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Effectiveness of a Dutch community-based alcohol intervention: Changes in alcohol use of adolescents after 1 and 5 years

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ABSTRACT

Background: Underage alcohol drinking is a severe public health problem. The aim of this study was to evaluate the short- and long-term effects of a Dutch community-based alcohol intervention on alcohol use of adolescents in the second and fourth grade of high school.
Methods: The community intervention integrated health education, regulation, and enforcement in multiple settings, targeting adolescents as well as their environments. In order to evaluate effectiveness, a quasi-experimental pretest posttest design was used based on three independent cross-sectional surveys in 2003, 2007 and 2011, resulting in an analytical sample of approximately 5700 and 3100 adolescents in the intervention and reference region, respectively. For the main analyses, we compared the change in recent alcohol use and binge drinking in the intervention region with the reference region. Linear regression was used to obtain (adjusted) prevalence of alcohol use.
Results: During the study period, there was an overall decline in the prevalence of alcohol use. After 1 year of intervention, the decline was 11% ($P<0.01$) and 6% ($P<0.01$) stronger in the intervention region as compared to the reference region, for recent alcohol use and binge drinking respectively. This effect was restricted to the second grade and remained after 5 years of intervention. No clear subgroup effects or confounding were observed for ethnicity, gender or educational level.
Conclusions: The Dutch community intervention appears to be effective on the short- and long-term in reducing the prevalence of recent alcohol use and binge drinking of (underage) adolescents in the second grade of high school.

1. Introduction

Underage drinking is a major public health problem in Western society. In the Netherlands, adolescent alcohol use ranks among the highest in Europe. At the age of 14, 39% of Dutch adolescents are recent drinkers, i.e., they had at least one drink in the month prior to investigation (Van Dorsselaer et al., 2010). A young age of onset is associated with a greater risk of alcohol abuse 10 years later (Behrendt et al., 2009). Moreover, there are several risks involved in drinking alcohol at an early age, such as unprotected sex, accidents and brain damage (Bonomo et al., 2001; Hingson et al., 2003a,b; Tapert et al., 2002). Therefore, from a public health viewpoint, prevention of alcohol use in young adolescents is crucial.

Especially in the Dutch Achterhoek region, a rural area in the eastern part of the Netherlands, the prevalence of alcohol use among adolescents was high. Health monitors performed by the Community Health Service in 1997 and 2002 showed a negative trend in the Achterhoek: the age of onset became lower, adolescents drank more often and they drank more alcohol consumptions per occasion (De Rover et al., 1998, 2002, 2003). Drinking alcohol was part of the culture at that time, and drinking alcohol by adolescents was considered normal by the community. Therefore, in 2005, the local authorities and several local organisations decided to develop the community intervention "Alcohol moderation among adolescents in the Achterhoek". The aim was to promote alcohol moderation among adolescents aged 10–19 years, in order to reduce the harmful effects. This has been the start of one of the first community-based interventions for alcohol reduction among adolescents in the Netherlands.

The effect of the intervention on knowledge, attitude and social norm of parents has already been demonstrated (De Vlaming

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et al., 2008). Moreover, the intervention has been acknowledged by the Dutch Centre of Healthy Living as theoretically well-founded (Database Healthy Living, 2015). However, until now, the effect of the community intervention "Alcohol moderation among adolescents in the Achterhoek" on the drinking behaviour of adolescents has not been examined.

Worldwide, the scientific literature on community-based interventions for prevention and reduction of alcohol use among adolescents is relatively scarce and shows mixed results (Anderson et al., 2009; Bagnardi et al., 2010; Foxcroft et al., 2003; Giesbrecht, 2003; Hallgren and Andreasson, 2013). Evaluation studies of community-based interventions do face difficulties regarding the time frame and scientific standards. For example, community interventions are often initiated by local organisations instead of researchers, which reduces the influence of the researcher in creating a 'controlled' setting, and increases the risk of bias. In addition, measuring long-term effects (i.e., 4 years or longer) is important since it takes a long time before community interventions are developed and implemented, and it takes even longer before changes in behaviour or health status can be demonstrated. To this end, it has been argued that more methodically sound research is required, measuring both short- and long-term effects.

Therefore, the aim of this study was to evaluate the effectiveness of the community intervention "Alcohol moderation among adolescents in the Dutch Achterhoek region" on alcohol use by adolescents in the second grade and fourth grade of Dutch high school. It was hypothesised that the community intervention would be superior to the reference condition in reducing the prevalence of recent drinking and binge drinking on the short and long term (1 and 5 years, respectively). Superiority was expected, in particular, in adolescents in the second grade compared to adolescents in the fourth grade of high school, as Dutch adolescents in the second grade are all underage, whereas adolescents in the fourth grade are a mixture of underage adolescents and adolescents who already reached the legal drinking age (16 years at that time). In addition, we performed stratified analyses for age, gender, educational level and ethnicity to gain more insight into possible sources of heterogeneity.

2. Methods

2.1. Design and data collection

In order to evaluate the effectiveness of the community intervention "Alcohol moderation among adolescents in the Achterhoek", a quasi-experimental (non-randomised) pretest posttest design was used, based on three independent cross-sectional surveys in the intervention and reference region. The change in adolescent alcohol use in the Achterhoek region (intervention region) was compared to the change in the Noord-Veluwe region (reference region) in the same period. The repeated cross-sectional surveys were part of the regular electronic health monitor system (E-MOVO), performed in October/November, 2003, 2007 and 2011 by the Dutch Community Health Service as described elsewhere (Croezen et al., 2009). Data were collected in the second and fourth grade of Dutch high schools using a detailed Internet questionnaire, under supervision of instructed teachers following a standardised protocol.

