

Alcohol Consumption in Movies and Adolescent Binge Drinking in 6 European Countries

AUTHORS: Reiner Hanewinkel, PhD,^{a,b} James D. Sargent, MD,^c Evelien A. P. Poelen, PhD,^d Ron Scholte, PhD,^d Ewa Florek, MD,^e Helen Sweeting, PhD,^f Kate Hunt, PhD,^f Solveig Karlsdottir, MSc,^g Stefan Hrafn Jonsson, PhD,^{g,h} Federica Mathis, BSc,ⁱ Fabrizio Faggiano, MD,^{i,j} and Matthis Morgenstern, PhD^{a,b}

^aInstitute for Therapy and Health Research, Kiel, Germany;

^bInstitute for Medical Psychology and Medical Sociology, University Hospital Schleswig-Holstein, Kiel, Germany; ^cDartmouth Medical School, Lebanon, New Hampshire; ^dBehavioural Science Institute, Radboud University, Nijmegen, Netherlands; ^eLaboratory of Environmental Research, Department of Toxicology, University of Medical Sciences, Poznan, Poland; ^fMedical Research Council (MRC) Social & Public Health Sciences Unit, Glasgow, United Kingdom; ^gDirectorate of Health, Reykjavik, Iceland; ^hUniversity of Iceland, Reykjavik, Iceland; ⁱPiedmont Centre for Drug Addiction Epidemiology, A.S.L. TO3 Grugliasco (TO), Italy; and ^jAvogadro University, Novara, Italy

KEY WORDS

alcohol, Europe, exposure, media, youth

www.pediatrics.org/cgi/doi/10.1542/peds.2011-2809

doi:10.1542/peds.2011-2809

Accepted for publication Nov 28, 2011

Address correspondence to Reiner Hanewinkel, PhD, Institute for Therapy and Health Research (IFT-Nord), Harmsstrasse 2, 24114 Kiel, Germany. E-mail: hanewinkel@ift-nord.de

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2012 by the American Academy of Pediatrics

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: Supported by the European Commission, the Ministry of Health of the Federal Republic of Germany. The coding of the US movies was supported by the National Institutes of Health (AA015591/AA/NIAAA NIH HHS/United States). The Scottish fieldwork was supported by additional funds from the UK Medical Research Council (MC_US_A540_0041). Funded by the National Institutes of Health (NIH).



WHAT'S KNOWN ON THIS SUBJECT: Some studies reveal an association between exposure to alcohol consumption in movies and youth drinking, but the evidence is sparse.



WHAT THIS STUDY ADDS: Exposure to alcohol consumption in movies is associated with youth binge drinking, is little influenced by cultural differences between countries (Germany, Iceland, Italy, Netherlands, Poland, and Scotland), and is specific to movie alcohol, not movie smoking, depictions.

abstract



OBJECTIVE: The goal of this study was to investigate whether the association between exposure to images of alcohol use in movies and binge drinking among adolescents is independent of cultural context.

METHODS: A cross-sectional survey study in 6 European countries (Germany, Iceland, Italy, Netherlands, Poland, and Scotland) was conducted. A total of 16 551 pupils from 114 public schools with a mean (\pm SD) age of 13.4 (\pm 1.18) years participated. By using previously validated methods, exposure to alcohol use in movies was estimated from the 250 top-grossing movies of each country (years 2004–2009). Lifetime binge drinking was the main outcome measure.

RESULTS: Overall, 27% of the sample had consumed >5 drinks on at least 1 occasion in their life. After controlling for age, gender, family affluence, school performance, television screen time, sensation seeking and rebelliousness, and frequency of drinking of peers, parents, and siblings, the adjusted β -coefficient for lifetime binge drinking in the entire sample was 0.12 (95% confidence interval: 0.10–0.14; $P < .001$). The crude relationship between movie alcohol use exposure and lifetime binge drinking was significant in all countries; after covariate adjustment, the relationship was still significant in 5 of 6 countries. A sensitivity analysis revealed that the association is content specific, as there was no significant association between lifetime binge drinking and exposure to smoking in movies.

CONCLUSIONS: The link between alcohol use in movies and adolescent binge drinking was robust and seems relatively unaffected by cultural contexts. *Pediatrics* 2012;129:709–720

Alcohol-related health and social problems are prevalent in almost all societies that consume alcohol.¹ For young people, injury remains the leading cause of death in every region of the world, with most deaths associated with motor vehicles; more than half of these are associated with driving under the influence of alcohol.² There is consistent evidence that higher alcohol consumption in adolescence continues into adulthood and is also associated with later alcohol problems and alcohol dependence.³ Furthermore, heavy alcohol use in adolescence has been found to be related to suicide,^{4,5} neurocognitive impairment,⁶ and impaired brain development.⁷ Thus, preventing underage drinking is an important public health goal.

Previous work has emphasized parental and peer risk factors for alcohol use.^{8–11} Recently, attention has switched to alcohol exposure in the media as another set of risk factors. Alcohol advertising such as direct advertising on television, at movie theaters, and product placement in movies has been linked to adolescent drinking.^{12–15} Favorable images of alcohol use are common in movies, and many such images are delivered to children and adolescents through entertainment media (box office, DVD, television, and Internet).¹⁶ Exposure to such imagery has been associated with youth drinking patterns,^{17–19} but the evidence in this area is sparse, with only a few studies providing evidence for the association between exposure to movie alcohol use and binge drinking of adolescents.^{20–24} However, recent experimental studies using a randomized design have shown that alcohol portrayals in movies directly influence actual alcohol intake, presumably by imitation and cue-reactivity processes.^{25–27} In addition, exposure to alcohol use in movies might increase social acceptability of alcohol use and change cognitions, resulting in initiation and escalation of alcohol use in

adolescents.^{12,14,28} Thus, further study of this association seems warranted.

