A community action programme for reducing harmful drinking behaviour among adolescents: the Trelleborg Project.

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ABSTRACT

Aims: To evaluate a three-year community intervention program by measuring changes in drinking patterns in a 15 to 16-year-old population.

Design, setting, participants, and measurements: The action program included five demand reducing and one supply reducing interventions. Cross-sectional, non-repeated data was collected from a questionnaire distributed in classrooms from 1999 to 2001, and in 2003 (n = 1376, 724 boys and 652 girls; response rate = 92.3%). Step-wise logistic regression analyses were used to determine the relationship between different risk factors and excessive drinking, heavy episodic drinking, purchaser of alcohol, and alcohol provided by parents. The results from the intervention community were also compared with similar Swedish cross-sectional datasets.

Findings: The results of our analyses indicated a decrease in harmful drinking behaviour in Trelleborg when comparing baseline with post-intervention measurements. The comparison with other studies showed that the changes in these indicators were more rapid and consistent in Trelleborg. Finally, the multivariable logistic regression analyses showed that the outcomes were not likely to be attributed to changes in environmental factors.

Conclusions: We concluded that a community action programme based on the systems approach effectively reduced hazardous alcohol consumption among adolescents in Trelleborg.

INTRODUCTION

In the late 1990s alcohol consumption dramatically increased in Sweden (Leifman, 2000), a change noticeable among teenagers as well (Hvitfeldt *et al*., 2004). This was largely the result of an erosion in Swedish policy regarding alcohol, attributed to European integration (Holder *et al*., 1998, Sulkunen *et al*., 2000, Room *et al*., 2005). In this period, importation quotas on alcohol for private consumption brought in from other European Union countries were raised and the price of alcohol in Sweden dropped. Traditionally, the Swedish government would counter an increase in alcohol consumption by reducing the availability (i.e., by controlling prices, retail locations, and hours of operations). In this new era, however, supply reduction strategies were obsolete, and the government had to rely on demand reduction if it were to turn the trend.

A decade earlier, researchers had become interested in community-based interventions to reduce harmful drinking behaviours and their consequences. Much of the research at the time had specific aims: the reduction of availability (Reynolds *et al*., 1997), responsible beverage service (Stockwell *et al*., 1993, Saltz & Stanghetta, 1997, Wallin, 2004), and the development of law enforcement strategies regarding alcohol-related problems (Hingson *et al*., 1996, Holder *et al*., 1997, Wagenaar *et al*., 2000a). Other studies focused on an entire community or a larger segment of the population (Larsson & Hanson, 1990, Giesbrecht & Ferris, 1993, Stout, 1994, Holmila, 1997, Wagenaar *et al*., 2000b, Perry *et al*., 2002).

In 1998, the Swedish Institute of Public Health (SIPH) launched a project to determine the potential of these interventions in Sweden. This initiative was based on the community systems approach stated by Harold Holder (1998), defined as (1) addressing a wide range of problem behaviours, (2) surveying the entire population, and (3) suggesting interventions that would affect the behavioural environment and promote the decision-making process. A vital part of the approach

was to expect the community, rather than the researchers linked to the project, to assume the primary responsibility for its implementation. Prior international community interventions targeting alcohol consumption had shown to be effective, but they had been carried out in affiliation with a research department possessing large resources (Holder, 2002).

Trelleborg was selected because it is a border town with heavy ferry traffic to and from Germany. At the time when the intervention started, alcohol beverage prices were 75% lower there than in Sweden. This resulted in a large-scale importation of alcoholic beverages by ferry travellers to Trelleborg, making alcohol more widely available there than in most other Swedish cities. In addition, it was reasonable to assume that the already relaxed Swedish policy on alcohol had an even looser grip on the people of Trelleborg than in other places further from the border. Easy access to alcohol would theoretically result in a higher prevalence of hazardous drinking (Giesbrecht & Conroy, 1987), particularly among adolescents, for whom availability was facilitated by illegal distribution channels.

We responded by designing a community systems approach-based intervention called the Trelleborg project. It was equally founded on the integrated theory of drinking behaviour presented by Wagenaar & Perry (1994), which integrates several theories to describe the rationale behind alcohol consumption, i.e., social structures, social interaction, social environment, economics, the role of public policy, and risk and protective factors. The core of this theory is that a versatile approach is needed to influence drinking habits, both in terms of supply and demand reduction, and structural versus individual approaches. This integrated theory was used in modelling the Communities Mobilizing for Change on Alcohol (CMCA) program (Wagenaar *et al.*, 1994), which inspired the modelling of the Trelleborg project (see figure 1).

The aim of this paper is to analyze the results of the Trelleborg intervention and determine its effectiveness—particularly with regard to adolescents.

MATERIALS AND METHODS

The Trelleborg Project

Trelleborg (pop. 39,000), Sweden's southernmost municipality, lies in close proximity to the country's third largest city, Malmö (pop. 260,000). It forms part of the Öresund region, which includes the Danish capital along with the greater Copenhagen metropolitan area (pop. 3,500,000), as illustrated in Figure 2.

The intervention strategy consisted in the design and implementation of a sustainable policy and program of action that targeted alcohol and illicit drugs in the municipality of Trelleborg. The project began in the spring of 1999 and ran for 36 months. The local community was responsible for formulating and putting interventions into action in accordance with the program. The main objectives were: (1) focusing the alcohol and drug preventive strategies on children and adolescents, (2) decreasing heavy episodic drinking in Trelleborg, (3) delaying the onset age of alcohol consumption, and (4) achieving changes in attitude toward alcohol and drinking behaviour in the adult population.

University staff was responsible for the evaluation of the project. The expected result, before the baseline measurement had been done, was that the intervention would lead to less availability of alcohol among Trelleborg adolescents, and that this would eventually lead to a reduction in consumption. Parents and vendors of medium strength beer were seen as the primary target group to achieve this change. Anticipated side-effects were a greater general awareness of the

problems associated with excessive alcohol consumption. The programme was organized by a steering committee; a project coordinator hired by the municipality managed and coordinated the actual interventions; and five action groups (comprising 28 individuals) designed and planned the intervention components. The action group members consisted of key members in the community, e.g. city employees working with adolescents, youth club employees, police, church staff, and sports club representatives.

