

ASSOCIATION BETWEEN SMOKING AND ALCOHOL USE IN THE GENERAL POPULATION: STABLE AND UNSTABLE ODDS RATIOS ACROSS TWO YEARS IN TWO DIFFERENT COUNTRIES

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Abstract — Aims: The main objective of this article was to compare alcohol and tobacco consumption in the US and the Basque Country (the North of Spain) with particular attention to the association between alcohol and tobacco use. The consistency of findings was considered by analyzing data from two different years. These comparisons may provide a rational basis for exploring the associations between alcohol and cigarette use that are influenced by changes in use prevalences. **Methods:** Two epidemiological samples from the US, obtained in 1992 and 1996, and two from the Basque Country, obtained in the same years, were used. Sampling methodologies were similar. Questionnaires were self-administrated with the help of interviewers, and were used to define ever smokers, ex-smokers, current smokers, heavy smokers, ever drinkers, ex-drinkers, current drinkers and weekly drinkers. The associations between smoking and alcohol drinking were explored through logistic regressions. **Results:** The associations between current smoking and current drinking in the general population, and between ever smoking and weekly drinking among current drinkers appear very stable. In 1992 and 1996, US subjects who decided to try alcohol tended to try smoking and vice versa. In US Caucasians (particularly in 1996), heavy smoking was strongly associated with ever drinking among current smokers. In the Basque Country in 1992, there was a significant association between smoking cessation and drinking cessation among ever drinkers who also were ever smokers. **Conclusions:** Our analyses suggest that some associations between alcohol drinking and smoking behaviours are likely to be detected in Western countries where alcohol and nicotine are legal and easily available. On the other hand, other associations may be detected only in certain social contexts. These social contexts make the associations in subpopulations who are vulnerable to addiction, influence the results in the general population. In social contexts that exert considerable social pressure to quit smoking, such as in US Caucasians (particularly in 1996), heavy smoking was strongly associated with ever drinking among current smokers. When a social environment strongly discourages smoking and alcohol initiation (as in the US in 1992 and 1996), subjects who decide to try alcohol tend to try smoking and vice versa. The lack of social stigmatization of smoking and drinking in the Basque Country in 1992 may help to explain the significant association between smoking cessation and drinking cessation among ever drinkers who also were ever smokers.

INTRODUCTION

The literature has paid attention to the combined use of alcohol and nicotine for several reasons: i) many alcoholics die from smoking-related illnesses (Hughes, 1995); ii) the combined, rather than single, use of these two substances may produce a multiplicative or synergistic increase in cancer rates, especially the oropharyngeal cancers (Bobo, 1989); iii) smoking may be a marker for alcoholism (Hughes, 1995); iv) until recently, alcoholism has been the main focus of cessation treatments because clinicians have been more preoccupied with the behavioural consequences of alcohol addiction and seem to have forgotten the health consequences of smoking in alcoholics (Hughes, 1996); and v) the discontinuation of one of these two substances may influence the use of the other.

The use of alcohol and tobacco may be related in two ways: i) intrapersonal linkage (alcohol drinkers usually smoke and vice versa) and ii) situational linkage (people who use alcohol and tobacco may use them together in the same

situations) (Shiffman and Balabanis, 1995). To explain these links, genetic, coping, pharmacological, learning, personality and cultural factors have been proposed (Niaura and Shiffman, 1995; Bien and Burge, 1990; Room, 2004).

Tobacco smoking and alcohol addiction are behaviours strongly influenced by genetic factors. The estimations for heritability of continuation of tobacco smoking once smoking has started is 70%, and of alcoholism is 51–65% in females and 48–73% in males (Tyndale, 2003). Thus, it has been suggested that genetic influences explain a substantial portion of the covariance of both behaviours (Swan *et al.*, 1990). In the context of the stress-coping theory, it has been proposed that alcohol and tobacco serve as coping mechanisms that together help some individuals to regulate their emotions (Niaura and Shiffman, 1995). The pharmacological explanations include pharmacokinetic and pharmacodynamic mechanisms studied in animal investigations (Niaura and Shiffman, 1995). Two main mechanisms are described: cross-tolerance and cross-reinforcement. Cross-tolerance refers to the development of tolerance towards the rewarding and aversive effects of one of these two substances due to the use of the other. Cross-reinforcement refers to the potential of one habit for enhancing or prolonging the effects of the other (Niaura and Shiffman, 1995). Learning factors have been proposed since alcohol is often consumed in situations that facilitate smoking

