

Portrayal of Alcohol Consumption in Movies and Drinking Initiation in Low-Risk Adolescents

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KEY WORDS

alcohol imagery, movies, binge drinking, young people, Europe

ABBREVIATIONS

CI—confidence interval

IRR—incidence rate ratio

Dr Hanewinkel designed the study, contributed to data acquisition in Germany, carried out the statistical analysis, and drafted the article; Dr Sargent designed the study, contributed to data acquisition (alcohol occurrences in movies), and revised the manuscript critically for important intellectual content; Dr Hunt contributed to data acquisition in Scotland and revised the manuscript critically for important intellectual content; Dr Sweeting contributed to data acquisition in Scotland and revised the manuscript critically for important intellectual content; Dr Engels contributed to data acquisition in the Netherlands and revised the manuscript critically for important intellectual content; Dr Scholte contributed to data acquisition in The Netherlands and revised the manuscript critically for important intellectual content; Ms Mathis contributed to data acquisition in Italy and revised the manuscript critically for important intellectual content; Dr Florek contributed to data acquisition in Poland and revised the manuscript critically for important intellectual content; Dr Morgenstern designed the study, contributed to data acquisition in Germany, carried out the statistical analysis, and revised the manuscript critically for important intellectual content; and all authors agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved and approved the final manuscript as submitted.

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WHAT'S KNOWN ON THIS SUBJECT: Several experimental and observational studies reveal an association between exposure to alcohol consumption in movies and youth drinking, but little is known about the effect of such exposure on drinking onset among low-risk adolescents.



WHAT THIS STUDY ADDS: In a longitudinal study, exposure to alcohol consumption in movies was associated with drinking initiation in a sample of adolescents from 6 European countries who had never drunk alcohol and were attitudinally nonsusceptible to future use at the time of exposure.

abstract



OBJECTIVES: To investigate the hypothesis that exposure to alcohol consumption in movies affects the likelihood that low-risk adolescents will start to drink alcohol.

METHODS: Longitudinal study of 2346 adolescent never drinkers who also reported at baseline intent to not to do so in the next 12 months (mean age 12.9 years, SD = 1.08). Recruitment was carried out in 2009 and 2010 in 112 state-funded schools in Germany, Iceland, Italy, Netherlands, Poland, and Scotland. Exposure to movie alcohol consumption was estimated from 250 top-grossing movies in each country in the years 2004 to 2009. Multilevel mixed-effects Poisson regressions assessed the relationship between baseline exposure to movie alcohol consumption and initiation of trying alcohol, and binge drinking (≥ 5 consecutive drinks) at follow-up.

RESULTS: Overall, 40% of the sample initiated alcohol use and 6% initiated binge drinking by follow-up. Estimated mean exposure to movie alcohol consumption was 3653 (SD = 2448) occurrences. After age, gender, family affluence, school performance, TV screen time, personality characteristics, and drinking behavior of peers, parents, and siblings were controlled for, exposure to each additional 1000 movie alcohol occurrences was significantly associated with increased relative risk for trying alcohol, incidence rate ratio = 1.05 (95% confidence interval, 1.02–1.08; $P = .003$), and for binge drinking, incidence rate ratio = 1.13 (95% confidence interval, 1.06–1.20; $P < .001$).

CONCLUSIONS: Seeing alcohol depictions in movies is an independent predictor of drinking initiation, particularly for more risky patterns of drinking. This result was shown in a heterogeneous sample of European youths who had a low affinity for drinking alcohol at the time of exposure. *Pediatrics* 2014;133:973–982

The causes of alcohol use and misuse in young people are multifactorial and include cultural norms, parental and peer influences, personality traits, alcohol use expectancies, and hereditary factors.¹ In the last decade some attention has been given to the question of whether alcohol exposure in the media might also account for variance in young people's alcohol consumption. The theoretical background for these studies is social learning theory, which suggests that behavior is learned from the environment as people observe and then imitate the actions of influential others.² Such models include parents, friends, teachers, and characters depicted in the media or advertising. For example, given access to cigarettes and alcohol in a Barbie play scenario, preschool children will enact smoking and alcohol scripts in their play, scripts they have learned from watching their parents.³