The project resulted in the implementation of seven intervention components: (1) the city council adopted a community policy and action plan on alcohol and drug management, (2) they also approved a school policy and action plan with the same goal, (3) the police and the city administration developed a cross-sectoral approach to inspecting grocery and convenience stores where black market alcohol could potentially be sold—leading to seven inspections, ten police reports, and one conviction during the intervention, (4) a comprehensive, evidence-based curriculum on alcohol and drugs was introduced in all primary and secondary schools, including a textbook that supported problem solving and value-oriented group discussions (5) a curriculum for the parents of 7^{th} through 9^{th} graders was designed, although only a pilot group completed it before the end of the intervention, (6) all parents of 7^{th} graders were mailed a leaflet containing basic information on what they could do to promote an alcohol and drug free adolescence for their children, and (7) a survey of adolescent alcohol and drug use in the community was publicized in the local mass media.

Study design of the project evaluation

Initially, the intended study design was to survey a cohort, consisting of 6^{th} and 9^{th} grade students, during and after the intervention. However, the ethical committee revising the suggested design decided that we needed informed and written consent from students as well as parents, which proved to be an impossible task. In the end, more than half of the parents did not reply at all, and less than

40% of the parents gave their written consent to let their children participate in the cohort. We then decided to evaluate the project using cross-sectional data only, but to do this in three phases. First, we made four cross-sectional data collections: one at baseline, two during the project, and one after the intervention was completed. Second, we analyzed the effect of socioeconomic factors, daily habits, and school-related elements, targeting those likely to reduce harmful drinking behaviour. Finally, we compared the trends of our outcome variables with corresponding data at the national and regional level.

The cross-sectional data sample was gathered by four different surveys: a baseline survey in 1999, one each in 2000 and 2001, and one at the conclusion of the project in 2003. In the first collection, two of the present authors (M.S. & P.L.) acted as field-workers, distributing and supervising the survey. In the following years, the school staff carried out the distribution and supervision. In 1999, 2000, and 2001, the data was collected at the beginning of May. In 2003 this took place in mid-March. The date change was due to the fact that this survey was made in collaboration with 20 other municipalities in the region, and the majority wanted to conduct the survey earlier in the year. The students participating in the survey were in the 9th grade (ages 15 to 16) and attended public schools in the municipality of Trelleborg, which has five schools with grades 7 through 9. Grades 7 and 8 were included in the surveys of 2000 and 2001, but not in 1999 and 2003. In the data material used for the analyses in this paper, we have only used 9th grade students, since they participated in all four data collections.

All students who were present on the day of the study were asked to complete the questionnaire. The overall response rate was 92.3% (see Table 1). The bulk of the non-responders consisted of those who were absent for such reasons as illness, truancy, or job training. Some questionnaires contained

inconsistent information. These were deleted from the data, resulting in internal non-response. In total 1376, questionnaires were collected. For each of the statistical analyses, the rate of missing cases varied from 10.3% to 10.8%.

The questionnaires were completed anonymously. All items were based on a national Swedish school survey on tobacco, alcohol, and drug use among 9th graders. The questionnaire contained 116 items and included space for comments.

Indicators for project objectives

Consumers of alcohol: Respondents were asked whether they drank any alcohol during the previous 12 months. Those answering that they had were considered to be consumers of alcohol.

Excessive drinking: This item was based on the following question: How often do you get drunk when you drink alcohol? The alternatives were: (1) don't drink, (2) never get drunk, (3) seldom, (4) sometimes, (5) almost every time, and (6) always. Alternatives (5) and (6) were added together to define the excessive drinking category.

Heavy episodic drinking the previous month: The variable for frequent high alcohol consumption was based on four open-ended questions asked of students who had consumed alcohol in the last 12 months (87.2%). These were: "How many times in the last 30 days have you had six cans of low strength beer (3.5 vol. %) on one occasion?", "Six bottles (or four cans) of normal beer (more than 3.5 vol. %)?", "One bottle of wine?" and finally, "Half a bottle (0.35 litres) of hard liquor?" The value of each of the four answers ranged from 0 to 30 (each occasion n = 1 point) and were totalled. Individuals scoring 1 or more were coded as having experienced heavy episodic drinking during the

previous month. The non-response rate was 6.5%. In the 2003 questionnaire, the four questions were combined into one: “How many times during the last 30 days did you happen to drink 6 cans of medium strength beer, or 6 either bottles or 4 cans of normal strength beer, or 1 bottle of wine, or half a bottle of hard liquor, or the equivalent, on one occasion?”.

Purchaser of alcohol: For each type of alcoholic beverage—low strength beer or cider, normal strength beer or cider, alco-pops, wine, and hard liquor—the respondents were asked how they obtained it. There were two alternatives: “Purchased from an adult” and “Gave money to an adult to buy it for me”. Responses were totalled and coded as purchasers of alcohol.

Alcohol provided by parents: Among the beverage source questions (see “Purchaser of alcohol”) was an alternative indicating “parents consented to provide alcohol”.

Independent variables

The independent variables included in the analyses were categorized into three different groups: socioeconomic status, lifestyle indicators, and school-related factors.

The socioeconomic variables were: *gender, not living with both parents*, and *high purchasing power*. Regarding the last indicator, students were asked, “How much spending money do you have every month?” In order to adjust for inflation, the open-ended answers were recalculated by means of the Consumer Price Index, using the year 2003 as a reference (Statistics Sweden, 2004). The revised values were then divided into less than 800 SEK, or 800 SEK or more (100 SEK ≈ 11 € or 16 US$). The cut-off was based on the median value of this item (800 SEK). Students in the upper category were coded as having high purchasing power. Another

socioeconomic variable in the analysis was *not born in Sweden*. The final indicator in this category was *living in a single family house*.