This study reports results of a large-scale cross-sectional survey of young adolescents from 6 European countries. These countries differ substantially in their alcohol control policies. Two countries (Poland and Iceland) are in the top 10 group of a total of 30 countries regarding 5 regulatory domains: physical availability of alcohol, drinking context, alcohol prices, alcohol advertising, and operation of motor vehicles. One country is in the middle group (United Kingdom), and the remaining 3 countries (Netherlands, Italy, and Germany) are in the bottom group.²⁹ These countries also show large differences in the alcohol use prevalence among young people. Based on data collected in 2007, the 30-day binge drinking prevalence among 15- to 16-year-olds ranged from 22% in the country with the lowest prevalence (Iceland) to 54% in the country with the highest prevalence (United Kingdom).³⁰

The goal of this article was to investigate whether the association between exposure to movie alcohol use and adolescent binge drinking occurs independently of cultural contexts, and alcohol control policies, which would support the argument that alcohol use in movies is an independent risk factor for initiation of potentially harmful patterns of drinking in youth.

METHODS

Study Sample and Procedure

The study was conducted by 6 research centers, in Germany (Kiel), Iceland (Reykjavik), Italy (Turin and Novara), Poland (Poznan), Netherlands (Nijmegen), and Scotland (Glasgow). The 6 study samples were all recruited from state-funded schools (Appendix 1 provides sample details). Overall, a total of 19 268 students from 114 schools and 865 classes were examined for eligibility. A

total of 1059 students (5.5%) could not be included in the study due to missing parental consent, 1559 students (8.1%) were absent on the day of assessment and could not be reached by mail, and 99 students (0.5%) refused to participate, resulting in a final overall sample of 16 551 students (85.9% response rate); 51% were male. The mean age was 13.4 ± 1.18 years, with an age range of 10 to 19 years. Within this final sample, the number of participating students per school ranged from 14 to 603, and the number of participating students per class ranged from 1 to 45.

Survey

In each country, data were collected through self-report questionnaires, administered by trained research staff. Students were assured that their individual data would not be seen by parents or school staff. Each completed questionnaire was placed in an envelope and sealed in front of the participant. Study implementation was approved in all 6 research centers by the respective ethical boards and data protection agencies.

Measures

Exposure to Movie Alcohol Use

Exposure to alcohol use in movies was assessed by using a method developed by researchers at Dartmouth Medical School, which relies on the recall of seeing movies presented to respondents as a list of titles.³¹ For this procedure, each participating research center provided a list of 250 box-office hits based on publicly available data on movie revenues in each respective country. Each of the 6 lists of 250 movies contained the 50 most successful movies of the years 2005–2008 and the 25 most successful movies of the years 2004 and 2009. Students in each country received a random selection of 50 movies (20%) from their country-specific list of 250, creating a unique individual movie list for each

student. To minimize subject-to-subject disparities in movie composition, selection of movies was stratified according to year of release and by country-specific age rating so that each randomly generated list of 50 titles had the same distribution with regard to year and country-specific age ratings. Students were asked to indicate how often they had seen each movie (from 0 = “never” to 3 = “>2 times”). For the present analysis, answers were dichotomized into “seen” and “not seen.”

In a parallel procedure, all included movies were content coded with regard to alcohol use. Due to a high overlap of box-office hits between countries, the complete sample of 1500 movies (6 countries \times 250 movies) contained 655 unique movies. Fifty-six percent of these movies ($n = 368$) were included within the top 100 box-office hits in the United States and had already been content-coded at the Dartmouth Media Research Laboratory.¹⁶ The remaining 44% ($n = 287$) were content-coded in the 6 European research centers. In this coding process, trained coders review each movie and count the number of occurrences of on-screen alcohol use. An alcohol occurrence is counted whenever a major or minor character handles or uses alcohol in a scene or when alcohol use is shown in the background (eg, extras drinking alcohol in a bar scene). Occurrences are counted each time the alcohol use appears 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 between $r = 0.93$ (Iceland) and $r = 0.99$ (Italy); the European re-counts of alcohol occurrences in the random movie

selection correlated ($r = 0.87$) with the Dartmouth counts.

Exposure to alcohol use in movies was calculated for all students by summing the number of alcohol occurrences in each movie they had seen. The measure was adjusted for possible variation in the movie lists by expressing individual exposure to movie alcohol use as a proportion of the total number of possible alcohol occurrences each student could have seen on the basis of the movies included in his or her questionnaire. The final exposure estimate was the proportion of alcohol occurrences the adolescent had seen in his or her particular sample multiplied by the number of alcohol occurrences in the 250 movies of that country.

Binge Drinking

Students were asked the following question about their alcohol use: “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.” Students who reported never were classified as “never binge drinkers,” and all others as “ever binge drinkers.”