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(Bien and Burge, 1990; Schiffman and Balabanis, 1995). Personality factors are described in the context of a 'common addictive personality pattern', which is proposed to explain the use of both substances (Bien and Burge, 1990). Cultural factors may explain why alcohol and tobacco may be consumed in a combined way in some, but not all, cultures (Room, 2004).

Unfortunately, the empirical studies in human subjects have not provided sufficient evidence to support many of the above explanations. Moreover, most of the evidence of linkage between alcohol and tobacco use comes from studies including individuals recruited for treatment, particularly alcoholics looking for treatment for their alcohol addiction (Istvan and Matarazzo, 1984; Schiffman and Balabanis, 1995; Hughes, 1995). Several authors have recommended that the best way to understand the combined use of tobacco and alcohol in the population would be by using representative samples from the general population instead of focusing on treatment samples of alcoholics (Istvan and Matarazzo, 1984; Hughes, 1995).

The main objective of this article was to compare alcohol and tobacco consumption in the US and in the North of Spain. Particular attention was paid to the association between alcohol and tobacco use. The consistency of findings across years was examined by analyzing data from two different years. This comparison of two countries may provide a rational basis for exploring the associations between alcohol and cigarettes, that are influenced by social changes in prevalence. Alcohol and tobacco use were examined by controlling for gender, level of education, race and age.

METHOD

Sample

This study was based on four samples from four epidemiological surveys that used similar sampling methodologies. Two samples were obtained in 1992, one in the US and the other in the Basque Country (the North of Spain). Similarly, a sample from the US and a sample from the Basque Country were obtained in 1996. The US samples were obtained through a multistage design by the National Household Survey on Drug Abuse (NHSDA) (United States Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Office of Applied Studies, 1997, 1998). The Spanish samples were obtained through a stratified, multistage design by the Basque Community Household Survey on General Health (called ESCAV in Spanish), conducted by the Health Department of the Basque Country Government (Anitua and Aizpuru, 1996, 1997). These sample procedures were designed to guarantee that the samples represent the populations well.

The target population for the NHSDA was the civilian, non-institutionalized population of the United States aged 12 years and above. For the ESCAV, the target group was the population of the Basque Country older than 16 years. Only subjects older than 18 years were included in the current analyses. The samples used in the analyses included 21 578 subjects from the 1992 US survey, 13 731 from the 1996 US survey, 3876 from the 1992 Spanish survey and 2786 from the 1996 Spanish survey.

Smoking and drinking assessment

In the four surveys, questionnaires were self-administrated with the help of an interviewer. Smoking behaviours were defined as follows: A person who had smoked more than 100 days (NHSDA) or more than 100 cigarettes (ESCAV) in his/her life was called an ever smoker. An ever smoker who had not smoked within the last 12 months (NHSDA) or within the last 6 months (ESCAV) was called an ex-smoker. An ever smoker who had smoked within the past 30 days was called a current smoker. A current smoker who had smoked more than 25 cigarettes per day within the last month was called a heavy smoker. However, for the 1992 Spanish survey, a cutoff point of 20 cigarettes per day was used due to the lack of further information on the number of cigarettes smoked per day.

Alcohol drinking behaviours were defined as follows (NHSDA and ESCAV criteria were the same): A person who had ever drunk any alcoholic beverage during his/her life was called an ever drinker; this definition excluded childhood sips that the person might have had from an older person's drink. An ever drinker who had not drunk alcohol within the last 12 months was called an ex-drinker. An ever drinker who had drunk alcohol within the last 12 months was called a current drinker. A current drinker who had drunk alcoholic beverages at least once a week in the last year was called a weekly drinker.