Alcohol portrayals are widespread in the mass media. A recent content analysis of popularly viewed television in the United Kingdom found that alcohol imagery occurred in >40% of broadcasts.⁴ In movies, alcohol use and brand appearances are even more prevalent: Some 86% of movies popular in the United Kingdom⁵ and 83% of Hollywood blockbusters⁶ depicted alcohol use. More importantly, results from experimental^{7–9} and cross-sectional observational studies^{10–12} have shown a consistent link between exposure to alcohol use in movies and drinking behavior in young people. This association has also been shown in 3 cohorts recruited in New England,¹³ across the United States,^{14–17} and in northern Germany.¹⁸

One gap in the literature to date is that little is known about the effect of exposure to drinking in movies on drinking among low-risk adolescents, those who have never drunk alcohol and are attitudinally nonsusceptible to

future use. Conceptually, this is a very important group, because they can shed more light on the temporal sequence of the exposure–behavior link (it is hard to imagine how they could be drawn to movies with alcohol because of favorable attitudes toward drinking at baseline). Empirically, they are extremely difficult to study, because usually only a small proportion of an early- to mid-adolescent sample belongs to this group, and analyses fail because of a lack of statistical power. One could solve these sample size problems by studying younger age groups (eg, 6- to 10-year-olds). However, the central behavioral outcomes under question are alcohol use and misuse initiation, and this cannot be realistically studied in young children or requires a long follow-up period.

From 2009 to 2011 we conducted a large European study on the effects of movies on smoking and drinking behavior of young people.^{12,19,20} In this study, 16 551 adolescents from 6 countries (from Germany, Iceland, Italy, Poland, Netherlands, and Scotland) were interviewed at baseline, and >80% of these were followed up 12 months later. The sample size of this study provides a unique opportunity to perform subsample analyses such as the one outlined earlier. In addition, it is one of the few longitudinal studies on alcohol use in movies and only the second ever conducted outside the United States. The 6 European countries involved in the study show variation in both alcohol policies and prevalence of alcohol use in young people.^{21,22} This variation provides valuable insight into the robustness and consistency of media effects across different cultural contexts.

In this article we present results on the longitudinal association between alcohol use in movies and drinking outcomes in adolescents who have never used alcohol in their lives, not even a sip,

and indicated at baseline that they would “definitely not” drink alcohol in the next year and “definitely not” drink alcohol offered by friends. As primary outcomes we studied the initiation of ever drinking and binge drinking.

METHODS

Design, Procedure, and Study Sample

A school-based longitudinal study was conducted in 6 European countries by research centers in Germany (Kiel), Iceland (Reykjavik), Italy (Turin and Novara), Poland (Poznan), Netherlands (Nijmegen), and Scotland (Glasgow). Study samples were all recruited from state-funded schools, with data collected through self-completion questionnaires overseen by trained research staff. Participants were given assurances about confidentiality and anonymity, and each completed questionnaire was placed in an envelope and sealed in front of participants to reassure them that teachers, peers, or family members would not see them. To permit linking of the baseline and follow-up surveys, identical questionnaire front sheets allowed participants to generate individual 7-character codes (based on prespecified digits or letters from memorable names and dates, including date of birth and mother's first name). This procedure has been tested in previous studies.²³ Ethical approval for the research was gained from the relevant body in each country. Additional approvals (eg, from educational authorities and individual head teachers) were sought as required. Additional details are given elsewhere.¹²

Pupils were recruited from 865 classes in 114 schools. Baseline surveys ($n = 16\,551$) were conducted between November 2009 and June 2010 (mean age 13.4 years, $SD = 1.18$), and follow-up surveys were conducted between January and May 2011 (mean between-wave interval =

12 months, range 10–14 months). Of these 16 551 pupils it was possible to match follow-up data for 13 642 pupils (82%) from 843 classes in 112 schools. Following a concept of Pierce et al,²⁴ we measured susceptibility toward future alcohol use by asking pupils at baseline, “Do you think you will drink alcohol one year from now?” and “If one of your best friends were to offer you alcohol, would you drink it?” Response options were “Definitely yes,” “Probably yes,” “Probably not,” and “Definitely not.” Some 2706 pupils had never drunk alcohol in their lives, not even a sip, at baseline and indicated that they would “definitely not” drink alcohol in the next year and would “definitely not” drink alcohol offered by friends. This is the sample for the present analysis of drinking onset. Country-specific overall matching rates and other sample details are given in the Appendix.

