

LONGITUDINAL EVALUATION OF SMOKE-FREE SCOTLAND ON PUB AND HOME
DRINKING BEHAVIOR: FINDINGS FROM THE INTERNATIONAL TOBACCO CONTROL (ITC)
POLICY EVALUATION PROJECT

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Abstract: On March 26, 2006 Scotland implemented a smoke-free policy prohibiting smoking in indoor public venues, including bars and pubs. Drinking and smoking are highly associated behaviors, so we evaluated whether the regulations would decrease drinking behavior in public venues among smokers. We further assessed whether this effect would be more pronounced in heavier drinkers, and whether decreases in drinking behavior in pubs would be offset by increased drinking in the home. Participants (n=1,059) were adult smokers and non-smokers from Scotland and from the rest of the United Kingdom, which did not have comprehensive smoke-free policies during the study period. Data was collected using a random digit-dialed telephone survey from February to March 2006, just prior to the policy implementation in Scotland. Follow-up surveys were conducted in March 2007. Using baseline data, participants were categorized into abstainers, moderate drinkers, and heavy drinkers. Overall, results demonstrated that drinking behavior did not change significantly in Scotland compared to the rest of the UK following the implementation of the smoke-free policy in Scotland. However, planned comparisons examining mean changes in drinks consumed in pubs or bars following the legislation demonstrated that the smoke-free legislation was associated with reduced drinking behavior in pubs and bars among moderate and heavy drinking smokers in Scotland. These moderate and heavy drinking Scottish smokers also reduced their pub attendance following policy implementation. The smoke-free Scottish law did not increase drinking in the home. These findings suggest that there may be additional alcohol-related public health benefits to smoke-free policies in those at greater risk for alcohol-related health problems.

KEYWORDS: International tobacco control, smoke-free, alcohol, Scotland, longitudinal

INTRODUCTION

On March 26, 2006, Scotland implemented a smoke-free policy prohibiting smoking in indoor public venues, including bars and pubs. Evidence supporting the public health significance of smoke-free policies is clear. Exposure of non-smokers to passive smoke is reduced, as is their risk of respiratory symptoms (Heloma, Jaakola, Kahkonen, & Reijula, 2001; Farrelly et al., 2005; Eisner et al. 1998; Menzies et al. 2006). Recent evidence suggests that smokefree policies reduces the rate of coronary heart disease in the population (Barnoya & Glantz, 2006; Juster et al. 2007; Sargent et al., 2004). Moreover, such policies may reduce overall levels of smoking (Fichtenberg & Glantz, 2002) and motivate smokers to make their homes smoke-free (Borland et al., 2006; Fong et al., 2006). In addition to the smoking-related benefits accrued by smoke-free pub policies, there may be additional public health benefits associated with possible concomitant reductions in drinking behavior.

It is well established that alcohol consumption and tobacco use are highly correlated in both clinical and non-clinical samples. Among those with alcohol use disorders, 34.5% are nicotine dependent (Grant et al., 2004). Smokers have a four to ten-fold increased risk for alcohol use disorders (DiFranza & Guerrera, 1990; Grant et al., 2004; Hurt et al., 1994; McKee et al., 2007) and the severity of alcohol and tobacco dependence is positively correlated (Ellingstad et al., 1999; Gulliver et al., 1995). Smoking is also highly correlated with drinking in individuals who do not meet criteria for alcohol use disorders (Carmody et al., 1985; Istvan & Matarazza, 1984), particularly among those who are heavy drinkers (Henningfield et al., 1984; McKee et al., 2007; Mello et al., 1987).