Statistics

An odds ratio (OR) is a measure of the strength of the association between two dichotomous variables such as current smoking and current alcohol drinking (Woodward, 1999). An OR also indicates the direction of the association. For instance, an OR of 4.4 for the association between current smoking and current drinking suggests that the chance of current drinking for people who currently smoke is 4.4 times the chance of current drinking for people who do not smoke. The fact that the OR is >1 indicates that a current smoker has a higher risk of becoming a current drinker than a non-smoker. (If the OR were <1 , then a current smoker would have a lower risk of becoming a current drinker than a non-smoker.) When comparing two ORs that are >1 , the larger OR indicates a stronger association. In contrast, if two ORs are <1 , the smaller OR indicates a stronger association. An OR equal to 1 indicates lack of association. Analogous interpretations can be made when studying the association between other pairs of dichotomous variables.

A 95% confidence interval (CI) for an OR is a range of highly plausible values for the OR and, in 95% of similar studies, the CI will include the 'true' OR. A CI including 1.0 indicates that the OR is not significantly different from 1.0 and, therefore, that the association is not significant. In contrast, if all the values included in a CI are greater than 1.0, then the OR is significantly greater than 1.0, suggesting that the association is significant. Two CIs that do not overlap indicate that the corresponding ORs are significantly different from each other. For instance, an OR of 1.5 with a CI = (1.2–1.9) and an OR of 4.4 with a CI = (2.8–7.0) suggest that the latter OR is significantly greater than the former, since the two CIs do not overlap.

Logistic regression is a multivariate technique that allows studying the association between two dichotomous variables

while adjusting for potential confounding variables (Woodward, 1999). This study considered gender, education, age and race as potential confounding variables. Thus, the ORs reported in this study, which were obtained through logistic regressions, were corrected for some or all of these confounding variables.

The association between current smoking and current alcohol drinking in different countries and years was explored through logistic regressions that were adjusted for gender, education and age. In the US samples, logistic regressions were also adjusted for race (all the Spanish subjects were Caucasian, so race was not considered in the Spanish analyses). Logistic regressions stratified by gender and race (US samples), while adjusted for education and age, were also performed. Similar analyses were performed to explore the associations between ever smoking and ever drinking, between heavy smoking and ever drinking among current smokers, between quitting smoking and quitting drinking among ever drinkers who also were ever smokers, between heavy smoking and weekly drinking among current smokers who also were current alcohol drinkers, and between weekly drinking and ever smoking among current drinkers.

Prevalences of smoking and alcohol drinking behaviours were also estimated. 95% CIs for ORs and prevalences were computed. All statistical procedures were performed using SUDAAN, a statistical package that took into account the complex nature of the samples (Shah *et al.*, 1997).

RESULTS

Prevalences

The prevalences of current smoking and current drinking decreased significantly from 1992 to 1996 in the Basque Country, but did not in the US population (Table 1). Prevalences of weekly drinking were stable from 1992 to 1996 in both the US and the Basque Country (Table 1), although the Basque Country had significantly higher prevalences at a 0.05-level of significance.

Associations between alcohol and tobacco that were consistently significant across combinations of country, year, gender and race

The association between current smoking and current drinking was significant, irrespective of country, year, gender or race.

The ORs measuring this association ranged between 1.5 (95% CI, 1.2–1.9) in 1996 Basque females and 4.4 (2.8–7.0) in 1992 US African American males. Similarly, among current drinkers, the association between weekly drinking and ever smoking was significant, irrespective of country, year, gender or race. For this association, the ORs ranged between 1.8 (CI, 1.4–2.4) in 1996 US Caucasian males and 3.9 (2.8–5.6) in 1996 US African American males. All the above ORs are corrected for age and educational background, which were potential confounding factors.

Associations that were significant in the US and not in the Basque country

Heavy smoking and ever drinking were not significantly associated in the Basque country. They were only significantly associated in the US. In 1992, the OR measuring the association between heavy smoking and ever drinking, corrected for gender, race, age and educational background, was 4.5 (CI, 2.5–8.0). In 1996, this OR became even stronger at 6.3 (2.9–13.9) and it appears mainly explained by the very high ORs in Caucasian males (10.7, 2.2–52.8) and Caucasian females (6.9, 1.7–28.5).