The lifestyle indicators consisted of two variables: *not engaged in weekly sports* and *daily tobacco use*. Students were asked whether they were engaged in sports and the frequency of their participation. Those who did not engage in any sport at least once a week were defined by this category. Organized sports are not a protective factor to harmful alcohol use, but rather the opposite (Holman *et al.*, 1997 and Moore & Werch, 2005).With regard to tobacco products, two types are commonly sold in Sweden: cigarettes and moist snuff. The latter is predominantly a male form of nicotine intake. Studies show that both impact the use of other drugs (including alcohol) in a similar way (Kelley *et al*., 1999), and tobacco use is a well-know risk factor for harmful alcohol consumption (Grant, 1998 and Jensen *et al.*, 1998). An individual who reported daily use of either product was categorized as a daily tobacco user.

There were also two school-related variables: *dislikes school* and *monthly truancy*. Students were asked to what degree they liked school. Among the five alternatives were "not very much", "not at all", and "dislike it intensely". Those who responded with these were defined as disliking school. Ninth graders were also asked how often they were truant. Students who described themselves as being truant once a month or more were categorized by monthly truancy.

Statistical methods

The Kendall's tau-c test was used to determine whether the estimated prevalence of the indicators between surveys was different. This test provides a nonparametric measure of the agreement between two rankings, by calculating the number of concordant and discordant pairs of observations, while it controls for tied ranks and number of rows. Kendall's tau-b assumes that the table is symmetric, while the Kendall's tau-a, in addition, does not control for tied ranks (SPSS,

1999). The Kendall's tau-c value ranges from -1 to 1, where 1 is perfect association. Null association is defined in terms of statistical independence (Kendall, 1970).

In the internal analyses, we used logistic regression. The multivariable binary logistic regression analysis was performed to evaluate whether it was the project or indicators outside the scope of the intervention that had led to the observed changes in outcome measurements over the four survey years. We wished to establish the degree to which differences in prevalence observed were the result of changing socio-economical conditions, lifestyles, or school-related behaviour. In order to determine this, we categorized the survey year variable for each survey. This allowed us to study the influence of the independent variables on the pre- and post-survey, and follow the changes throughout the intervention period.

The results of our analysis in Trelleborg have been compared with the only other geographical areas in Sweden having relatively similar survey data going back to the late 1990s (see Figure 2). The data from Lund and Gävleborg has been provided in the form of tables that include both frequencies and percentages. The City of Lund supplied us with their data, while the Gävleborg data analysis was provided by the Community Medicine Department of the Gävleborg County Administration, with CAN (the Swedish Council for Information on Alcohol and other Drugs) as sub-contractor. CAN also gathers and reports national data for the whole of Sweden on an annual basis.

RESULTS

Cross-sectional Trelleborg data

Three of the dependent variables had significantly different outcomes from 1999 to 2003 (Table 2). The two other variables that appeared stable over the entire four-year period, *purchaser of alcohol* and *alcohol provided by parents*, actually changed within it (1999 and 2001); however, the prevalence went back to its baseline value in 2003.

Consumers of alcohol decreased from 81.7% in 1999 to 67.2% in 2003. The proportion of students who experienced *excessive drinking* dropped from 37.2% in 1999 to 23.7% in 2003. The rate of those reporting *heavy episodic drinking* during the prior month decreased from 44.5% in 1999 to 27.5% in 2003. The two variables that tracked the availability of alcohol were at their lowest in 2001: the number of students coded as *purchasers of alcohol* were 8.0% and those with *alcohol provided by parents* dropped to 6.3%. However, taking the overall period into consideration, the decrease was insignificant. In the case of the variable *purchaser of alcohol*, the share of respondents dropped by only 2.7% from 1999 and 2003 levels, and for *alcohol provided by parents*, no differences appeared in the percentages when comparing 1999 and 2003. When we tested for the correlation between 2001 and 2003 for the two latter variables there was a significant increase between the years in both (purchaser of alcohol: Kendall's tau-b = 0.08, approx. sig. = 0.001; alcohol provided by parents: Kendall's tau-b = 0.07, approx. sig. = 0.002).

Among the independent variables, there were three noticeable trends: (1) a significant decrease in *living in a single family house*, *monthly truancy*, and *not engaged in weekly sports*; (2) insignificant changes in *gender distribution*, *purchasing power*, *proportion of students born in Sweden*, and *daily tobacco use*; and (3) a significant increase in those *not living with both parents* and students *disliking school*.

Changes as a result of the intervention

The bivariate binary logistic regression analysis (Table 3) showed that there were significant differences between survey years in relation to outcome measurements. The majority of the independent variables were also significant risk factors for the dependent variables. In the multivariable analysis, the same trends remained manifest over time. When independent variables were incorporated into the analytical model (Table 4), almost no changes resulted in the odds ratios over the course of the survey.

Geographical comparison of cross-sectional data

In Table 5, important demographic characteristics are presented for Sweden, Trelleborg, Lund, and Gävleborg, these figures represents the percentage of the total population in each geographical area, and they are based on national registry data. The demographics of Sweden are quite typical of a European welfare state. Trelleborg has a tradition of being a blue collar town. Today there are two large factories: a rubber mill and a floor manufacturer. In addition, its commercial harbour has always played an important part of the city. By Swedish standards, however, Trelleborg's population lags behind in the rate of higher education. This is given as the main explanation for the city's relatively low income. Lund's demographics are greatly dependent on it hosting the university that bears its name, with more than 40,000 students and 6000 employees. Gävleborg is in one of Sweden's traditional industrial areas and includes saw mills, steel, and paper manufacturing.

In order to validate the findings in Trelleborg, we compared our results with data generated elsewhere (Table 6). In Trelleborg, the decrease in the proportion of alcohol consumers was close to 20%; Lund had an increase of approximately 5%; Gävleborg showed an increase of barely 1%; and in Sweden as a whole there was a decrease of 5%. The data showed similar trends for excessive drinking and heavy episodic drinking during the prior month. Alcohol provided by parents, however, decreased slightly both in Lund and in Sweden overall, but remained relatively unchanged in Trelleborg and Gävleborg.

DISCUSSION

When baseline and post-intervention results were compared, our analyses indicated a decrease in harmful alcohol consumption in Trelleborg. The comparison with other studies shows that changes in these indicators took place more rapidly and consistently as a result of our intervention. Finally, multivariable logistic regression analyses demonstrated that the variations we found over time were not likely to be attributable to changes in factors outside the scope of the intervention.