Measures

Exposure to Alcohol Use in Movies

Exposure to alcohol consumption in movies was assessed by using a method developed by researchers at Dartmouth Medical School. This method relies on the recall of having seen movies presented to respondents as a list of movie titles.²⁵ First, the research centers in each country compiled a master list of the 250 most commercially successful box office hits in their country, using publicly available data on movie revenues. Each country-specific master list contained the top 50 box office hits for the years 2005 to 2008 and the 25 most successful movies for the years 2004 and 2009. Then, through a process of random selection from the master list, each pupil was presented with a unique list of 50 movies from their country-specific list. To minimize between-subject variation in the composition of the individual lists, the

random selection of movies was stratified by year of release and country-specific age rating. Pupils indicated how often (never, once, twice, >2 times) they had seen each movie on their unique list. For the present analysis, answers were dichotomized into “ever seen” and “never seen.”

In a parallel procedure, all included movies were content coded with regard to alcohol use occurrences. Because of a high overlap of box office hits between countries, the complete sample of 1500 movies (6 countries, 250 movies each) contained 655 different movies. Fifty-six percent ($n = 368$) had already been content coded at the Dartmouth Media Research Laboratory. The remaining 44% ($n = 287$) were content coded in the 6 European study centers. In this coding process, trained coders reviewed each movie and counted the number of occurrences of on-screen alcohol use. An alcohol occurrence was counted whenever a major or minor character handled or used alcohol in a scene or when alcohol use was shown in the background (eg, extras drinking alcohol in a bar scene). Occurrences were counted each time alcohol use appeared on the screen. Interrater reliability was studied via 2 types of correlations: (1) between the coding results of the European coders and the European trainer on a selected number of training movies and (2) between the European trainer and the Dartmouth coders, based on a blinded European recoding of a random sample of 40 Dartmouth-coded movies. European coder–trainer correlations ranged from $r = 0.93$ (Iceland) to $r = 0.99$ (Italy); the European recounts of alcohol occurrences in the random movie selection correlated ($r = 0.87$) with the Dartmouth counts.

We calculated exposure to alcohol use in movies for all pupils by summing the number of alcohol occurrences in each movie they had seen. To adjust the

measure for variation in the country-specific movie lists, individual exposure to movie alcohol use was expressed as a proportion of the total number of possible alcohol occurrences each pupil could have seen on the basis of the movies included in his or her unique list of 50 movies. The final exposure estimate was the proportion of alcohol occurrences the adolescent had seen in his or her unique list multiplied by the number of alcohol occurrences in the 250 movies of that country.

Drinking Behavior

Both surveys included identical questions about alcohol use. We asked participants, “Have you ever drunk any alcohol, even just a sip?” (yes/no). Those responding “yes” at follow-up were categorized as having initiated any kind of alcohol use over the follow-up period. The transition from non-drinker to having any experience of binge drinking was assessed through the question, “How often have you had 5 or more drinks of alcohol on one occasion?” Response categories were 0 = never, 1 = once, 2 = 2 to 5 times, or 3 = >5 times. Pupils who reported never were classified as “never binge drinkers” and all others as “ever binge drinkers.”

Covariates

A number of covariates were included (Table 1) that could confound or modify the relationship between exposure to alcohol use in movies and drinking initiation, including sociodemographic (gender, age, family affluence), personal (school performance, TV screen time, sensation seeking and rebelliousness), and social environmental (drinking of peers, parents, and siblings) characteristics.