Associations that were significantly higher in the US than in the Basque country

The association between ever smoking and ever drinking was significantly stronger in the US than in the Basque Country for both 1992 and 1996. For 1992, the ORs measuring this association, corrected for age, educational background, gender and race were 6.2 (4.4–8.8) in the US versus 3.0 (2.3–3.9) in the Basque Country. For 1996, they were 9.8 (7.5–12.8) versus 2.6 (2.1–3.3), respectively. When comparing samples stratified by gender, US ORs continued to be higher, although the difference was not significant in 1992 females.

Smoking and drinking cessation were associated only in environments without pressure to quit

In subpopulations of ever drinkers who also were ever smokers, significant associations between quitting smoking and quitting drinking were observed only when the proportion of ex-smokers in the subpopulation was less than one third (Table 2). These associations were observed in 1992 US male and female African-Americans, in 1992 male and female Basques, and in 1996 US female African-Americans (Table 2).

Table 1. Comparison of 1992 and 1996 prevalences of current smoking, current drinking and weekly drinking for the US and Basque Country general populations

	US		Basque country	
	1992	1996	1992	1996
Current smoking	27.6% (26.3–28.9) ^c	26.7% ^a (25.0–28.4)	35.9% (34.2–37.6)	23.9% ^b (22.2–25.6)
Current drinking	68.3% (66.6–70.0)	68.7% ^a (66.7–70.7)	82.3% (81.0–83.6)	68.5% ^b (66.6–70.4)
Weekly drinking	22.1% (20.4–23.8)	23.8% ^a (22.3–25.3)	47.0% (45.2–48.8)	45.1% ^a (43.1–47.1)

^a The prevalence was stable across the 2 years.

^b The prevalence decreased significantly from 1992 to 1996.

^c Intervals in brackets are at the 95% confidence level.

Table 2. Prevalences of ex-smokers and associations between smoking cessation and drinking cessation^a

	Prevalences (%)	Significant ORs ^b
1992		
US		
Caucasian males	47.8 (44.4–51.2)	n.s. ^c
Caucasian females	34.5 (30.6–38.4)	n.s. ^c
African–American males	30.3 ^d (24.6–36.0)	4.5 (2.5–8.0)
African–American females	31.2 ^d (24.6–37.8)	2.1 (1.2–3.6)
Basque Country		
Males	18.3 ^d (14.9–21.7)	6.4 (2.6–16.0)
Females	28.7 ^d (25.8–31.6)	3.0 (1.9–4.8)
1996		
US		
Caucasian males	45.7 (39.7–51.7)	n.s. ^c
Caucasian females	41.7 (37.8–45.6)	n.s. ^c
African–American males	33.8 (27.3–40.3)	n.s. ^c
African–American females	28.2 ^d (22.5–33.9)	2.6 (1.5–4.5)
Basque Country		
Males	51.2 (47.2–55.2)	n.s. ^c
Females	41.7 (36.6–46.8)	n.s. ^c

^a All numbers were computed from ever drinkers who also were ever smokers.

^b ORs were adjusted for educational background and age.

^c n.s.: Not significant.

^d Prevalences lower than one third (33.3 %).

Unstable associations that were not well understood

In current smokers who also were current drinkers, our study did not show a consistent association between heavy smoking and weekly drinking. In 1992, the association was significant, irrespective of country, gender or race. For this year, the ORs measuring the association, corrected for age and educational background, ranged between 1.6 (CI, 1.2–2.2) in US Caucasian males and 6.2 (3.2–12.1) in US African–American females. In 1996, only the corrected ORs for Basque males and US African–American males were significant.