Covariates

We included a number of covariates that could confound the relation between exposure to alcohol consumption in movies and binge drinking, including sociodemographic circumstances, behavioral and personality characteristics, television viewing, and drinking of peers, parents, and siblings (Appendix 2). The list of covariates mirrored that of previous studies on movie alcohol use.^{20,23,32}

Statistical Analysis

All data analyses were conducted with Stata version 12.0 (Stata Corp, College Station, TX). Bivariate associations between all study variables were analyzed with Spearman rank correlation coefficients and multiple mean comparisons with Tukey's test. Locally weighted

scatterplot smoothings were used to graphically represent the crude relationship between movie alcohol use exposure and adolescent binge drinking for each country. To compare the dose—response curves, we standardized movie alcohol use exposure for each country so that the lowest value was 0 and the highest was 1. For that purpose, we recoded low outliers to the fifth percentile and high outliers to the 95th percentile, subtracted the difference between fifth and 0, so that the distribution started at 0. We divided by the maximum number and had a rescaled variable from 0 to 1 representing going from the fifth to the 95th percentile.

Because the data were clustered at the country, school, and classroom level, the adjusted associations between amounts of movie alcohol use and lifetime binge drinking were analyzed with multilevel mixed-effects linear regressions with random intercepts for country, school, and class. In a first step, unadjusted models were specified, with movie alcohol use exposure as the only fixed effect. In the adjusted models, all covariates were included as fixed effects. These analyses were restricted to students who had complete data on all model variables.

A sensitivity analysis was undertaken to assess the specificity of the association between exposure to alcohol consumption in the movies and adolescent binge drinking. Specificity of the association was examined by adding a variable assessing exposure to smoking in movies to the regression model. The methods for measurement of onscreen smoking have been described in detail elsewhere.³³

RESULTS

Descriptive Statistics

Descriptive statistics for binge drinking and all covariates are presented in Table 1. Overall, 27% had consumed >5 drinks on at least 1 occasion in their life, but this finding varied substantially

between countries. For example, 6% of the Icelandic students were classified as ever binge drinking, compared with 38% in the Dutch sample ($\chi^2(5) = 854$; $P < .001$). Differences in binge drinking rates remained after controlling for age, with age-adjusted prevalences for ever binge drinking of 7%, 20%, 23%, 30%, 32%, and 40% for Iceland, Italy, Poland,

Netherlands, Germany, and Scotland, respectively.

Exposure to Alcohol Consumption in Movies

Overall, 86% of the total 655 movies included at least 1 alcohol scene. Figure 1 shows the distributions for the estimated exposure to alcohol use in movies.

Almost all histograms were positively skewed, with some differences between the countries with regard to the average amount of exposure (all pairwise comparisons $P < .05$, with the exception of Germany versus Netherlands, Iceland versus Italy, Iceland versus Poland, and Italy versus Poland). The lowest exposures occurred among Dutch and

TABLE 1 Descriptive Statistics for Lifetime Binge Drinking and Covariates, Overall and According to Country

	Overall (<i>N</i> = 16 551)	Germany (<i>n</i> = 2754)	Iceland (<i>n</i> = 2664)	Italy (<i>n</i> = 2668)	Poland (<i>n</i> = 4105)	Netherlands (<i>n</i> = 1423)	Scotland (<i>n</i> = 2937)
Adolescents							
Lifetime binge drinking							
Never	73	76	94	75	67	62	65
Once	13	12	3	13	18	10	14
2–5 times	9	8	2	8	10	12	13
>5 times	5	4	1	4	5	16	8
Sociodemographics							
Gender							
Female	49	49	48	44	53	51	49
Male	51	51	52	56	47	49	51
Age, mean (SD), y	13.4 (1.18)	12.7 (1.06)	13.1 (0.89)	13.6 (1.37)	14.2 (0.79)	13.8 (1.36)	13.0 (0.89)
Family affluence							
Low	10	8	2	14	17	2	10
Medium	36	37	21	45	42	27	39
High	54	55	77	41	41	71	51
Personal characteristics							
School performance							
Below average	8	6	4	15	9	9	3
Average	33	44	25	39	39	29	21
Good	42	40	43	39	35	49	51
Excellent	17	10	28	7	17	13	25
TV screen time							
≤0.5 h	23	25	29	20	19	24	22
1–2 h	51	52	55	48	49	57	50
3–4 h	19	17	13	23	24	17	20
>4 h	7	6	3	9	8	2	8
Sensation seeking and rebelliousness, mean (SD), range 0–4	1.31 (0.74)	1.21 (0.72)	1.0 (0.69)	1.43 (0.75)	1.53 (0.74)	1.01 (0.59)	1.40 (0.73)
Social environment							
Peer drinking							
None	32	48	69	21	10	22	30
A few	25	25	19	25	25	18	33
Some	21	17	7	29	32	21	16
Most	17	8	3	19	27	27	17
All	4	2	1	6	6	12	4
Mother figure drinking							
Never	23	16	18	39	28	12	14
Seldom	59	64	68	50	63	51	46
Often but not every day	17	16	13	8	8	30	37
Every day	2	2	1	3	1	7	3
Father figure drinking							
Never	13	12	15	18	14	6	12
Seldom	52	58	60	47	61	38	41
Often but not every day	29	25	23	24	22	45	42
Every day	6	5	2	11	4	11	5
Any sibling drinking							
No	65	68	57	75	69	56	57
Yes	35	32	43	25	31	44	43

Data are presented as % or mean ± SD.