Statistical Analysis

All data analyses were conducted in 2013 with Stata version 13.0 (Stata

TABLE 1 Covariates and Their Assessment

Variable	Survey Question	Response Categories
Sociodemographics		
Age	How old are you?	Years
Gender	Are you a girl or a boy?	Boy, Girl
Family affluence scale	Does your family own a car, van, or truck?	No, Yes: 1, 2, or more
	Do you have your own bedroom for yourself?	No, Yes
	During the past 12 mo, how many times did you travel away on holiday with your family?	Not at all, Once, Twice, More than twice
	How many computers does your family own?	None, 1, 2, More than 2
Personal characteristics		
School performance	How would you describe your grades last year?	Excellent, Good, Average, Below average
TV screen time	On a school day, how many hours a day do you usually spend watching TV?	None, Less than 1 h, 1–2 h, 3–4 h, More than 4 h
Number of movies seen	Below is a list of movie titles. Please mark if, and how often, you have seen each movie.	Never, Once, Twice, More than twice
Sensation seeking or rebelliousness (Cronbach's $\alpha = 0.70$)	How often do you do dangerous things for fun?	Not at all, Once in a while, Sometimes, Often, Very often
	How often do you do exciting things, even if they are dangerous?	
	I believe in following rules. (recoded) I get angry when anybody tells me what to do.	Not at all, A bit, Quite well, Very well
Social environment		
Peer drinking	How many of your friends drink alcohol?	None, A few, Some, Most, All
Mother drinking	How often does your mother or female guardian drink alcohol?	Never, Seldom, Often but not every day, Every day Don't have (coded "no")
Father drinking	How often does your father or male guardian drink alcohol?	Never, Seldom, Often but not every day, Every day Don't have (coded "no")
Sibling drinking	Do any of your brothers or sisters drink alcohol?	Yes, No, Don't have (coded "no")

Corp, College Station, TX). Baseline differences between successfully followed-up and lost students were analyzed by using χ^2 and *t* tests. Adjusted associations between exposure to alcohol use in movies and drinking initiation were analyzed with multilevel mixed-effects Poisson regressions (uncentered data in all analyses). Poisson regression allows the presentation of incidence rate ratios (IRRs) and 95% confidence intervals (CIs) for the relationship between movie alcohol use occurrences and initiation of any drinking and of binge drinking. IRRs were calculated in respect of exposure to every 1000 alcohol occurrences. Because the data were clustered at the country, school, and classroom level, random intercepts for all 3 levels were included in the adjusted models. In these models, movie alcohol use and all covariates were entered as fixed effects. Multiple pairwise comparisons after logistic regression were Bonferroni adjusted.

Missing data were handled by listwise deletion.

A sensitivity analysis was undertaken to assess for differential country-specific associations between movie alcohol exposure and the 2 alcohol initiation outcomes. Instead of using the country of data assessment as a random effect in the regression model, we included an exposure \times country interaction term to test for differential country-specific associations.

RESULTS

Descriptive Statistics at Baseline and Attrition Analysis

Table 2 lists descriptive statistics for all nonsusceptible never drinkers at baseline, for those lost to follow-up, and for the final analyzed sample, allowing comparisons of differences due to attrition. Never drinkers lost to follow-up had higher exposure to alcohol use in movies, were more often recruited from schools in Poland and less often from schools in Italy, were significantly older,

rated their school performance more poorly, had higher scores on the sensation seeking and rebelliousness scale, had more friends and siblings who drink alcohol, and more often had fathers who never drink alcohol.

Drinking Initiation During the Observation Period

Overall, 40% of the nonsusceptible baseline never drinkers tried alcohol during the 12-months observation period, and about 6% initiated binge drinking (Table 3). Initiation rates varied between the 6 countries, with the lowest rates in Iceland and the highest in Germany and Poland. After Bonferroni adjustment, pairwise country comparisons for alcohol use initiation were significant for Iceland in comparison with all other countries. For binge drinking initiation there were additional differences between Germany versus Italy and Italy versus Poland. No significant difference was found for the rates of binge drinking in Dutch compared with the Icelandic sample.