DISCUSSION

Alcohol and tobacco are legal substances that are widely used in many populations. Animal studies and clinical studies among alcoholics have suggested that these two substances may potentiate each other in a number of complex ways. One should expect that some of the biological interactions between alcohol and tobacco can be observed in all their users, and can be detected in all social environments. Some other biological interactions between alcohol and tobacco may be specific to vulnerable individuals or may be the result of a chronic use of high doses of at least one of the two substances. Since these latter interactions are restricted to some individuals, they may not be detected in small groups of people or in the presence of unidentified variables with strong confounding effects.

Stable and consistent associations: associations detected in both countries and both years

Our analyses suggest that some associations between alcohol drinking and smoking behaviours are likely to be detected in Western countries where alcohol and nicotine are legal and easily available. Examples of observed stable associations are those between current smoking and current drinking in the general population, and those between weekly drinking and ever smoking among current drinkers.

Other associations

Other associations may be detected only in social contexts that make the effects of vulnerable populations more obvious. In social contexts in which there is considerable social pressure to quit smoking, such as in US Caucasians (particularly in 1996), subjects who continued smoking probably included a high number of subjects with a high vulnerability to nicotine dependence (Breslau *et al.*, 2001). This is usually called the hardening hypothesis, which states that when public health efforts decrease tobacco use, the remaining smokers are the more 'hardcore' smokers (Hughes, 2001). The hardening hypothesis may explain our observation that heavy smoking was strongly associated with ever drinking among US Caucasian smokers, reflecting that alcohol users may be a prominent group within the heavy smokers who cannot stop smoking easily.

When social environment strongly discourages smoking and alcohol initiation (as in the US in 1992 and 1996), the specific subjects who decide to try alcohol also tried smoking

and vice versa. In the Basque Country in 1992, smoking and drinking were not socially stigmatized, so relatively few subjects quit and those who quit probably had serious personal reasons such as medical ones. These atypical subjects may explain the significant association between smoking cessation and drinking cessation among ever drinkers who also were ever smokers. In the other social contexts studied, i.e. the US and the Basque Country in 1996, smoking cessation was more prevalent and probably highly influenced by social pressure.

Prevalences of weekly drinking were higher in the Basque Country. This probably is a reflection of 'social drinking' as a culturally approved behaviour in the Basque Country. Thus, it is possible that in the Basque Country, trying alcohol reflects a socially approved behaviour and not a biologically vulnerable trend. This may explain why there was no significant association between heavy smoking and ever drinking among current smokers in the Basque Country, irrespective of year or gender, not even after correcting for age and educational background. In contrast, in the US, smoking has progressively become an 'inappropriate' behaviour and there has been progressively more social pressure to quit.

It appears that ever drinking is not a good predictor of ever smoking, in places where drinking and smoking are not considered 'bad' behaviours in adolescence, such as in the Basque Country. The association between ever smoking and ever drinking can only be detected if there is some subject selection among those who choose to try these drugs.

Among ever drinkers who also were ever smokers, one can hypothesize the existence of two types of people who quit smoking: social quitters and personal quitters. Social quitters are the ones who decide to quit smoking because everybody is quitting, while personal quitters probably make a strong personal decision driven by the realization that tobacco use has medical consequences. When personal quitters predominate, one should expect that quitting smoking and quitting drinking are associated. When social quitters predominate, one should expect that quitting smoking is frequent and not associated with quitting drinking.

Limitations

The analyses described in this article are secondary analyses, and the surveys were not originally designed to study the associations between alcohol and tobacco use. This study was based on epidemiological surveys that used sophisticated and complex sampling designs to represent the populations. However, epidemiological surveys only provide statistical associations and cannot provide causal connections. This study was based on surveys that recorded subject reports with no further verification of clinical diagnoses by expert clinicians or from other sources. It is always possible that self-reporting has introduced biases in the results. This article used epidemiological definitions of drug use to define tobacco and alcohol use; only a subgroup of tobacco or alcohol users will meet the DSM-IV or ICD-10 diagnostic criteria for abuse or dependence.

In summary, our analyses suggest that some associations between alcohol drinking and smoking behaviours are likely to be detected in Western countries in which alcohol and nicotine are legal and easily available, while other associations

may change with changes in prevalences of current smoking and weekly drinking. Future studies should explore these changes in prevalence in different countries and in multiple years, in order to consider time trend changes more thoroughly.