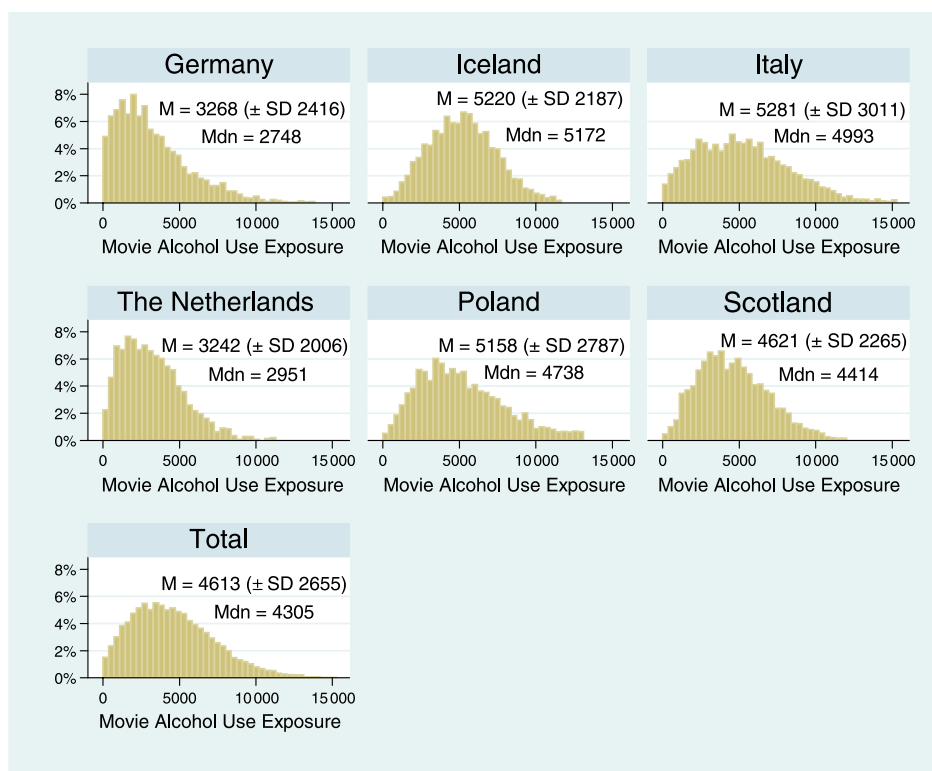


FIGURE 1

Exposure to alcohol use in movies among adolescents from 6 European countries ($N = 16\,551$). Estimation based on alcohol use in each country's 250 most successful movies of the years 2004–2009. Number of seen alcohol occurrences displayed in the x-axes. Mdn = median.

German adolescents and the highest among those from Italy and Iceland. In each of the countries, it was estimated that the most highly exposed adolescents had seen in excess of 10 000 alcohol depictions from his or her country-specific sample of popular movies.

Associations Between Study Variables

Zero-order correlations between the study variables demonstrated significant crude associations between the central constructs. Exposure to movie alcohol use was significantly associated with all study variables, particularly with sensation seeking/rebelliousness ($r = 0.25$), peer drinking ($r = 0.21$), and lifetime binge drinking ($r = 0.21$) (Appendix 3).

Association Between Exposure to Alcohol Consumption in Movies and Adolescent Binge Drinking

The smoothed lowest curves in Fig 2 show the unadjusted association between

exposure to movie alcohol use and adolescent binge drinking for each country. The curves illustrate that the dose–response was linear through the exposure range for each country. Icelandic youth had the lowest rates of binge drinking, whereas youths in the Netherlands, Scotland, and Germany had the highest. Across all countries, there was a crude dose–response association between higher exposure to movie alcohol depictions and lifetime binge drinking.

Multivariate Analysis

Figure 2 also reports adjusted β -coefficients for the relationship between movie alcohol use exposure and adolescent binge drinking, overall and by country. In the overall (all countries) adjusted model, adolescents with higher exposure to alcohol use in movies were significantly more likely to have engaged in binge drinking, even after controlling for age, gender, family affluence, school performance, television screen time,

sensation seeking and rebelliousness, and frequency of drinking of peers, parents, and siblings. We found few between-country differences in the strength of the crude and the adjusted relationship. An exception was the Icelandic model, which revealed a smaller crude relationship and a nonsignificant adjusted association.

Sensitivity Analysis

Table 2 presents the adjusted multilevel regression results with the additional inclusion of exposure to movie smoking. The correlation between exposure to movie smoking and movie alcohol use was $r = 0.83$. Despite the high correlation, exposure to movie alcohol use remained significantly associated with lifetime binge drinking, whereas exposure to movie smoking was not (Table 2). Other factors that were associated with binge drinking included peer drinking, sensation seeking and rebelliousness, school performance, age, and sibling drinking.