TABLE 2 Descriptive Statistics at Baseline, and Attrition Analysis, %

	Baseline Nonsusceptible Never-Drinkers (<i>n</i> = 2706)	Lost to Follow-Up (<i>n</i> = 380)	Analyzed Sample (<i>n</i> = 2326)	Lost to Follow-Up Versus Analyzed Sample <i>P</i>
Country				
Germany	21.7	21.8	21.6 (<i>n</i> = 503)	<.01
Iceland	35.4	36.8	35.2 (<i>n</i> = 819)	
Italy	12.9	8.7	13.6 (<i>n</i> = 315)	
Netherlands	4.2	3.4	4.3 (<i>n</i> = 101)	
Poland	15.1	20.3	14.3 (<i>n</i> = 332)	
Scotland	10.7	8.9	11.0 (<i>n</i> = 256)	
Sociodemographics				
Age at baseline (y), M (SD)	12.91 (1.10)	13.18 (1.15)	12.86 (1.08)	<.001
Gender				
Female	53.9	50.0	54.6	.101
Male	46.1	50.0	45.5	
Family affluence				
Low	9.2	11.3	8.9	.198
Medium	36.6	37.9	36.3	
High	54.2	50.8	54.8	
Personal Characteristics				
School performance				
Below average	4.0	3.7	6.4	<.01
Average	25.5	24.8	29.6	
Good	44.7	45.1	42.3	
Excellent	25.8	26.4	21.7	
TV screen time per day (h), M (SD)	1.92 (0.84)	1.91 (0.89)	1.92 (0.83)	.746
Sensation seeking and rebelliousness, M (SD)	0.81 (0.62)	0.92 (0.70)	0.79 (0.60)	<.001
Exposure to alcohol use in movies, M (SD)	3707 (2472)	4037 (2590)	3653 (2448)	.005
Social Environment				
Peer drinking				
None	71.3	63.3	72.7	<.01
A few	17.9	22.4	17.1	
Some	8.5	11.9	7.9	
Most or all	2.3	2.4	2.3	
Mother figure drinking				
Never	37.0	39.3	36.6	.682
Seldom	55.7	52.8	56.2	
Often but not every day	6.6	7.2	6.5	
Every day	0.7	0.8	0.7	
Father figure drinking				
Never	26.4	31.9	25.6	<.05
Seldom	57.4	51.3	58.4	
Often but not every day	13.8	14.9	13.6	
Every day	2.4	1.9	2.5	
Any sibling drinking				
No	81.2	76.3	82.0	<.01
Yes	18.8	23.7	18.0	

Exposure to Alcohol Use in Movies

Overall, 86% of the total 655 movies included at least 1 alcohol scene, with a range of 0 to 617 and a mean of 68 (SD = 87) occurrences per movie. On average, participants in the analyzed sample had seen 18 (SD = 9) of the movies on their movie list, which translated to an estimated mean individual exposure to movie alcohol use of 3653 (median = 3233, SD = 2448) occurrences, with a range of 0 to 14 498

occurrences, based on the extrapolation to the respective 250 movies.

Association Between Exposure to Alcohol Use in Movies and Adolescent Drinking Initiation

Figure 1 shows the adjusted association between the exposure to movie alcohol consumption and alcohol use initiation of nonsusceptible never drinkers at baseline. After age, gender, family affluence, school performance,

TV screen time, personality characteristics, and drinking behaviors of peers, parents, and siblings were controlled for, exposure to movie alcohol use was significantly related to drinking initiation. The adjusted IRR for any alcohol use in the observation period was 1.05 (95% CI, 1.02–1.08; *P* = .003) for each additional 1000 occurrences of alcohol movie exposure. Figure 1 illustrates that going from lowest to highest exposure raised the incidence of alcohol

onset by about 30 percentage points. For binge drinking the adjusted IRR was 1.13 (95% CI, 1.06–1.20; $P < .001$). Figure 1 illustrates that going from lowest to highest exposure raised the incidence of binge drinking by about 20 percentage points. For alcohol use initiation, the only other significant longitudinal associations were found for drinking of siblings (IRR = 1.25; 95% CI, 1.09–1.52; $P = .003$) and drinking frequency of the mother (IRR = 1.14; 95% CI, 1.01–1.29; $P = .035$). Binge drinking initiation was significantly related to school performance (IRR = 0.67; 95% CI, 0.55–0.84; $P < .001$), family affluence (IRR = 0.77; 95% CI, 0.60–0.99; $P = .045$), and sensation seeking (IRR = 1.48; 95% CI, 1.15–1.91; $P = .003$).

Sensitivity Analysis

None of the exposure \times country interaction terms reached significance, indicating either that the reported associations did not differ between countries or that statistical power was not high enough to show such differences.

DISCUSSION

This study demonstrates that movie alcohol exposure is associated with initiation of alcohol use and binge drinking among low-risk European adolescents, independent from other risk factors that model the social environment and personal characteristics. The range of exposure was substantial, such that high alcohol use in movies independently accounted for increases in the incidence of alcohol initiation by 30 percentage points and binge drinking by 20 percentage points.