Both laboratory studies and naturalistic observations have demonstrated that alcohol consumption is strongly associated with increased rates of smoking (e.g., Glautier et al., 1996; Griffiths et al., 1976; Mintz et al., 1985; Mitchell et al., 1995; Shiffman et al., 1994), and conversely, that smoking increases alcohol consumption (Barrett et al., 2006; Mello et al., 1980; 1987). Given that smoking can increase alcohol consumption during a drinking episode, we

were interested in examining whether public health benefits associated with smoke-free policies would extend to reductions in drinking behavior, particularly among heavy drinkers. Heavy alcohol consumption is associated with significant health risk (i.e., hypertension, gastrointestinal bleeding, sleep disorders, major depression, hemorrhagic stroke, cirrhosis of the liver, and several cancers; Rehm et al., 2003), and is a leading cause of death (McGinnis & Foege, 1993; Meister et al., 2000). Additionally, concurrent alcohol and tobacco use is known to further exacerbate health risks associated with the singular use of each substance (Blot et al., 1988; Hurt et al., 1996; Klatsky & Armstrong, 1992; Rosengren et al., 1993; Valliant et al., 1991).

Few studies have examined the impact of smoking policies on alcohol consumption. Using longitudinal data from the US Health and Retirement Survey (1992-2002), Picone and colleagues (Picone, Sloan, & Torgdon, 2004) found that smoking regulations reduced alcohol consumption in females. However, this was a generalized population effect that did not consider when specific state policies were enacted, nor did it evaluate reductions in alcohol consumption as a function of smoking status or of heavy drinking status.

The primary aim of the current study was to prospectively evaluate the impact of Scotland's smoke-free policy (prohibiting smoking in indoor public venues, including bars and pubs) on drinking behavior. As drinking and smoking are highly associated behaviors, we evaluated whether the regulations would decrease drinking behavior in public venues among smokers in Scotland. The rest of the United Kingdom (England, Wales, and Northern Ireland), which did not have comprehensive smoke-free policies during the study period served as the comparison group. We further assessed whether this effect would be most pronounced in heavier drinkers, and whether changes in drinking behavior would be reflected in changes to pub attendance. Finally, we also assessed whether any decreases in drinking behavior in public venues would be offset by increased drinking in the home. While some have expressed concern that smoke-free policies may reduce drinking in pubs by increasing drinking in the home (see Reid, 2005), we have not found support for this effect using a cross-sectional design (Hyland et al., 2007). The

present study examines the effect of smoke-free policies on changes in drinking behavior and location, using a more rigorous longitudinal design.

METHODS

Sample

To evaluate the impact of Scotland's smoke-free policy on pub and home drinking behavior, we examined drinking behavior just prior to, and 1 year following the policy implementation. The rest of the United Kingdom, which did not have comprehensive smoke-free policies during the study period, served as the comparison group. Respondents were adult smokers and non-smokers, from Scotland (n=525, smokers = 309, non-smokers = 216) and the rest of the United Kingdom (n=534, smokers = 305, non-smokers = 229) who were surveyed on both occasions (retention rate=66%). Data was collected by random digit-dialed telephone survey from February to March, 2006, just prior to the policy implementation of the smoke-free law in Scotland on March 26, 2006. Follow-up surveys were collected in March, 2007, 1 year following the policy implementation. The survey field work was conducted by Roy Morgan Research (Melbourne, Australia), using computer assisted telephone interviewing software. Surveys took an average of 40 minutes to complete, and were conducted by trained interviewers. These respondents were part of a larger cohort study conducted as part of the International Tobacco Control (ITC) Policy Evaluation Project that has been previously described (see Fong, Cummings, Borland, et al., 2006 for a complete description of survey and data management procedures).

Respondents were recruited using probability sampling methods with telephone numbers selected at random from the population of each country, within strata defined by geographic region and community size. List assisted numbers were obtained from Survey Sampling International. Eligible households were defined as residential homes containing at least one adult. A household informant was asked to provide the number of adult smokers in the home. Smokers received a £7 voucher to a health and beauty retailer (Boots) as an incentive to take

part, while nonsmokers received a smaller £4 Boots voucher commensurate with the shorter duration of the non-smoker survey. The study protocol was standardized across the two regions and was reviewed and cleared by the Research Ethics Board or Institutional Review Board of the University of Waterloo, the University of Stirling, and Roswell Park Cancer Institute.