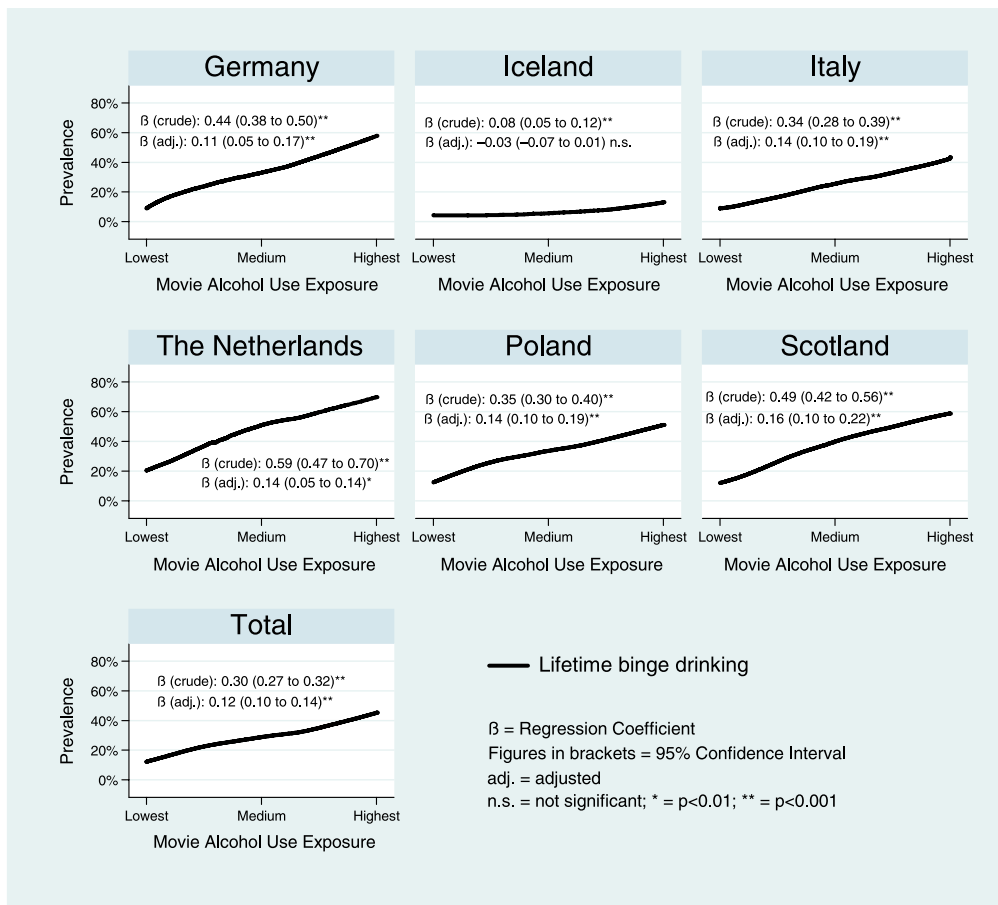


FIGURE 2

Crude association between exposure to movie alcohol use and adolescents' lifetime binge drinking, by country. Adjusted β coefficients are adjusted for age, gender, family affluence, school performance, television screen time, sensation seeking and rebelliousness, and frequency of drinking among peers, parents, and siblings. Figures in parentheses are presented as 95% confidence intervals.

TABLE 2 Sensitivity Analysis: Adjusted Regression Coefficients for Lifetime Binge Drinking: Results of the Multilevel Mixed-Effects Linear Regression

Predictor	β	95% Confidence interval	<i>P</i>
Exposure to movie alcohol use	0.09	0.06 to 0.13	<.001
Exposure to onscreen smoking	0.03	-0.00 to 0.07	NS
Age	0.03	0.02 to 0.04	<.001
Gender (0 = male, 1 = female)	0.01	-0.02 to 0.01	NS
Family affluence	-0.00	-0.01 to 0.01	NS
School performance	-0.05	-0.05 to -0.04	<.001
TV screen time	-0.00	-0.00 to 0.01	NS
Sensation seeking/ rebelliousness	0.10	0.10 to 0.11	<.001
Peer drinking	0.13	0.12 to 0.14	<.001
Mother drinking	0.01	-0.00 to 0.02	NS
Father drinking	0.01	-0.00 to 0.02	NS
Sibling drinking	0.05	0.04 to 0.06	<.001

Adjusted for all predictor variables named in the table. $n = 15\ 997$ students, $n = 865$ classes, $n = 114$ schools, $n = 6$ countries. Country, school, and class as random effects. Analyses were restricted to students who had complete data on all model variables. NS, not significant.

DISCUSSION

To the best of our knowledge this article represents the largest cross-cultural study to date examining the association

between exposure to alcohol use in movies and youth drinking. The results reveal that European adolescents are exposed to many images of alcohol use

through popular movies. This exposure is substantially associated with lifetime binge drinking, a problematic drinking behavior. Results indicate that exposure to alcohol use in movies is robust in the context of different European cultures, with only a few between-country differences in the strength of the relationship. Recent commentators have questioned whether the movie smoking effect is specific to the behavior depicted.³⁴ Because risk behaviors cluster in movies, exposure assessments of these individual behaviors are correlated, and it requires studies of substantial sample size to disentangle the respective effects. From a theoretical standpoint, the most simple explanation for an association between seeing movies and drinking is the direct modeling

effect. If that were the case, one would expect exposure to movie alcohol use and not exposure to movie smoking to predict drinking behavior, and that is what we report in this study. Thus, the association is present after controlling for confounding characteristics of the adolescent (characteristics that would be expected to draw the adolescents to other elements in movies, such as excitement) and is specific to the depiction of movie alcohol. The results suggest that if steps were taken to decrease exposure of adolescents to movie depictions of alcohol, then fewer young people would take up binge drinking.

The current study yielded important insights on the link between alcohol movie exposure and alcohol use in Europe. Nevertheless, several questions remain. Most importantly, we do not know to what extent the associations are moderated, for example, by individual factors (eg, personality factors), parental alcohol use, and parenting styles in relation to regulating the amount and types of movies seen (eg, whether age-appropriate or older) movie exposure. Second, an important question may be whether adolescents are differentially affected by movies that differ in country of production (United States versus indigenous) or content.