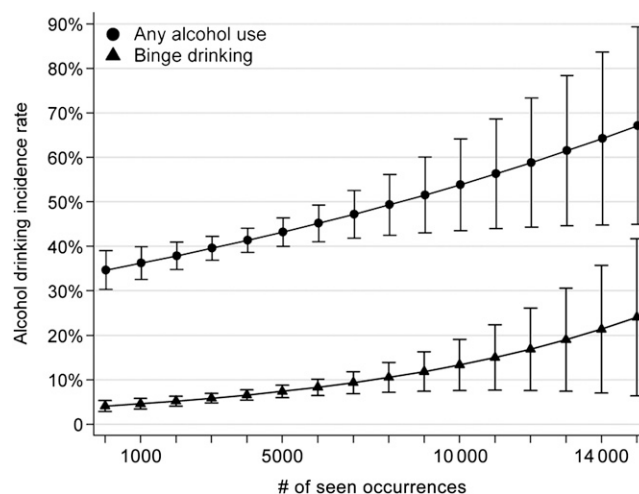


FIGURE 1

Adjusted association between exposure to alcohol use occurrences in movies and adolescents' drinking initiation. *Note:* Covariate adjustment for age, gender, family affluence, school performance, TV screen time, sensation seeking and rebelliousness, and alcohol consumption in the social environment (friends, siblings, and parents).

There are at least 3 contributions of the current study. The first is the longitudinal design, which enables the investigation of the incidence of behavioral transitions, placing the exposure before these transitions. To date only 3 other cohorts have been followed up to explore the effects of exposure to movie depictions of alcohol, 2 from the United States and 1 from Germany. The second contribution is the large and diverse sample that was recruited in 6 European countries. These countries differ in respect of both macro-level contextual environmental factors (eg, alcohol control policies) and prevalence of alcohol use. An association that holds across this source of significant (unmeasured) variance is likely to be robust and extends beyond the multiple individual risk factors controlled for in this study. Third, for the first time we reported the effect of movie alcohol exposure on a subgroup of adolescents

who have a very low affinity for alcohol (never users without intention to use alcohol). This limits the argument that seeing specific movies with alcohol is simply a byproduct of other unmeasured personal characteristics that are indicative of alcohol use.

There are limitations to the study, which must be taken into account. Loss to follow-up affects the generalizability of results, especially if there is selective attrition, which was the case in the current study: Adolescents at higher risk of drinking were more likely to be lost to follow-up. The fact that lost students had a higher exposure to alcohol depictions in movies might lead to an underestimation of the true association. Although we captured a large number of covariates and studied a very restricted sample, it is still possible that the results may be biased by unmeasured confounding on the individual level. Additional tests are

TABLE 3 Age- and Gender-Adjusted Incidence Rates (%) for Ever Alcohol Use (Even Just a Sip) and Binge Drinking During the 12-mo Study Period ($n = 2326$)

	Total	Germany (de)	Iceland (is)	Italy (it)	Netherlands (nl)	Poland (pl)	Scotland (uk)
Alcohol use initiation	40.3	46.7 ^{is}	29.6 ^{de,it,nl,pl,uk}	34.2 ^{is}	41.4 ^{is}	54.1 ^{is}	49.9 ^{is}
Binge drinking initiation	6.2	12.8 ^{is,it}	1.0 ^{de,it,pl,uk}	4.7 ^{de,is,pl}	3.0	11.4 ^{is,it}	6.2 ^{is}

Superscripts indicate significant between-country comparisons after Bonferroni correction.

needed to tap into unmeasured confounding on the side of the predictor. In addition, because alcohol use is often presented together with other adult movie contents such as violence, profanity, tobacco, and sex, the reported associations may not be specific, a feature one would expect if a risk factor is causal.

Implications for Prevention

This study provides evidence of a robust longitudinal association between seeing drinking scenes in movies and drinking initiation in a sample of low-risk early adolescents recruited in 6 European countries. Generally, prevention measures can be classified into structural and behavioral measures. One structural preventive measure applying this concept would be to incorporate movie alcohol use into the movie rating systems, which would lower the “dose” of exposure. Such a proposal is currently debated for

on-screen smoking²⁶ but should also be applied for alcohol use in movies. When it comes to more behavior-oriented preventive measures, health care practitioners, teachers, and other professionals could stress the importance of prudent media management for parents of young children. Parents might help prevent movies and other media from influencing their children’s susceptibility to alcohol use via two different methods²⁷: First, they could reduce exposure to movies that show alcohol use. This could be done by reducing the overall movie and media use of children, which has also other health benefits.²⁸ It has been shown that children who report less parental restrictions on watching movies designed for older adolescents have a higher risk of engaging in binge drinking.²⁹ Second, parents could talk to their children regularly about what they are seeing or hearing in media

related to alcohol use, or they could view movies together with their children. They can discuss false or misleading information from alcohol imagery on screen (in movies but also through alcohol advertisements). This strategy can be subsumed under the heading “media literacy education,” but this research field is just emerging.³⁰