Measures

The measures included in the ITC Scotland/UK Survey were originally adapted from the ITC Four Country Survey (ITC-4), a cohort telephone survey of over 2000 adult smokers in each of four countries, Canada, USA, UK, and Australia, conducted annually since 2002 (Fong, Cummings, Borland, et al., 2006).

Drinking patterns

Given that our primary outcome was quantity of drinks consumed per week (drinks per day and beverage type were not available), we used the National Institute on Alcohol Abuse and Alcoholism's (NIAAA) weekly guidelines to determine moderate and heavy drinking status (USDHHS, 2006). NIAAA defines heavy or hazardous drinking as those exceeding gender-specific weekly limits (males – more than 14 drinks per week; females- more than 7 drinks per week). In order to determine participants' drinking status, we employed the question "In a typical week when you do drink alcohol, how many alcoholic drinks do you usually consume?" A typical drink was defined as a small glass of wine, half pint of beer, or a standard measure of spirits. Using drinking data obtained prior to the implementation of the smoke-free policy, participants who reported consuming no alcohol on a weekly basis were coded as abstainers (n=222). Those consuming alcohol, but not exceeding the gender-specific weekly limits (Males ≤ 14 , females ≤ 7) were coded as moderate drinkers (n=573) which also included low or minimal drinkers. Participants who exceeding the gender-specific weekly drinking limits were coded as heavy drinkers (n=254).

The measure that we employed to assess changes in drinking across different locations was adapted from Treno et al. (2000). Across both waves, respondents were asked: “In the past week, approximately how many alcoholic beverages have you consumed *over the entire week* at each of the following places? : At home, at the homes of others, at parties or events in a social venue, at pubs or bars, at restaurants, or somewhere else?” Changes in drinking were calculated as post-legislation drinking quantities minus pre-legislation drinking quantities across home, pub, and all locations.

Smoking patterns

A smoker was defined as an individual who reported having smoked at least 100 cigarettes lifetime, and who also reported currently smoking at least once per month. A non-smoker was defined as an individual who reported no smoking in the past month. Participants were asked, “How often have you allowed yourself a cigarette”. The following responses indicated current smoking; “Daily”, “Less than daily but at least once per week”, “Less than weekly but at least once per month”. Participants also reported the mean number of cigarettes smoked per day.

Pub Attendance

At the 1-year follow-up assessment, participants were asked “Do you now visit pubs more often than a year ago, less often, or about the same amount?” Responses for pub attendance were categorized as either “the same or more often’ or as ‘less often”.

Statistical Analysis

Chi-square analyses were conducted to evaluate the absolute and relative frequencies of drinking status by region (Scotland, U.K.) across demographic variables and smoking status. For drinking locations (all, home, pub) we conducted separate baseline mean comparisons of drinking amounts across regions (Scotland, UK), within smoking status (smoker, non-smoker), drinking status (moderate, heavy drinker). Separate linear regressions, controlling for demographic variables, were used to evaluate main and interactive changes in drinking amounts (post-legislation minus pre-legislation values) by smoking status (smoker, non-

smoker), drinking status (moderate, heavy), and region (Scotland, UK). To further test our hypotheses, a-priori mean comparisons of changes in drinks consumed in pubs and homes pre to post-legislation across region (Scotland, UK) were conducted within smoking status (smoker, non-smoker) and drinking status (moderate, heavy drinker). Chi-square analyses were conducted to examine changes in pub attendance ('same or more' vs. 'less') by drinking status (abstainer, moderate, heavy) within smoker (smoker vs. non-smoker) and region (Scotland, UK) categories. Results are weighted to be nationally representative of the smoker demographics within each country.

RESULTS

Baseline characteristics

Demographic characteristics and smoking status for each region (Scotland, U.K.) by drinking status at baseline are presented in Table 1. Drinking status was associated with sex, age, ethnicity, education, income, and smoking status. Given these results, we included the demographic variables as control variables in the primary regression analyses assessing changes in drinking behavior.

Baseline drinking behavior is presented in Table 2. Overall, smokers consumed more alcohol than non-smokers and baseline drinking was equivalent between Scotland and the UK with two exceptions. Mean comparisons demonstrated that drinking across all locations in moderate drinking smokers was greater in Scotland compared to the UK. Heavy drinking non-smokers consumed more drinks in the home in the UK compared to Scotland.