There are several limitations to the current study, the most important one being the cross-sectional design. Cross-sectional data cannot provide information on the temporal sequence of events; that is, in this case, whether exposure to alcohol consumption in movies

preceded the binge drinking episode(s) or whether adolescents who had consumed alcohol in this way were more inclined to watch movies with more alcohol exposure. Temporal antecedence is one important determinant of a causal relationship. However, a major advantage of the cross-cultural design of the study is the fact that unmeasured confounding is accounted for by the country-level random effect. In the present context, exposure to alcohol consumption in movies is the constant on a background of many other between-country differences such as the age at which someone can legally purchase alcohol or the prevalence of drinking during meals with family at home, which is relatively rare in Iceland but more common in Italy. The consistent finding of a movie alcohol use effect after controlling for variance at the country level seems to be an important contributor to the causal argument. Other limitations relate to the assessment of movie alcohol use exposure, which was based on student recall of films seen and hence open to error and biases. However, there is no obvious reason for memory distortions to be systematically related to the amount of movie alcohol use exposure. A final issue is the potential bias due to the 14% of students who provided no data because of absence from school on the day of the survey or lack of parental consent.

CONCLUSIONS

The consistency of the association between movie alcohol use exposure and adolescent binge drinking across

cultures, specifically 6 European countries with different norms regarding teen and adult alcohol use and different prevalences of youth alcohol use, argues in favor of movie alcohol exposure as an independent social risk factor. Although these cross-sectional findings need to be confirmed through studies with a longitudinal design, our findings raise concern about the role popular movies may play in Europe and beyond in the early experimentation with patterns of alcohol consumption in adolescents. These patterns have the potential to have a detrimental influence on individual health and future drinking trajectories and to be costly at a societal level.

ACKNOWLEDGMENTS

We thank Abita Bhaskar, Daria Buscemi, Lars Grabbe, Roberto Gullino, Leonie Hendriksen, Maksymilian Kulza, Martin Law, Dan Nassau, Balvinder Rakhra, Monika Senczuk-Przybylowska, and Tiziano Soldani for coding the movies. We are also thankful to all pupils and staff in participating schools and the survey field forces in each country. The Italian center acknowledges the work of Piera Arata, Silvia Caristia, Diego Concina, and Silvia Randino who substantially helped in conducting the study. The Scottish center acknowledges the work of Catherine Ferrell, Elaine Hindle, and Abita Bhaskar and colleagues who substantially helped with data collection. The Icelandic center acknowledges the work of Professor Thorolfur Thorlindsson, Viðar Jensson, and Jón Óskar Guðlaugsson for their help in conducting the study.

REFERENCES

1. Rehm J, Mathers C, Popova S, Thavorncharoensap M, Teerawattananon Y, Patra J. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *Lancet*. 2009;373(9682):2223–2233
2. Patton GC, Coffey C, Sawyer SM, et al. Global patterns of mortality in young people: a systematic analysis of population health data. *Lancet*. 2009;374(9693):881–892
3. McCambridge J, McAlaney J, Rowe R. Adult consequences of late adolescent alcohol consumption: a systematic review of cohort studies. *PLoS Med*. 2011;8(2):e1000413
4. Light JM, Grube JW, Madden PA, Gover J. Adolescent alcohol use and suicidal ideation: a nonrecursive model. *Addict Behav*. 2003;28(4):705–724
5. Spirito A, Esposito-Smythers C. Attempted and completed suicide in adolescence. *Annu Rev Clin Psychol*. 2006;2:237–266
6. Squeglia LM, Spadoni AD, Infante MA, Myers MG, Tapert SF. Initiating moderate to heavy alcohol use predicts changes in

