 103(10), 1614-1621.

- Jencks, C., & Meyer, S. E. (1990). The social consequences of growing up in a poor neighborhood. In L. E. Lynn, JR. & M. G. H. McGeary (Eds.), *Inner City Poverty in the United States* pp. 111-186): Washington, DC: National Academies Press.
- Kadushin, C., Reber, E., Saxe, L., & Livert, D. (1998). The substance use system: Social and neighborhood environments associated with substance use and misuse. *Substance Use & Misuse*, 33, 1681-1710.
- Karvonen, S., & Rimpela, A. H. (1997). Urban small area variation in adolescents' health behaviour. *Social Science & Medicine*, 45, 1089 -1098.
- Kling, J. R., Liebman, J. B., & Katz, L. F. (2007). Experimental analysis of neighborhood effects. *Econometrica*, 75, 83-119.
- Lambert, S. F., Brown, T. L., Phillips, C. M., & Ialongo, N. S. (2004). The relationship between perceptions of neighborhood characteristics and substance use among urban African American adolescents. *American Journal of Community Psychology*, 34(3-4), 205-218.
- Le, F., Ahern, J., & Galea, S. (2010). Neighborhood education inequality and drinking behavior. *Drug and Alcohol Dependence*, 112(1-2), 18-26.
- Leon, D. A., Saburova, L., Tomkins, S., Andreev, E., Kiryanov, N., & McKee, M. (2007). Hazardous alcohol drinking and premature mortality in Russia: a population based case-control study. *Lancet*, 369, 2001-2009.
- Leventhal, T., & Brooks-Gunn, J. (2003). Children and youth in neighborhood contexts. *Current Directions in Psychological Science*, 12, 27-31.
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., et al. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ*, 339, b2700.
- Livingston, M., Laslett, A.-M., & Dietze, P. (2008). Individual and community correlates of young people's high-risk drinking in Victoria, Australia. *Drug and Alcohol Dependence*, 98(3), 241-248.
- Locker, D., Payne, B., & Ford, J. (1996). Area variation in health behaviours. *Canadian Journal of Public Health*, 87(2), 125-129.
- Lundborg, P. (2002). Young people and alcohol: an econometric analysis. *Addiction*, 97, 1573-1582.
- Mrug, S., & Windle, M. (2009). Initiation of alcohol use in early adolescence: links with exposure to community violence across time. *Addict Behav*, 34(9), 779-781.
- Mulia, N., Schmidt, L., Bond, J., Jacobs, L., & Korcha, R. (2008). Stress, social support and problem drinking among women in poverty. *Addiction*, 103(8), 1283-1293.
- Nalls, A., Mullis, R. L., & Mullis, A. K. (2009). American Indian youths' perceptions of their environment and their reports of depressive symptoms and alcohol/marijuana use. *Adolescence*, 44(176), 965-978.
- National Collaborating Centre for Methods and Tools. (2011). Quality Assessment Tool for Quantitative Studies.
- Pollack, C. E., Cubbin, C., Ahn, D., & Winkleby, M. (2005). Neighbourhood deprivation and alcohol consumption: does the availability of alcohol play a role? *Int J Epidemiol*, 34(4), 772-780.
- Poortinga, W. (2006). Do health behaviors mediate the association between social capital and health? *Preventive Medicine*, 43(6), 488-493.