Changes in drinking behavior pre to post-legislation

Regression analyses of changes in overall drinking behavior across all drinking locations demonstrated there were no main or interactive effects of drinking status, smoking status, or region on changes in drinking behavior pre- to post-legislation in the home or in pubs (data not shown). However, a-priori comparisons of changes in drinking behavior demonstrated significant effects of region, within smoking and drinking status (see Figures 1a-c). Figure 1a

shows that significant decreases in the total number of weekly drinks consumed were observed in Scottish moderate drinkers compared to moderate drinkers in the rest of the UK, but that small increases in total weekly consumption were observed among Scottish non-smokers. When the results were stratified by the location drinks were consumed, strong and consistent associations were observed such that Scottish smokers had decreased their weekly drink consumption in pubs by about 4 drinks per week relative to English smokers (Figure 1b). Specifically, Scottish heavy drinking smokers demonstrated the greatest reductions in pub drinking behavior pre- (12.02 drinks/week) to post-legislation (6.31 drinks/week, 47.5% reduction), compared to heavy drinking smokers in the UK (7.66 drinks/week pre-Scottish legislation to 5.72 drinks/week post-Scottish legislation). No differences were observed in the number of drinks consumed at home (Figure 1c).

Change in pub attendance

During the post-legislation period, there were no overall differences in pub attendance between smokers in Scotland and the UK (see Table 3). However, when drinking status was considered, heavy and moderate drinking smokers in Scotland were less likely to frequent pubs or bars compared to moderate and heavy drinking smokers in the rest of the UK, but fewer Scottish smokers who abstained from alcohol reported going to pubs less often compared to rest of the UK abstaining smokers. Fewer Scottish non-smokers also reported going to pubs less often compared to non-smokers in the rest of the UK, regardless of their level of alcohol consumption.

DISCUSSION

When overall alcohol consumption was considered, there were no statistical differences in drinking among Scottish participants compared to those in the rest of the UK. However, in subset analyses, significant decreases in alcohol consumption in pubs were observed among both moderate and heavy drinking Scottish smokers compared to smokers in the rest of the UK,

and no commensurate increase in home drinking was observed. Consistent with these findings, we observed decreases in self-reported pub patronage among Scottish smokers who consumed alcohol compared to smokers in the rest of the UK. However, Scottish non-smokers reported more pub patronage after the smoke-free law, which is consistent with another report showing no overall change in the frequency of pub patronage but some increases among non-smokers and some decreases among smokers (Hyland et al. 2007). These empirical results from the present study are similar to those demonstrating that smoke-free policies do not have an adverse economic impact on the hospitality sector (CDC, 2004; Cowling & Bond, 2005; Hirasuna, 2006; Ludbrook, Bird, Teiflingen, 2005; Smoke Free Europe Partnership, 2005; Scollo et al., 2003; Thomson & Wilson, 2006). While some people may decrease their spending in pubs and restaurants, others may increase their spending yielding no discernable net effect.

The finding that the heaviest drinking smokers in Scotland reduced their alcohol consumption in pubs by about 6 drinks per week (47.5% of baseline levels) is consistent with findings suggesting that alcohol and tobacco interactions appear to be most pronounced in heavier drinkers (Henningfield et al., 1984; McKee et al., 2007; Mello et al., 1987). Findings such as these indicate that smoking restrictions may have additional public health benefits as a result of lowered alcohol consumption among those at the greatest risk for negative alcohol-related consequences (Rehm et al., 2003). We also explored whether there was evidence for an interactive relationship between country and amount smoked and two demographic factors, gender and SES. No statistically significant associations were observed, although the results trended toward seeing larger decreases in drinking behavior in heavier smokers and men who lived in Scotland. To examine how smokefree policies may impact various subpopulations, more detailed future study designed expressly to address this question needs to be conducted.