The reductions observed during the intervention in the number of students consuming alcohol, heavy episodic drinking, and excessive drinking, in combination with the stable and relatively small proportion of students with an early onset age of intoxication, continued after the project ended in 2002, in spite of an increase in the number of students who were provided alcohol by their parents and who purchased alcohol themselves between 2001 and 2003. It appears that the general attitude toward potentially hazardous drinking patterns in Trelleborg's 9th grade population had changed, if one compares 1999 with 2003. The 9th graders we studied possessed the means to get drunk, but chose not to. It may be noted that the adult Swedish population (ages 16 to 80) increased its consumption by 15% during the same period (SoRAD, 2004). This increase has mainly

been attributed to a relaxation of the Swedish policy toward alcohol (Leifman & Gustafsson, 2003 and Room *et al*., 2005).

Remarkably, none of the three sets of independent variables (socioeconomic, daily habits, or school-related indicators) changed the crude odds ratios (OR) of the survey year variables. Furthermore, our findings indicated that a significant reduction in harmful drinking had occurred, even though independent variables that theoretically would promote harmful drinking remained at about their former levels (daily tobacco use, purchasing power, percentage of students born in Sweden, number of those not living with both parents, and those not living in single family housing). These results have led us to conclude that the change in alcohol consumption indicators were not primarily a consequence of changes in the macro-environment.

Even though the outcome of this study indicates that the Trelleborg project had a positive impact on hazardous drinking, it is not clear that these changes can be solely attributed to our intervention: the general social and economic development of a community, and the geographical and financial factors pertaining to the availability of alcohol, must also be considered. The general indicators of development in Trelleborg, i.e., its employment and unemployment rates, improved slightly between 1999 and 2003. However, the availability of alcohol changed dramatically during the same period. In 1999, the amount of 100% alcohol that could be privately imported from another EU country was 1.75 litres per trip. By 2004, the same figure was 12.5 litres. In 2001 state-owned liquor stores in Sweden began opening on Saturdays, which had not been the case since 1980. Further, the price of wine and spirits (adjusted for inflation) actually decreased, while beer prices increased marginally. It seems reasonable to conclude, therefore, that changes in the macro-environment actually promoted more drinking, rather than the opposite.

In the case of the two outcome variables *purchaser of alcohol* and *alcohol provided by parents*, both of them indicators of the availability of alcohol, the results were somewhat ambiguous.

The decreases observed during the intervention, in combination with the regression to the baseline value in the post-intervention measurement, suggest two things. First, these indicators may be measuring the outcome of changes beyond the reach of the intervention, e.g., the introduction of new laws pertaining to alcohol or an increase in globalization, both of which may have altered attitudes and values. Second, certain changes may well be attributed to the intervention, since some behaviours regressed when the intervention halted, while the general attitude of the teenaged population remained unchanged. When comparing the findings with Trelleborg with other Swedish data sources, we find that the prevalence of *alcohol provided by parents* was much lower at baseline in Trelleborg than elsewhere. The fact that this variable dropped with 50% between 2000 and 2001 is quite remarkable, especially if one takes the already relatively low prevalence into account. We suggest that this change has to be, at least partly, a result of external influence. One such influential factor could be that parents became a target in the intervention, receiving information on their role in moderating teenage drinking. Another factor, however, could be that the private import of alcohol from Germany made alcohol more widely available. The latter is, however, somewhat contradicted by the fact that the figure regressed to the baseline value in the post intervention measurement.

Methodological considerations

The research design consisted of an analysis of sequential cross-sectional data collected in 12 month intervals between 1999 and 2003, with 22 months separating the 2001 and 2003 surveys. In analytical terms, this represents a cross-sectional dataset with a time variable corresponding to the year of investigation. The variable, therefore, may also be viewed as a proxy for exposure to the intervention. To obtain an external reference for our findings, we compared the Trelleborg results with studies of a similar design from other geographical areas in Sweden. Even though the questions and alternative responses were not identical, our objective was to compare trends. The choice of

geographical units was dependent on the existence of data: in the last few years, many cities and counties have conducted surveys on adolescent drug use, but hardly any have data going back to the late 1990s. Another methodological problem arose in comparing datasets having large differences in sample size. Fluctuations are likely to be wider in data collections with smaller samples. However, sample size cannot be the sole explanatory factor to account for opposite trends such as often emerged from our analysis.

The methodology of collecting cross-sectional data regarding alcohol and drug consumption behaviour and the validity of this methodology has been discussed in several studies. The results have consistently shown school surveys on alcohol and drug use to be valid (Brener *et al*., 1995 and Solbergsdottir *et al*., 2004). Admittedly, the use of unlinked self-report data is not a perfect way to measure the effectiveness of an intervention. However, the coherence in the results, showing a clear trend of reduction in the drinking behaviour variables, indicates that a cohort design would not reach a different conclusion.

One problematic item in the questionnaire was the variable *high episodic drinking*, which was somewhat altered in the 2003 version. The new wording was to facilitate the understanding of a question considered muddled prior to the change. Something that also can have had an impact on the result of this variable, more than the others, is the time change of the last survey. We cannot exclude the possibility that the new format and the time change affected the answers. On the other hand, the outcomes for the variable *excessive drinking* suggest that the results are valid.

When using binary data, one might loose sensitivity in the analysis. E.g. the proportion of students that have had experience of heavy episodic drinking in the previous month could decrease, while the total number of such episodes becomes higher, due to individuals increasing the

number of such drinking occasions. We conducted a sensitivity analysis of our continuous data, and concluded that this was not the case.

There is also a risk of dependent misclassification. For example, there may be students whose parents disapprove of them drinking. As a result, these students may be reluctant to report the fact that they consume large quantities of alcohol. However, since the survey was conducted anonymously, the risk of this kind of misclassification would be reduced. We have found no evidence of confounding in the main exposure variables. In the multivariable analysis, the odds ratios decreased rather insignificantly in the step-wise regression model.