- Reboussin, B. A., Preisser, J. S., Song, E.-Y., & Wolfson, M. (2010). Geographic clustering of underage drinking and the influence of community characteristics. *Drug and Alcohol Dependence*, 106(1), 38-47.
- Reyes, J. C., Colon, H. M., Robles, R. R., Negron, J., Marrero, C. A., Matos, T. D., et al. (2006). Alcohol use among adolescents in Puerto Rico: the influence of physical and social neighborhood disorder. *Boletin de la Asociacion Medica de Puerto Rico*, 98(3), 186-191.
- Rootman, I., & Oakey, J. (1973). School and community correlates of alcohol use and abuse among Alberta junior high school students. *Can J Public Health*, 64(4), 351-359.
- Scheier, L. M., Botvin, G. J., & Miller, N. L. (1999). Life events, neighborhood stress, psychosocial functioning, and alcohol use among urban minority youth. *Journal of Child & Adolescent Substance Abuse*, 9(1), 19-50.
- Smart, R. G., Adlaf, E. M., & Walsh, G. W. (1994). Neighbourhood socio-economic factors in relation to student drug use and programs. *Journal of Child & Adolescent Substance Abuse*, 3(1), 37-46.
- Song, E.-Y., Reboussin, B. A., Foley, K. L., Kaltenbach, L. A., Wagoner, K. G., & Wolfson, M. (2009). Selected community characteristics and underage drinking. *Substance Use & Misuse*, 44(2), 179-194.
- Sorensen, G., Barbeau, E., & Hunt, M. K. (2004). Reducing social disparities in tobacco use: a social-contextual model for reducing tobacco use among blue-collar workers. *American Journal of Public Health*, 94, 230-239.
- Stephens, A., & Feldman, P. J. (2001). Neighborhood problems as sources of chronic stress: Development of a measure of neighborhood problems, and associations with socioeconomic status and health. *Annals of Behavioral Medicine*, 23(3), 177-185.
- Stockwell, T., Donath, S., Cooper-Stanbury, M., Chikritzhs, T., Catalano, P., & Mateo, C. (2004). Under-reporting of alcohol consumption in household surveys: a comparison of quantity-frequency, graduated-frequency and recent recall. *Addiction*, 99(8), 1024-1033.
- Sutton, R. M., & Farrall, S. (2009). Untangling the web: deceptive reporting in fear of crime research. In M. Lee & S. Farrall (Eds.), *Fear of crime: critical voices in an age of anxiety* pp. 108-124). Oxford: Routledge-Cavendish.
- Svensson, M., & Hagquist, C. (2010). Adolescents alcohol-use and economic conditions: a multilevel analysis of data from a period with big economic changes. *Eur J Health Econ*, 11(6), 533-541.
- The Cochrane Collaboration. (2011). *Cochrane Handbook for Systematic Reviews of Interventions* In J. P. T. Higgins & S. Green (Eds.).
- Theall, K. P., DeJong, W., Scribner, R., Mason, K., Schneider, S. K., & Simonsen, N. (2009). Social Capital in the College Setting: The Impact of Participation in Campus Activities on Drinking and Alcohol-Related Harms. *Journal of American College Health*, 58(1), 15-23.
- Thomas, B. H., Ciliska, D., Dobbins, M., & Micucci, S. (2004). A Process for Systematically Reviewing the Literature: Providing the Research Evidence for Public Health Nursing Interventions. *Worldviews on Evidence-Based Nursing*, 1(3), 176-184.
- Tobler, A. L., Komro, K. A., & Maldonado-Molina, M. M. (2009). Relationship between neighborhood context, family management practices and alcohol use among urban, multi-ethnic, young adolescents. *Prev Sci*, 10(4), 313-324.

- Trim, R. S., & Chassin, L. (2008). Neighborhood socioeconomic status effects on adolescent alcohol outcomes using growth models: exploring the role of parental alcoholism. *J Stud Alcohol Drugs*, 69(5), 639-648.
- Truong, K. D., & Sturm, R. (2009). Alcohol environments and disparities in exposure associated with adolescent drinking in California. *American Journal of Public Health*, 99(2), 264-270.
- van Praag, L., Bracke, P., Christiaens, W., Levecque, K., & Pattyn, E. (2009). Mental health in a gendered context: Gendered community effect on depression and problem drinking. *Health Place*, 15(4), 990-998.
- Von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gotsche, P. C., & Vandembroucke, J. P. (2007). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet*, 370(9596), 1453-1457.
- Weitzman, E. R., & Chen, Y.-Y. (2005). Risk modifying effect of social capital on measures of heavy alcohol consumption, alcohol abuse, harms, and secondhand effects: National survey findings. *Journal of Epidemiology and Community Health*, 59(4), 303-309.
- Weitzman, E. R., & Kawachi, I. (2000). Giving means receiving: the protective effect of social capital on binge drinking on college campuses. *Am J Public Health*, 90(12), 1936-1939.
- Wilson, N., Syme, S., Boyce, W., Battistich, V. A., & Selvin, S. (2005). Adolescent Alcohol, Tobacco, and Marijuana Use: The Influence of Neighborhood Disorder and Hope. *American Journal of Health Promotion*, 20(1), 11-19.
- World Health Organization. (2009). Global Health Risks. Mortality and burden of disease attributable to selected major risks. Geneva: World Health Organization.
- World Health Organization. (2011). Global status report on alcohol and health. Geneva: World Health Organization.