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APPENDIX Study Sample Details

	Germany	Iceland	Italy	Poland	The Netherlands	Scotland
Setting	Public schools, 4 school types: Gymnasium, Gemeinschaftsschule, Regionalschule, Hauptschule	Public schools	Public schools, second class of secondary school and first class of high school	Public schools, 1 school type (Gymnasium)	Public schools, 4 different school types: VMBO, HAVO, Atheneum, Gymnasium	Mainstream (state-funded) schools
Locations	Schleswig-Holstein, Germany District of Kiel, Flensburg, Schleswig-Flensburg, and Rendsburg-Eckernförde	Schools from each region (north, south, east, west) of Iceland in addition to the capital area (Reykjavik)	Piedmont region, Italy Schools with head office in Turin and Novara provinces	Wielkopolska region	Gelderland, Limburg, Brabant	Central belt of Scotland
Time of baseline assessment	November–December 2009	January–February 2010	March–June 2010	April–June 2010	December 2009–June 2010	January–March 2010
Time of follow-up assessment	February–March 2011	January–February 2011	March–May 2011	January–April 2011	February–May 2011	January–February 2011
Eligibility criteria for schools	Location Number of classes >8 No special pedagogic education center No other studies of IFT-Nord	Number of participating pupils >100	Location in Turin and Novara provinces	Location in Wielkopolska region No special pedagogic education center	No special pedagogic education center No current participation in other studies of the BSI, Radboud University Not known	Location in either Midlothian or East Dumbartonshire No special education No private education
No. of schools potentially eligible	104	Not known	578	253	Not known	14
No. of schools invited	60	23	31	253	43	7
Invitation criteria for schools	Random	Convenience sampling	Convenience sampling	All eligible schools	Random	Selected based on proportion of free school meals
No. of schools that agreed (baseline)	21	20	26	35	5	7
No. of schools that agreed (follow-up)	21	20	26	33	5	7
Eligibility criteria for pupils	Active (“opt-in”) parental consent Presence on the day of assessment or, if absent, willing to complete a questionnaire and return by post Willing to participate	Passive (“opt-out”) parental consent Pupil’s presence on the day of assessment Willing to participate	Active or passive parental consent Willingness to participate or, if absent, willing to complete a questionnaire and return by post	Active (“opt-in”) parental consent Presence on the day of assessment Willing to participate	Passive parental consent Presence on the day of assessment	Passive (“opt-out”) parental consent Presence on the day of assessment or, if absent, willing to complete a questionnaire and return by post Willing to participate
No. of pupils examined for eligibility	3544	2798	2953	5078	1706	3189
No. confirmed eligible	2754	2664	2668	4105	1423	2937

	Germany	Iceland	Italy	Poland	The Netherlands	Scotland
Reasons for nonparticipation	No parental consent (n = 515), absence (n = 264), refusal (n = 11)	No parental consent (n = 19), absence (n = 102), refusal (n = 13)	No parental consent (n = 100), absence (n = 175), refusal (n = 10)	No parental consent (n = 396), absence (n = 527), refusal (n = 50)	No parental consent (n = 18), absence (n = 265), refusal (n = 0)	No parental consent (n = 11), absence (n = 226), refusal (n = 15)
No. participating at baseline	2754	2664	2668	4105	1423	2937
No. analyzed at baseline	2754	2664	2668	4105	1423	2937
Response rate at baseline (%)	78	95	90	81	83	92
Mean age at baseline (y)	12.7	13.1	13.6	14.2	13.8	13.0
No. participated at follow-up	2645	2594	2404	3698	1676	3012
No. matched	2336	2168	2272	3148	1215	2503
Reasons for nonmatch	Absence at baseline Absence at follow-up Incorrect code	Absence at baseline Absence at follow-up Incorrect code	Absence at baseline Absence at follow-up Incorrect code	Absence at baseline Absence at follow-up Incorrect code	Absence at baseline Absence at follow-up Incorrect code	Absence at baseline Absence at follow-up Incorrect code
No. of baseline pupils lost to follow-up	388	496	396	957	208	434
Matching rate (%)	84.8	81.4	85.2	76.7	84.4	80.0

BSI, Behavioral Science Institute.

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