CONCLUSIONS

According to the indicators used, the prevalence of hazardous drinking decreased during the three years of the community intervention. The reduction did not appear to be a result of environmental factors outside the scope of the intervention. The congruent development of behaviours that the intervention targeted also supports our conclusion that it was effective in bringing about the project's objectives.

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REFERENCES

Andréasson, S., Brandt, L., Romelsjö, A. & Allebeck, P. (1992) Antecedents and covariates of high alcohol consumption in young men. *Alcoholism and Clinical Experimental Results*, **16**, 708-713.

Babor, T., ed. (2003) *Alcohol: No Ordinary Commodity*. Oxford: Oxford Univ. Press.

Beman, D. S. (1995) Risk factors leading to adolescent substance abuse. *Adolescence*, **30**, 201-208.

Brener, N. D., Collins, J. L., Kann, L., Warren, C. W. & Williams, B. I. (1995) Reliability of Youth Risk Behavior Survey Questionnaire. *American Journal of Epidemiology*, **15**, 575-580.

Giesbrecht, N. & Conroy, G. (1987) Options in developing community action against alcohol problems. In: Holder, H. D., ed. *Advances in Substance Abuse: Behavioral and Biological Research* (Supplement 1—Control Issues in Alcohol Abuse Prevention: Strategies for States and Communities), pp. 315-336. Greenwich, CT: JAI Press.

Giesbrecht, N. & Ferris, J. (1993) Community-based research initiatives in prevention. *Addiction*, **88** Supplement, S83-S93.

Grant B. F. (1998) Age at smoking onset and its association with alcohol consumption and DSM-IV alcohol abuse and dependence: results from the National Longitudinal Alcohol Epidemiologic Survey, *Journal of Substance Abuse*, **10**, 59–73.

Hingson, R., McGovern, T., Howland, J., Heeren, T., Winter, M. & Zakocs, R. (1996) Reducing alcohol-impaired driving in Massachusetts: the Saving Lives Program. *American Journal of Public Health*, **86,** 791-796.

Holder, H. D. (1998) *A Community Systems Approach to Alcohol Prevention*. Cambridge: Cambridge Univ. Press.

Holder, H. D. (2002) Prevention of alcohol and drug "abuse" problems at the community level: what research tells us. *Substance Use & Misuse*, **37**, 901-921.

Holder, H. D., Kühlhorn, E., Nordlund, S., Österberg, E., Romelsjö, A. & Ugland, T. (1998) *European Integration and Nordic Alcohol Policies*. Aldershot, UK: Ashgate.

Holder, H. D., Saltz, R. F., Grube, J. W., Voas, R. B., Gruenewald, P. J. & Treno, A. J. (1997) A community prevention trial to reduce alcohol-involved accidental injury and death: overview. *Addiction*, **92** Supplement, S155-S171.

Holman, C. D., Donovan, R. J., Corti, B. & Jalleh, G. (1997) The myth of "healthism" in organized sports: implications for health promotion sponsorship of sports and the arts. *American Journal of Health Promotion*, **11**, 169-176.

Holmila, M., ed. (1997) *Community Prevention of Alcohol Problems*. London: Macmillan.

Hvitfeldt, T., Andersson, B. & Hibell, B. (2004) *Skolelevers drogvanor 2003* [Drug habits of secondary school students 2003]. Stockholm: CAN [Swedish Council for Information on Alcohol and other Drugs]. In Swedish.

Jensen M. K., Sorensen T. I., Andersen A. T., Thorsen T., Tolstrup J. S., Godtfredsen N. S. *et al.* (1998) A prospective study of the association between smoking and later alcohol drinking in the general population, *Addiction*, **98** (2003), 355–363.

Johansson, L., Stenlund, H., Lindqvist, P. & Eriksson, A. (2005) A survey of teenager unnatural deaths in northern Sweden 1981-2000. *Accident: Analysis and Prevention*, **37**, 253-258.

Kelley, B. M., Denny, G. & Young, M. (1999) Modified stages of acquisition of gateway drug use: a primary prevention application of the stages of change model. *Journal of Drug Education*, **29**, 189-203.

Kendall, M. G. (1970) Rank Correlation Methods, 4th edition. London: Griffin.

Larsson, S. & Hanson, B. S. (1990) Ethical and political issues encountered in conducting community action programs: experiences from the Kirseberg Project in Sweden. In: *Research, Action, and the Community: Experiences in the Prevention of Alcohol and Other Drug Problems*. Center for Substance Abuse Prevention, Prevention Monograph 4, pp.147-157. Rockville, MD: US Department of Health and Human Services.

Leifman, H. (2000) *Svenskens bruk av svartsprit och totala alkoholkonsumtion 1996-2000* [Illegal and total alcohol consumption in Sweden 1996-2000]. OAS (Oberoende Alkoholsamarbete) [Independent Collaboration on Alcohol Issues]. Stockholm: Ministry of Social Affairs. In Swedish.

Leifman, H. & Gustafsson, N-K. (2003) *En skål för det nya milleniet: En studie av svenska folkets alkoholvanor i början av 2000-talet* [A toast for the new millennium: a study of Swedish alcohol consumption patterns in the early 21st century]. SoRAD (Centrum för socialvetenskaplig alkohol- och drogforskning) [Centre for Social Research on Alcohol and Drugs], Research Report 11. Stockholm: Stockholm Univ. In Swedish.

Moore, M. J. & Werch, C. E. (2005) Sport and physical activity participation and substance use among adolescents. *Journal of Adolescent Health*, **36**, 486-493.

Perry, C. L., Williams, C. L., Komro, K. A., Veblen-Mortenson, S., Stigler, M. H., Munson, K. A., *et al.* (2002) Project Northland: long-term outcomes of community action to reduce adolescent alcohol use. *Health Education Research,* **17**, 117-132.

Reynolds, R. I., Holder, H. D. & Grunewald, P. J. (1997) Community prevention and alcohol retail access. *Addiction*, **92** Supplement, S261-S272.

Room, R., Babor, T. & Rehm, J. (2005) Alcohol and the public health. *Lancet*, **365**, 519-530.

Saltz, R. F. & Stanghetta, P. (1997) A community-wide responsible beverage service program in three communities: early findings. *Addiction*, **92** Supplement, S237-S249.