The present study shows that drinking behavior is not displaced from pubs to the home, and this is consistent with other studies that have shown that smoking inside the home does not increase following smokefree pub legislation (Fong et al. 2006, Hyland 2007). The theory that

smokefree policies somehow displace drinking and smoking behaviors from pubs into homes is not empirically supported by the current study.

We were unable to examine the effect of the smoke-free policy on the intensity of drinking during a drinking episode because of the way alcohol use was queried. Future investigations of the effect of smoke-free policies on alcohol consumption would benefit from collecting more detailed information concerning weekly frequency of consumption by location, and quantity of drinks consumed per episode for each location. Investigators could then disentangle the potential effects of smoke-free policies on frequency and quantity of alcohol consumption for each drinking location. Additionally, it would be beneficial to determine whether daily drinking limits have been exceeded. NIAAA guidelines (USDHHS, 2005) defines excessive drinking as males who exceed five drinks in a day, and females who exceed four drinks in a day at least once in the past year. These daily drinking limits are consistent with the UK Department of Health Guidelines (2007) for low-risk single occasion drinking, which suggest that men not consume more than 3-4 units per day (8g of pure alcohol per unit), and females not consume more than 2-3 units per day. Exceeding daily drinking limits has been shown to be more predictive of negative alcohol-related consequences than exceeding weekly drinking limits (Dawson, Grant, & Li, 2005).

Strengths of this study include the longitudinal cohort design, evaluating smoking status and drinking behavior across locations in Scotland and a matched control group in the rest of the UK prior to and following implementation of the smoke-free legislation. Both alcohol and tobacco excise taxes are the same throughout the UK, ruling out this potential confounding influence. Potential limitations include a lack of biochemical or collateral confirmation of smoking and drinking behavior, respectively. However, there is no reason to think that there would be a difference in bias due to self-report in Scotland versus the rest of the UK. Additionally, 34% of the cohort was lost to follow-up between waves; however, drinking and country status were not significant predictors of being lost to follow-up. Smokers were less likely to complete the follow-

up interview; however, this was not differential between countries; therefore, we do not expect this factor to alter the findings and conclusions. However, it is unknown whether these results will generalize to other countries.

One year following the implementation of the smoke-free policy in Scotland, the smoke-free legislation had some effect on reducing drinking behavior in moderate and heavy drinking smokers in Scottish pubs without any increase in drinking in the home in Scotland. Although future studies should assess the longer-term impact of smoke-free policies on drinking behavior using a more detailed assessment of alcohol use, this study provides some initial indications that the public health benefits of smoke-free policies may extend beyond smoking-related outcomes.