- neuropsychological functioning for adolescent girls and boys. *Psychol Addict Behav.* 2009;23(4):715–722
7. Tapert SF, Caldwell L, Burke C. Alcohol and the adolescent brain: human studies. *Alcohol Res Health.* 2004;28(4):205–212
 8. Bahr SJ, Hoffmann JP, Yang X. Parental and peer influences on the risk of adolescent drug use. *J Prim Prev.* 2005;26(6):529–551
 9. Callas PW, Flynn BS, Worden JK. Potentially modifiable psychosocial factors associated with alcohol use during early adolescence. *Addict Behav.* 2004;29(8):1503–1515
 10. Donovan JE. Adolescent alcohol initiation: a review of psychosocial risk factors. *J Adolesc Health.* 2004;35(6):529.e7–e18
 11. van der Vorst H, Engels RC, Meeus W, Deković M. The impact of alcohol-specific rules, parental norms about early drinking and parental alcohol use on adolescents' drinking behavior. *J Child Psychol Psychiatry.* 2006;47(12):1299–1306
 12. Austin EW, Chen MJ, Grube JW. How does alcohol advertising influence underage drinking? The role of desirability, identification and skepticism. *J Adolesc Health.* 2006;38(4):376–384
 13. Gordon R, MacKintosh AM, Moodie C. The impact of alcohol marketing on youth drinking behaviour: a two-stage cohort study. *Alcohol Alcohol.* 2010;45(5):470–480
 14. Morgenstern M, Isensee B, Sargent JD, Hanewinkel R. Attitudes as mediators of the longitudinal association between alcohol advertising and youth drinking. *Arch Pediatr Adolesc Med.* 2011;165(7):610–616
 15. Morgenstern M, Isensee B, Sargent JD, Hanewinkel R. Exposure to alcohol advertising and teen drinking. *Prev Med.* 2011;52(2):146–151
 16. Dal Cin S, Worth KA, Dalton MA, Sargent JD. Youth exposure to alcohol use and brand appearances in popular contemporary movies. *Addiction.* 2008;103(12):1925–1932
 17. Anderson P, de Bruijn A, Angus K, Gordon R, Hastings G. Impact of alcohol advertising and media exposure on adolescent alcohol use: a systematic review of longitudinal studies. *Alcohol Alcohol.* 2009;44(3):229–243
 18. Nunez-Smith M, Wolf E, Huang HM, et al. Media exposure and tobacco, illicit drugs, and alcohol use among children and adolescents: a systematic review. *Subst Abuse.* 2010;31(3):174–192
 19. Smith LA, Foxcroft DR. The effect of alcohol advertising, marketing and portrayal on drinking behaviour in young people: systematic review of prospective cohort studies. *BMC Public Health.* 2009;9:51
 20. Hanewinkel R, Tanski SE, Sargent JD. Exposure to alcohol use in motion pictures and teen drinking in Germany. *Int J Epidemiol.* 2007;36(5):1068–1077
 21. Hanewinkel R, Morgenstern M, Tanski SE, Sargent JD. Longitudinal study of parental movie restriction on teen smoking and drinking in Germany. *Addiction.* 2008;103(10):1722–1730
 22. Hanewinkel R, Sargent JD. Longitudinal study of exposure to entertainment media and alcohol use among German adolescents. *Pediatrics.* 2009;123(3):989–995
 23. Wills TA, Sargent JD, Gibbons FX, Gerrard M, Stoolmiller M. Movie exposure to alcohol cues and adolescent alcohol problems: a longitudinal analysis in a national sample. *Psychol Addict Behav.* 2009;23(1):23–35
 24. Hunt K, Sweeting H, Sargent J, Lewars H, Young R, West P. Is there an association between seeing incidents of alcohol or drug use in films and young Scottish adults' own alcohol or drug use? A cross sectional study. *BMC Public Health.* 2011;11:259
 25. Engels RC, Hermans R, van Baaren RB, Hollenstein T, Bot SM. Alcohol portrayal on television affects actual drinking behaviour. *Alcohol Alcohol.* 2009;44(3):244–249
 26. Koordeman R, Kuntsche E, Anschutz DJ, van Baaren RB, Engels RC. Do we act upon what we see? Direct effects of alcohol cues in movies on young adults' alcohol drinking. *Alcohol Alcohol.* 2011;46(4):393–398
 27. Koordeman R, Anschutz DJ, van Baaren RB, Engels RC. Effects of alcohol portrayals in movies on actual alcohol consumption: an observational experimental study. *Addiction.* 2011;106(3):547–554
 28. Thomsen SR, Rekke D. The relationship between viewing US-produced television programs and intentions to drink alcohol among a group of Norwegian adolescents. *Scand J Psychol.* 2006;47(1):33–41
 29. Brand DA, Saisana M, Rynn LA, Pennoni F, Lowenfels AB. Comparative analysis of alcohol control policies in 30 countries. *PLoS Med.* 2007;4(4):e151
 30. Hibell B, Guttormson U, Ahlström S, et al. *The 2007 ESPAD Report—Substance Use Among Students in 35 European Countries.* Stockholm, Sweden: The European School Survey Project on Alcohol and Other Drugs; 2007
 31. Sargent JD, Worth KA, Beach M, Gerrard M, Heatherton TF. Population-based assessment of exposure to risk behaviors in motion pictures. *Commun Methods Meas.* 2008;2(1-2):134–151
 32. Sargent JD, Wills TA, Stoolmiller M, Gibson J, Gibbons FX. Alcohol use in motion pictures and its relation with early-onset teen drinking. *J Stud Alcohol.* 2006;67(1):54–65
 33. Morgenstern M, Poelen EAP, Scholte RH, et al. Smoking in movies and adolescent smoking: cross-cultural study in six European countries. *Thorax.* 2011;66(10):875–883
 34. Chapman S, Farrelly MC. Four arguments against the adult-rating of movies with smoking scenes. *PLoS Med.* 2011;8(8):e1001078

APPENDIX 1 Study Sample Details

	Germany	Iceland	Italy	Poland	Netherlands	Scotland
Setting	Public schools, 4 school types: Gymnasium, Gemeinschaftsschule, Regionalschule, Hauptschule	Public schools	Public schools, 2nd class of secondary school and first class of high school	Public schools, 1 school type (Gymnasium)	Public schools, 4 different school types	Mainstream (state-funded) schools
Locations	Schleswig-Holstein, Germany; District of Kiel, Flensburg, Schleswig-Rendsburg-Eckernförde	Schools from each region (north, south, east, west) of Iceland in addition to the capital area (Reykjavik and surrounding municipalities)	Piedmont region, Italy; Schools with head office in Turin or Novara provinces	Wielkopolska region	Geidenland, Limburg, Brabant	Central belt of Scotland
Time of data assessment for schools	Nov–Dec 2009	Jan–Feb 2010	March–June 2010	April–June 2010	Dec 2009–June 2010	Jan–Mar 2010
Eligibility criteria for schools	Location; Number of classes > 8; No special pedagogic education center; No participation in other studies of IFT-Nord	Number of participating students > 100	Location in Turin or Novara provinces	Location in Wielkopolska region; No special pedagogic education center	No special pedagogic education center; No current participation in other studies of the Behavioural Science Institute, Radboud University	Location in either Midlothian or East Dumbartonshire; Not providing special education; Not providing private (non state-funded) education
No. of schools potentially eligible	$N = 104$	Not known	$N = 578$	$N = 253$	Not known	$N = 14$
No. of schools invited	$n = 60$	$n = 23$	$n = 31$	$n = 253$	$n = 43$	$n = 7$
Invitation criteria for schools	Random	Convenience sampling	Convenience sampling	All eligible schools	Random	Selected on the basis of deprivation, based on the most recent (2007–2008) nationally available data relating to the proportion of free school meals
No. of schools that agreed to participate	$n = 21$	$n = 20$	$n = 26$	$n = 35$	$n = 5$	$n = 7$
Eligibility criteria for students	Active (“opt-in”) parental consent; Presence on the day of assessment or, if absent, willing to complete a questionnaire and return by post; Willingness to participate	Passive (“opt-out”) parental consent; Students presence on the day of assessment; Willingness 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; Willingness to participate	Passive parental consent; Presence on the day of assessment; Willingness to participate	Passive (“opt-out”) parental consent; Presence on the day of assessment or, if absent, willing to complete a questionnaire and return by post; Willingness to participate (written informed) consent from pupil