Solbergsdottir, E., Bjornsson, G., Gudmundsson, L. S., Tyrfingsson, T. & Kristinsson, J. (2004) Validity of self-reports and drug use among young people seeking treatment for substance abuse or dependence. *Journal of Addictive Diseases*, **23**, 29-38.

SoRAD (2004) *Alkohol i siffror* [Alcohol in Figures]. Web-based database, Stockholm University, address: http://webbdb.sorad.su.se. Data collected September 15, 2004. In Swedish.

SPSS (1999) SPSS Base 9.0: Applications Guide. Chicago: SPSS.

Statistics Sweden (2004) *Statistisk årsbok för Sverige* [Statistical Yearbook of Sweden 2004]. Stockholm: Statistics Sweden. In Swedish.

Stockwell, T., Rydon, P., Lang, E. & Beel, A. (1993) *An Evaluation of the 'Freo Respects You' Responsible Alcohol Service Project*. Perth, WA: Curtin University, National Centre for Research into the Prevention of Drug Abuse.

Stockwell, T., Hawks, D., Lang, E. & Rydon, P. (1996) Unravelling the preventive paradox. *Drug and Alcohol Review,* **15**, 7-15.

Stout, R. L. (1994) *Final Report of the Rhode Island Community Alcohol Abuse and Injury Prevention Project*. Report to National Institute on Alcohol Abuse and Alcoholism. Providence, RI: Rhode Island Department of Health.

Sulkunen, P., Sutton, C., Tigerstedt, C. & Warpenius, K., eds. (2000) *Broken Spirits. Power and Ideas in Nordic Alcohol Control*. NAD (Nordiska nämnden för alcohol- och drogforskning) [Nordic Council for Alcohol and Drug Research] Publication No. 39. Helsinki: NAD.

Sundell, K. (2003) *Drog- och riskbeteenden hos Stockholmsungdomar. Resultat från 2002 års drogvaneinventering i grundskolans årskurs 9 och gymnasiets år 2*. Forsknings- och Utvecklingsenheten rapport [Drug and risk behaviour among Stockholm adolescents: results from the 2002 drug use survey in 9th and 11th grade. Research and Development Unit report] 2003:2. Stockholm: Socialtjänstförvaltningen, FoU. In Swedish.

Wagenaar, A. C., Murray, D. M., Wolfson, M., Forster, J. L. & Finnegan, J. R. (1994) Communities Mobilizing for Chanfe on Alcohol: design of a randomized trial. *Journal of Community Psychology*, **Special Issue,** 79-101.

Wagenaar, A. C. & Perry, C. L. (1994) Community strategies for the reduction of youth drinking: theory and application. *Journal of Research on Adolescence*, **4,** 319-345.

Wagenaar, A. C., Murray, D. M. & Toomey, T. L. (2000a) Communities Mobilizing for Change on Alcohol (CMCA): effects of a randomized trial on arrests and traffic crashes. *Addiction*, **95**, 209-217.

Wagenaar, A. C., Murray, D. M., Gehan, J. P., Wolfson, M., Forster, J. L., Toomey, T. L., *et al.* (2000b) Communities Mobilizing for Change on Alcohol: outcomes from a randomized community trial. *Journal of Studies on Alcohol*, **61**, 85-94.

Wallin, E. (2004), *Responsible Beverage Service, Effects of a Community Action Project*. Doctoral dissertation. Stockholm: Karolinska Institutet.