REFERENCES

- Barnoya, J. & Glantz, S.A. (2006). Cardiovascular effects of second-hand smoke help explain the benefits of smoke-free legislation on heart disease burden. *Journal of Cardiovascular Nursing*, 457-462.
- Barrett, S.P., Tichauer, M., Leyton, M., Pihl, R.O. (2006). Nicotine increases alcohol self-administration in non-dependent male smokers. *Drug and Alcohol Dependence*, 81, 297-204.
- Blot, W. J., McLaughlin, J. K., Winn, D. M., Austin, D. F., Greenberg, R. S., Preston-Martin, S., et al. (1988). Smoking and drinking in relation to oral and pharyngeal cancer. *Cancer Research*, 48, 3282-3287.
- Borland, R., Yong, H. H., Cummings, K. M., Hyland, A., Anderson, S., & Fong, G.T. (2006). Determinants and consequences of smoke-free homes: Findings from the International Tobacco Control (ITC) Four Country Survey. *Tobacco Control*, 15, 42-50.
- Carmody, T. P., Brischetto, C., Matarazzo, J., O'Donnell, R. P., & Connor, W. E. (1985). Concurrent use of cigarettes, alcohol, and coffee in healthy community-living men and women. *Health Psychology*, 4(4), 323-335.
- Centers for Disease Control and Prevention (CCD). (2004). Impact of a smoking ban on restaurant and bar revenues- El Paso, Texas, 2002. *MMWR – Morbidity & Mortality Weekly Report*, 53(7), 150-152.
- Cowling, D. W., & Bond, P. (2005). Smoke-free laws and bar revenues in California- the last call. *Health Economics*, 14, 1273-1281.
- Dawson, D. A., Grant, B. F., & Li, T-K. (2005). Quantifying the risks associated with exceeding recommended drinking limits. *Alcoholism: Clinical and Experimental Research*, 29, 902-908.
- DiFranza, J. R., & Guarrera, M. P. (1990). Alcoholism and smoking. *Journal of Studies on Alcohol*, 51, 130-135.
- Ellingstad, T. P., Sobell, L. C., Sobell, M. B., Cleland, P. A., & Agrawal, S. (1999). Alcohol abusers who want to quit smoking: Implications for clinical treatment. *Drug and Alcohol Dependence*, 54, 259-264.
- Eisner, M.D., Smith, A. K., Blanc, P. D., (1998). Bartenders' respiratory health after establishment of smoke-free bars and taverns, *JAMA*, 280, 1909-1914.
- Farrelly, M. C., Nonnemaker, J. M., Chou, R., Hyland, A., Peterson, K. K., & Bauer, U. E. (2005). Changes in hospitality workers' exposure to secondhand smoke following the implementation of New York's smoke-free law. *Tobacco Control*, 14(4), 236-241.
- Fichtenberg, C. M., & Glantz, S. A. (2002). Effect of smoke-free workplaces on smoking behaviour: Systematic review. *BMJ*, 325, 188-191.
- Fong, G. T., Hammond, D., Laux, F. L., Zanna, M. P., Cummings, K. M., Borland, R., et al. (2004). The near-universal experience of regret among smokers in four countries: Finds from the International Tobacco Control Policy Evaluation Survey. *Nicotine and Tobacco Research*, 6(Suppl. 3), S341-351.
- Fong, G. T., Hyland, A., Borland, R., Hammond, D., Hastings, G., McNeill, A., et al. (2006). Reductions in tobacco smoke pollution and increases in support for smoke-free public places following the implementation of comprehensive smoke-free workplace legislation in the Republic of Ireland: Findings from the ITC Ireland/UK Survey. *Tobacco Control*, 15, 51-58.
- Glautier, S., Clements, K., White, J. A., Taylor, C., & Stolerman, I. P. (1996). Alcohol and the reward value of cigarette smoking. *Behavioral Pharmacology*, 7, 144-154.
- Grant, B., Stinson, F., Dawson, D., Chou, S., Dufour, M., Compton, W., Pickering, R., & Kaplan, K. (2004). Prevalence and co-occurrence of substance use disorders and independent