The questionnaire contained approximately 100 standardised questions concerning social-demographic factors, school, health-status and lifestyle, including alcohol use (Dutch National Health Monitor, 2015). Ethnicity was measured by asking where the parents were born, in accordance with the definition of Statistics Netherlands (2015a). Educational level was measured as type of education that adolescents were following at the time of the survey and classified as low (VMBO) or high (HAVO/VWO). Recent alcohol use was measured by asking how many times adolescents had consumed an alcoholic beverage in the past four weeks, with 13 predefined response categories ranging from 0 times to 20 times or more. Recent binge drinking was measured by asking how many times adolescents had consumed 5 or more alcoholic beverages at one occasion in the past four weeks, with 7 predefined response categories ranging from never to 9 times or more. Self-report measures of adolescents on alcohol use are reliable and valid methods to measure alcohol use (Del Boca and Darkes, 2003), although they might underestimate heavy alcohol consumption (Northcote and Livingston, 2011). We had no data available on the onset of alcohol use.

2.2. Intervention "Alcohol moderation among adolescents in the Achterhoek"

The Dutch community intervention "Alcohol moderation among adolescents in the Achterhoek" was one of the first large-scale, intensive and long-lasting interventions in the Netherlands which aimed to stop the trend of increasing alcohol use in adolescents. This intervention has been described in detail elsewhere (Izeboud et al., 2008). In short, the community intervention was comprised of a range of activities in order to promote alcohol moderation among adolescents aged 10–19 years, targeting their environment and adolescents themselves. Health education, regulation, and enforcement were integrated and implemented in multiple settings, i.e., homes, schools, sport clubs, youth work, bars and dance clubs. The intervention was developed and carried out by the eight municipalities in the Achterhoek region, the regional Addiction Service, the Police and the Public Prosecution Service, under the guidance of the Community Health Service. The Community Health Service and the regional Addiction Service selected evidence-based programmes (such as "Alcohol: another story") or developed intervention activities based on scientific knowledge in close collaboration with the National Institute of Mental Health and Addiction and local communities. Some examples of intervention activities are mass media campaign (radio broadcast, posters, TV commercials etcetera), parent-child evenings at school, regulations at schools and at sport clubs, instruction of barkeepers of community centres, sport clubs, bars and dance clubs, health education by the school nurse, cartoon battle at high schools and the "fine or chance card" for adolescents who were fined for an alcohol-related crime. Substantial attention was paid to preventing the onset of alcohol use under the age of 16, the legal drinking age at that time. Several prevention strategies were focused on raising awareness among parents on the relation between brain development and alcohol use of adolescents, as well as parenting skills, e.g., rule setting. The implementation of intervention activities started in 2006 and, after two prolongations, ended in December, 2012. The aim of this study was to assess the overall impact of the combined interventions and not the effects of individual strategies. The primary target population consisted of approximately 37,000 adolescents aged 10–19 years living in the eight municipalities of the Achterhoek region in January, 2006 (Statistics Netherlands, 2015b).

2.3. Reference region

The reference region was a rural area west of the intervention region, with enough distance to avoid contamination from the intervention region to the reference region (Fig. 1). In the reference region, which consisted of six municipalities, "regular policy" was continued throughout the study period. This also included the regular national Dutch alcohol legislation and policy of that time (2003–2011), including the development of local initiatives for alcohol prevention. We do not consider this as a threat to the results of our study, as most alcohol initiatives in the Netherlands had a smaller scale, a lower intensity and a shorter time frame than our intervention "Alcohol moderation among adolescents in the Achterhoek".

2.4. Analyses

Our hypothesis was that the change in alcohol use of adolescents would be significantly larger in the intervention region compared to the reference region. In addition, we expected that the effect would be more prominent in the second grade than in the fourth grade. Therefore, all analyses were stratified by grade. Data were analysed using SPSS, version 21. Overall, the response to the repeated cross-sectional surveys was high. As shown by a response study performed in 2007, 82% of schools participated in the surveys and within participating schools, 95% of the adolescents participated (Croezen et al., 2009). This resulted in an analytical sample of 5881, 5502 and 5920 adolescents in the intervention region and 3122, 3053 and 3211 adolescents in the reference region in 2003, 2007 and 2011 respectively. Missing data varied from 0 to 606 missings (1.5%) per variable and consequently subjects with missing data were not included in the analyses. Descriptive analyses per region were conducted to identify possible differences in gender, educational level and ethnicity. For the main analyses, 'recent alcohol use' was defined as at least one drinking occasion in the past four weeks and 'recent binge drinking' was defined as at least one drinking occasion with 5 or more alcoholic beverages in the past four weeks, in accordance with national standards (Dutch National Health Monitor, 2015). To this end, the scales were recoded into dichotomous variables 0 = 'no recent alcohol use' versus 1 = 'recent alcohol use' and 0 = 'no recent binge drinking' versus 1 = 'recent binge drinking'.

For the main analyses, we compared the change in alcohol use in the period 2003–2007 and 2003–2011 in the intervention region with the reference region. Linear regression was used to obtain (adjusted) percentages as the outcome. Although logistic regression is the common method for binary outcomes, we primarily applied linear regression to obtain (adjusted) effect estimates; this enhances straightforward interpretation and it has been argued that this is statistically appropriate for the limited range of percentages and effect estimates in our data (Hellevik, 2009). The model used to obtain (adjusted) effect estimates contained an indicator variable for intervention ($I = 1$ for intervention region, $I = 0$ for control region) and time period (T with subscript for the year 2007 and 2011; 2003 served as reference). The covariates gender, educational level and ethnicity were added as potential confounders as indicated below. In this model, the intervention effect is estimated by the coefficient β_{12} and β_{13} of the product terms region*year, for the short and long term effects,