Appendix – Figures and tables

Figure 1. Intervention model

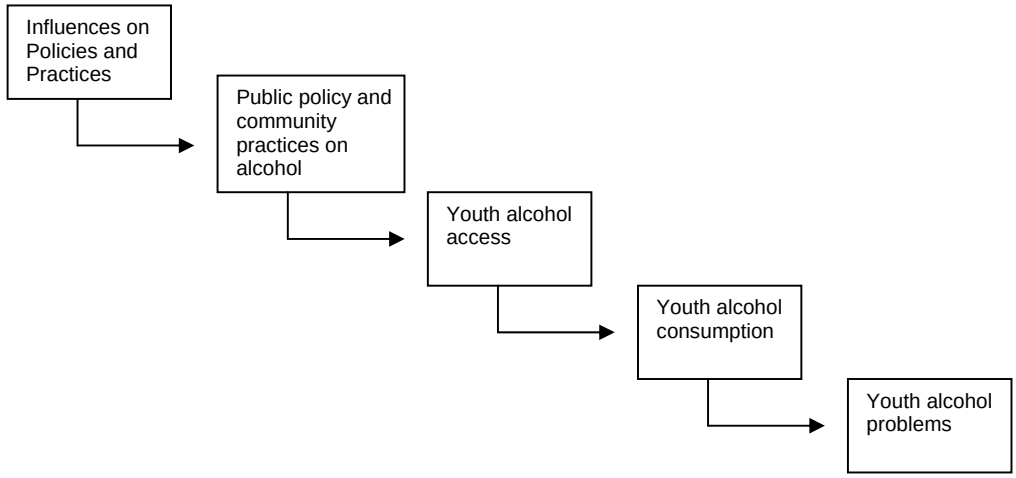

Figure 2 – Location of geographical areas included in the study

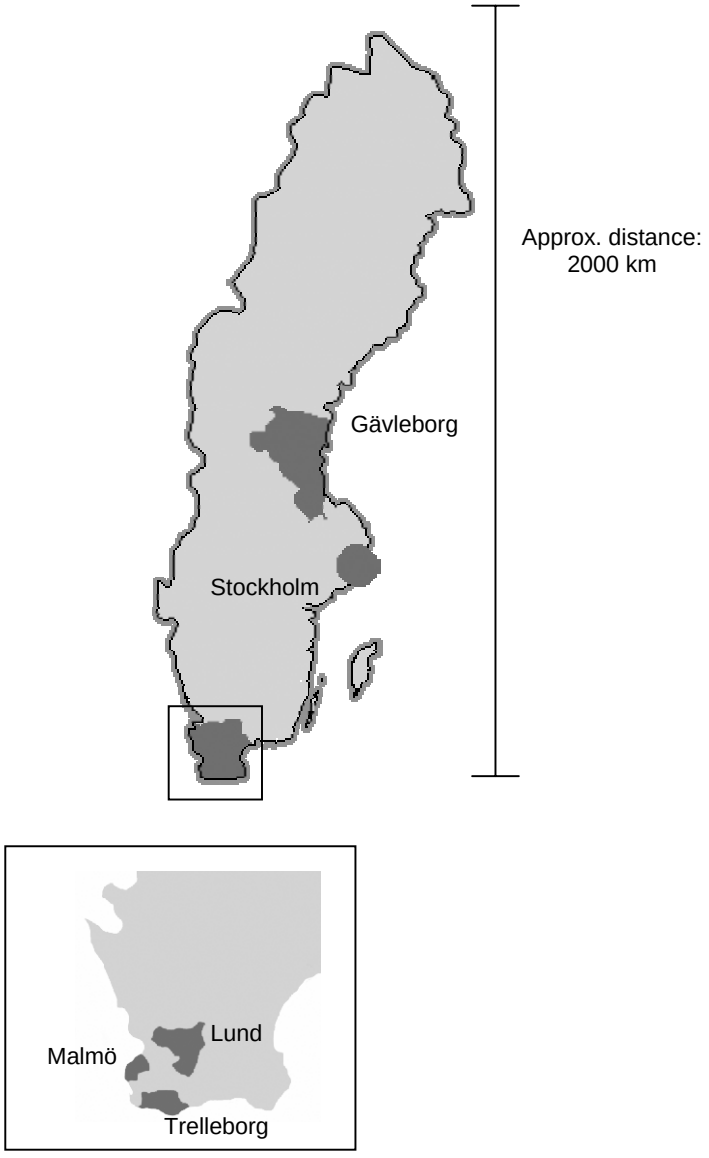

Table 1. External and internal non-response rates

Survey year	1999	2000	2001	2003	Total
Potential number of respondents	394	326	383	387	1490
Number of respondents absent from class when survey was carried out (external non-response)	20	39	23	12	94
Questionnaires invalidated due to inconsistency (internal non-response)	3	4	9	4	20
Total number of respondents	371	283	351	371	1376
Total response rate (%)	*94.2*	*86.8*	*91.6*	*95.8*	*92.3*

Table 2. Prevalence of dependent and independent variables in four data samples (1999–2003) using Kendall's tau-c test for association in binary data

	Survey year	1999		2000		2001		2003		Kendall's tau-c	
	Variable	N	%	N	%	N	%	N	%	Value	Approx. Sig.
Dependent variables	Consumer of alcohol	303	81.7	226	79.9	266	75.8	248	67.2	–0.12	0.000
	Excessive drinking	138	37.2	117	41.3	104	29.6	88	23.7	–0.13	0.000
	Heavy episodic drinking during prior month	165	44.5	130	45.9	132	37.6	102	27.5	–0.15	0.000
	Purchaser of alcohol	70	18.9	34	12.0	28	8.0	60	16.2	–0.03	0.191
	Alcohol provided by parents	48	12.9	35	12.4	22	6.3	48	12.9	–0.13	0.524
Independent variables	Boys	189	51.4	153	54.3	184	52.4	198	53.4	0.10	0.692
	Girls	179	48.6	129	45.7	167	47.6	173	46.6	–0.10	0.692
	Living in single family house	268	72.8	218	77.9	248	71.1	243	65.9	–0.07	0.012
	Not living with both parents	81	21.8	54	19.1	82	23.4	116	31.3	0.08	0.002
	High purchasing power	136	42.9	121	49.8	156	50.3	149	40.6	–0.02	0.458
	Born in Sweden	340	92.4	252	89.7	316	90.0	323	87.1	–0.04	0.024
	Dislikes school	82	22.1	64	22.6	89	25.4	95	25.6	0.03	0.193
	Monthly truancy	72	19.4	52	18.4	60	17.1	53	14.3	–0.04	0.056
	Not engaged in weekly sports	116	31.5	63	22.3	92	26.4	74	19.9	–0.08	0.002
	Daily tobacco use	79	21.3	54	19.1	68	19.4	68	18.3	–0.02	0.343

Table 3. Bivariate logistic regression of outcome variables investigated, presented as odds ratios (OR) and 95% confidence intervals (CI), using 1999 as reference category for survey year, controlled for gender

Bivariate logistic regression		Consumer of alcohol		Excessive drinking		Heavy episodic drinking		Purchaser of alcohol		Alcohol provided by parents	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Survey year	2000	0.9	0.6-1.3	1.2	0.9-1.6	1.1	0.8-1.4	0.6	0.4-0.9	1.0	0.6-1.5
	2001	0.7	0.5-1.0	0.7	0.5-1.0	0.8	0.6-1.0	0.4	0.2-0.6	0.5	0.3-0.8
	2003	0.5	0.3-0.6	0.5	0.4-0.7	0.5	0.3-0.6	0.8	0.6-1.2	1.0	0.7-1.5
Socioeconomic indicators	Born in Sweden	2.7	1.8-3.8	2.8	1.8-4.5	1.9	1.3-2.9	1.3	0.7-2.2	1.9	1.0-3.9
	High purchasing power	1.8	1.4-2.4	2.1	1.6-2.6	2.1	1.7-2.6	2.2	1.6-2.9	1.2	0.8-1.6
	Not living with both parents	1.4	1.0-1.9	1.7	1.3-2.1	1.1	0.8-1.4	1.4	1.0-1.9	1.3	0.9-1.8
	Living in single family house	1.2	1.0-1.6	0.9	0.7-1.1	1.0	0.8-1.3	0.8	0.6-1.1	1.1	0.8-1.5
Daily habit indicators	Daily tobacco use	5.4	3.3-8.9	5.6	4.2-7.4	5.3	4.0-7.1	2.6	1.9-3.6	1.7	1.2-2.5
	Not engaged in weekly sports	1.0	0.8-1.4	1.1	0.9-1.5	1.0	0.8-1.3	0.8	0.5-1.1	1.3	0.9-1.9
School-related indicators	Monthly truancy	3.1	2.0-4.7	3.5	2.6-4.7	3.2	2.4-4.2	2.1	1.5-3.0	1.7	1.1-2.5
	Dislikes school	1.7	1.2-2.3	1.5	1.2-2.0	1.8	1.4-2.3	1.6	1.2-2.3	1.5	1.0-2.1
	Gender: Male	1.0	0.8-1.3	1.1	0.9-1.4	1.2	1.0-1.5	1.0	0.7-1.3	0.8	0.6-1.1