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REFERENCES

- Anitua, C. and Aizpuru, F. (1996) *Encuesta de Salud, 1992. Metodología y Resultados*. Servicio Central de Publicaciones, Gobierno Vasco, Vitoria-Gasteiz, Spain.
- Anitua, C. and Aizpuru, F. (1997) *Encuesta de Salud, 1996. Metodología y Resultados*, Servicio Central de Publicaciones, Gobierno Vasco, Vitoria-Gasteiz, Spain.
- Bien, T. H. and Burge, R. (1990) Smoking and drinking: a review of the literature. *The International Journal of the Addictions* **25**, 1429–1454.
- Bobo, J. K. (1989) Nicotine dependence and alcoholism epidemiology and treatment. *Journal of Psychoactive Drugs* **21**, 323–329.
- Breslau, N., Johnson, E. O., Hiripi, E. *et al.* (2001) Nicotine dependence in the United States: Prevalence, trends and smoking persistence. *Archives of General Psychiatry* **58**, 810–816.
- Hughes, J. R. (1995) Clinical implications of the association between smoking and alcoholism. In *Alcohol and Tobacco: From Basic Science to Clinical Practice, NIH Publication 95-397*, Ferting, J. B., Allen, J. P. eds, pp. 171–181. United States Department of Health and Human Services, Washington, DC.
- Hughes, J. R. (1996) An overview of nicotine use disorders for alcohol/drug abuse clinicians. *The American Journal of Addictions* **5**, 262–273.
- Hughes, J. R. (2001) Distinguishing nicotine dependence from smoking: Why it matters to tobacco control and psychiatry. *Archives of General Psychiatry* **58**, 817–818.
- Istvan, J. and Matarazzo, J. D. (1984) Tobacco, alcohol, and caffeine use: a review of their interrelationships. *Psychological Bulletin* **93**, 301–326.
- Niaura, R. and Shiffman, S. (1995) Psychosocial and biological mechanism. In *Alcohol and Tobacco: From Basic Science to Clinical Practice, NIH Publication 95-397*, Ferting, J. B., Allen, J. P. eds, pp. 159–168. United States Department of Health and Human Services, Washington, DC.
- Room, R. (2004) Smoking and drinking as complementary behaviors. *Biomedicine and Pharmacotherapy* **58**, 111–115.
- Shah, B. V., Barnwell, B. G. and Bieler, G. S. (1997) *SUDAAN User's Manual, Release 7.5*. Research Triangle Institute, Research Triangle Park, NC.
- Shiffman, S. and Balabanis, M. (1995) Association between alcohol and tobacco. In *Alcohol and Tobacco: From Basic Science to Clinical Practice, NIH Publication 95-397*, Ferting, J. B., Allen,

- J.P. eds, pp. 17–37. United States Department of Health and Human Services, Washington, DC.
- Swan, G. R., Carmelli, D., Rosenman, R. H. *et al.* (1990) Smoking and alcohol consumption in adult male twins: genetic heritability and shared environmental influences. *Journal of Substance Abuse* **2**, 39–50.
- Tyndale, R. F. (2003) Genetics of alcohol and tobacco use. *Annals of Medicine* **35**, 94–121.
- United States Department of Health and Human Services. Substance Abuse and Mental Health Services Administration. Office of Applied Studies. (1997) *National Household Survey on Drug Abuse: Population Estimates, 1996, DHHS Publication No. (SMA) 97-3137*. United States Government Printing Office, Hyattsville, MD.
- United States Department of Health and Human Services. Substance Abuse and Mental Health Services Administration. Office of Applied Studies. (1998) *National Household Survey on Drug Abuse: Main Findings, 1996, DHHS Publication No. (SMA) 98-3165*. United States Government Printing Office, Hyattsville, MD.
- Woodward, M. (1999) *Epidemiology. Study design and data analysis*, Chapman and Hall/CRC, Boca Raton, FL.