APPENDIX 1 Continued

	Germany	Iceland	Italy	Poland	Netherlands	Scotland
No. of students examined for eligibility	<i>n</i> = 3544	<i>n</i> = 2798	<i>n</i> = 2953	<i>n</i> = 5078	<i>n</i> = 1706	<i>n</i> = 3189
No. confirmed eligibility	<i>n</i> = 2754	<i>n</i> = 2664	<i>n</i> = 2668	<i>n</i> = 4105	<i>n</i> = 1423	<i>n</i> = 2937
Reasons for nonparticipation	No parental consent (<i>n</i> = 515); absence (<i>n</i> = 264); pupil refusal (<i>n</i> = 11)	No parental consent (<i>n</i> = 19); absence (<i>n</i> = 102); pupil refusal (<i>n</i> = 13)	No parental consent (<i>n</i> = 100); absence (<i>n</i> = 175); pupil refusal (<i>n</i> = 10)	No parental consent (<i>n</i> = 396); absence (<i>n</i> = 527); pupil refusal (<i>n</i> = 50)	No parental consent (<i>n</i> = 18); absence (<i>n</i> = 265); pupil refusal (<i>n</i> = 0)	No parental consent (<i>n</i> = 11); absence (<i>n</i> = 226); pupil refusal (<i>n</i> = 15)
No. participated in the study	<i>n</i> = 2754	<i>n</i> = 2664	<i>n</i> = 2668	<i>n</i> = 4105	<i>n</i> = 1423	<i>n</i> = 2937
No. analyzed	<i>n</i> = 2754	<i>n</i> = 2664	<i>n</i> = 2668	<i>n</i> = 4105	<i>n</i> = 1423	<i>n</i> = 2937
Response rate	78%	95%	90%	81%	83%	92%

APPENDIX 2 Covariates and Their Assessment

Variable	Survey Question	Response Categories
Sociodemographic		
Age	How old are you?	Years
Gender	Are you a girl or a boy?	Boy/girl
Family affluence scale, (Cronbach's $\alpha = 0.44$)	Does your family own a car, van or truck?	No/yes, one/yes, ≥ 2
	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/>2
Personal characteristics		
School performance	How would you describe your grades last year?	Excellent/good/average/below average
Television screen time	On a school day, how many hours a day do you usually spend watching television?	None/less than 1 h/1–2 h/3–4 h/>4 h
Number of movies seen	Below is a list of film titles. Please mark if, and how often, you have seen each film.	Never/once/twice/more than twice
Sensation seeking/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?	Not at all/once in a while/sometimes/often/very often
	I believe in following rules (recoded).	Not at all/a bit/quite well/very well
	I get angry when anybody tells me what to do.	Not at all/a bit/quite well/very well
Frequency of drinking in close associates		
Peer drinking	How many of your friends drink alcohol?	None/a few/some/most/all
Mother drinking	How often does your mother/female guardian drink alcohol?	Never/seldom/often but not every day/every day/do not have (coded "never")
Father drinking	How often does your father/male guardian drink alcohol?	Never/seldom/often but not every day/every day/do not have (coded "never")
Sibling drinking	Do any of your brothers or sisters drink alcohol?	Yes/no/do not have (coded "no")

APPENDIX 3 Zero-Order Correlation Matrix

	Movie Alcohol Use Exposure	Lifetime Binge Drinking	Age	Gender	Family Affluence	School Performance	Television Screen Time	Sensation Seeking/ Rebelliousness	Peer Drinking	Mother Drinking	Father Drinking
Lifetime binge drinking	0.21										
Age	0.15	0.26									
Gender (0 = male, 1 = female)	-0.04	-0.06	-0.03								
Family affluence	0.10	-0.03	-0.07	-0.04							
School performance	-0.08	-0.21	-0.16	0.12	0.15						
Television screen time	0.10	0.09	0.06	-0.09	-0.08						
Sensation seeking/ rebelliousness	0.25	0.37	0.18	-0.22	-0.03	0.13					
Peer drinking	0.21	0.49	0.50	-0.19	-0.08	0.04	0.42				
Mother drinking	0.05	0.10	-0.06	0.15	0.07		0.07	0.10			
Father drinking	0.03	0.12		0.08	0.08	0.03	0.11	0.16	0.48		
Sibling drinking	0.12	0.18	0.09	0.04	0.04	0.04	0.13	0.19	0.16	0.16	

All displayed coefficients are significant at $P < .001$.