Table 4. Multivariable stepwise logistic regression of outcome variables investigated, presented as odds ratios (OR) and 95% confidence intervals (CI), using 1999 as reference category for survey year, controlled for gender

Multivariable stepwise logistic regression		Consumer of alcohol				Excessive drinking				Heavy episodic drinking				Purchaser of alcohol				Alcohol provided by parents			
		Crude model		Model I		Crude model		Model I		Crude model		Model I		Crude model		Model I		Crude model		Model I	
	Variable name	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Survey year	2000	0.8	0.6-1.2	0.7	0.5-1.1	1.2	0.8-1.6	1.4	0.9-2.0	1.0	0.8-1.4	1.0	0.7-1.5	0.6	0.4-0.9	0.5	0.3-0.8	1.0	0.6-1.5	1.0	0.6-1.7
	2001	0.7	0.5-1.0	0.7	0.4-1.0	0.7	0.5-1.0	0.8	0.5-1.1	0.7	0.5-1.0	0.8	0.5-1.1	0.4	0.2-0.6	0.3	0.2-0.5	0.5	0.3-0.8	0.5	0.3-0.9
	2003	0.4	0.3-0.6	0.4	0.3-0.6	0.5	0.4-0.7	0.5	0.4-0.7	0.5	0.3-0.6	0.4	0.3-0.6	0.8	0.6-1.2	0.7	0.5-1.1	1.0	0.6-1.5	1.0	0.7-1.6
Socio-economic indicators	Born in Sweden			1.9	1.2-3.0			2.7	1.5-4.7			1.7	1.0-2.8			1.3	0.7-2.4			1.6	0.8-3.5
	High purchasing power			1.6	1.2-2.2			1.7	1.3-2.2			2.0	1.5-2.5			1.9	1.4-2.7			1.1	0.7-1.5
	Not living with both parents			1.3	0.9-1.9			1.4	1.0-1.9			0.9	0.7-1.2			1.1	0.7-1.6			1.1	0.7-1.7
	Living in single family house			1.5	1.0-2.1			1.0	0.7-1.4			1.3	0.9-1.7			0.9	0.6-1.3			1.1	0.7-1.7
Daily habit indicators	Daily tobacco use			4.8	2.8-8.4			4.5	3.3-6.3			4.6	3.3-6.4			2.0	1.3-2.8			1.5	1.0-2.2
	Not engaged in weekly sports			0.9	0.6-1.3			1.0	0.7-1.3			0.8	0.6-1.1			0.7	0.5-1.0			1.3	0.9-1.9
School-related indicators	Monthly truancy			2.4	1.4-4.1			2.4	1.7-3.5			2.1	1.5-3.0			1.6	1.1-2.4			1.5	1.0-2.4
	Dislikes school			1.2	0.8-1.7			1.0	0.7-1.3			1.2	0.9-1.7			1.3	0.9-1.9			1.3	0.9-2.0
	Gender: Male	1.0	0.8-1.3	0.9	0.7-1.2	1.1	0.9-1.4	1.0	0.8-1.3	1.2	1.0-1.5	1.1	0.9-1.5	1.0	0.7-1.3	0.9	0.6-1.2	0.8	0.6-1.1	0.7	0.5-1.1

Table 5. Demographics of Sweden, Trelleborg, Lund, and Gävleborg County

Indicator	Sweden	Trelleborg	Lund	Gävleborg
Average age in 2003	40.7	41.5	37.8	42.5
Average income in SEK[a] in 2002	168,100	152,900	169,400	155,900
% with higher education[b] in 2003	10.4	6.4	23.8	6.8
% of immigrants in 2003	12.0	11.9	14.3	6.3
% in active employment in 2002	46.2	44.3	45.1	44.6

(Source: Statistics Sweden, 2004)

[a]1€ = 9 SEK, 1US$ = 7 SEK

[b]Defined as three or more years of education beyond high school

Table 6. Changes over time in Sweden, Gävleborg County, Lund, and Trelleborg (1999–2003) in various 9th grade cross-sectional data samples (all numbers percentages)

	Sweden[a]				Trelleborg[b]					Lund[c]				Gävleborg[d]		
	1999	2001	2003	Change	1999	2000	2001	2003	Change	1999	2001	2003	Change	1999	2002	Change
Consumer of alcohol	75.9	77.5	72.4	–4.6%	81.7	79.9	75.8	66.8	–18.2%	67.2	78.2	70.1	+4.3%	76.5	77.0	+0.7%
Excessive drinking	37.5	40.0	37.5	0%	37.2	41.3	29.6	23.7	–36.3%	37.0	39.8	30.7	–17.0%	39.2	41.7	+6.4%
Heavy episodic drinking in prior month	26.1	27.5	24.0	–8.0%	44.5	45.9	37.6	27.5	–38.2%	24.8	33.0	24.3	–2.0%	24.4	27.0	+10.7%
Alcohol provided by parents	22.8	23.0	18.4	–19.3%	12.9	12.4	6.3	12.9	0%	25.0	21.0	22.2	–11.2%	15.7	15.1	–3.8%

N.B. No data available on *purchaser of alcohol* was obtainable in other datasets

[a] All students present in preselected Swedish classes and schools in March; data collected via questionnaire designed by CAN [the Swedish Council for Information on Alcohol and other Drugs] (approx. 5000 questionnaires yearly)

[b] See Study Design for detailed information

[c] All students present in each school in March; data collected via questionnaire designed by City of Lund (approx. 700 questionnaires yearly)

[d] All students present in each school in March; data collected via questionnaire designed by CAN (approx. 2000 questionnaires yearly)