- mood and anxiety disorders: results from the national epidemiologic survey on alcohol and related conditions. *Archives of General Psychiatry*, 61, 807-816.
- Griffiths, R. R., Bigelow, G. R., & Liebson, I. (1976). Facilitation of human tobacco self-administration by ethanol: A behavioral analysis. *Journal of Experimental and Analytical Behavior*, 25, 279-292.
- Gulliver, S. B., Rohsenow, D. J., Colby, S. M., Dey, A. N., Abrams, D. B., Niaura, R. S., et al. (1995). Interrelationship of smoking and alcohol dependence. *Journal of Studies on Alcohol*, 56, 202-206.
- Heloma, A., Jaakkola, M. S., Kahkonen, E., & Reijula, E. (2001). The short-term impact of national smoke-free workplace legislation on passive smoking and tobacco use. *American Journal of Public Health*, 91, 1416-1418.
- Henningfield, J. E., Chait, L. D., & Griffiths, R. R. (1984). Effects of ethanol on cigarette smoking volunteers without histories of alcoholism. *Psychopharmacology*, 82, 1-5.
- Menzies, D., Nair, A., Williamson, P. A., Schembri, S., Al-Khairalla, M. Z. H., Barnes, M. et al. (2006). Respiratory symptoms, pulmonary function, and markers of inflammation among bar workers before and after a legislative ban on smoking in public places, *JAMA*, 296, 1742-1748.
- Hirasuna, D. (2006, March). *Review of economic studies on smoking bans in bars and restaurants*. Retrieved May 2006, from the Minnesota House of Representatives Web site: <http://www.house.leg.state.mn.us/hrd/pubs/smokeban.pdf>
- Hurt, R. D., Eberman, K. M., Croghan, I. T., Offord, K. P., Davis L. J. Jr., Morse, R. M., et al (1994). Nicotine dependence treatment during inpatient treatment for other addictions: A prospective intervention trial. *Alcoholism: Clinical & Experimental Research*, 4, 867-72.
- Hurt, R. D., Offord, K. P., Croghan, I. T., Gomez-Dahl, L., Kottke, T. E., Morse, R. M., et al. (1996). Mortality following inpatient addictions treatment: Role of tobacco use in a community-based cohort. *JAMA*, 275, 1097-1103.
- Hyland, A., Higbee, C., Hassan, L., Fong, G. T., Borland, R., Cummings, K. M., et al. Does smoke-free Ireland have more smoking inside the home and less in pubs than the United Kingdom? Finds from the international tobacco control policy evaluation project. *European Journal of Public Health Advance Access*. Retrieved July 2007 from <http://eurpub.oxfordjournals.org/cgi/reprint/ckm054v3?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=Hyland&searchid=1&FIRSTINDEX=0&resourcetype=HWCIT>
- Istvan, J., & Matarazza, J. D. (1984). Tobacco, alcohol, and caffeine use: A review of their interrelationships. *Psychological Bulletin*, 95, 301-326.
- Juster, H. R., Loomis, B. R., Hinman, T. M., Farrelly, M.C., Hyland, A., Bauer, U. E., Birkhead, G. S. (2007). Declines in Hospital Admissions for Acute Myocardial Infarction in New York State After Implementation of a Comprehensive Smoking Ban. *American Journal of Public Health*, online, [PMID: 17901438].
- Klatsky, A. L., & Armstrong, M. A. (1992). Alcohol, smoking, coffee, and cirrhosis. *American Journal of Epidemiology*, 136, 1248-1257.
- Ludbrook, A., Bird, S., & Van Teijlingen, E. (2004). Economic impacts of restrictions on smoking in public places. In *International review of the health and economic impact of the introduction of the restrictions of smoking in public places* (pp. 51-64). Edinburgh, UK: NHS Health Scotland. Retrieved May 2006 from <http://www.hebs.com/researchcentre/pdf/InternationalReviewFullReport.pdf>
- McGinnis, J. M., & Foege, W. H. (1993). Actual causes of death in the United States. *JAMA*, 270, 2207-2212.
- McKee, S. A., Falba, T., O'Malley, S. S., Sindelar, J., & O'Connor, P. G. (2007) Smoking status is a clinical indicator for alcohol misuse in US adults. *Archives of Internal Medicine*, 167, 716-721.

- Meister K.A., Whelan, E.M., Kava, R. (2000). The health effects of moderate alcohol intake in humans: an epidemiologic review. *Critical Reviews in Clinical Laboratory Sciences*, 37, 261-296.
- Mello, N. K., Mendelson, J. H., Sellers, M. L., & Kuehnle, J. C. (1980). Effect of alcohol and marijuana on tobacco smoking. *Clinical Pharmacology and Therapeutics*, 27, 202-209.
- Mello, N. K., Mendelson, J. H., & Palmieri, S. L. (1987). Cigarette smoking by women: Interactions with alcohol use. *Psychopharmacology*, 93, 8-15.
- Mintz, J., Boyd, G., Rose, J. E., Charuvastra, V. C., & Jarvik, M. C. (1985). Alcohol increases cigarette smoking: A laboratory demonstration. *Addictive Behaviors*, 10, 203-207.
- Mitchell, S. H., deWit, H., & Zacny, J. P. (1995). Effects of varying ethanol dose of cigarette consumption in healthy normal volunteers. *Behavioral Pharmacology*, 6, 359-365.
- Picone, G. A., Sloan, F., & Trogdon, J. G. (2004). The effect of the tobacco settlement and smoking bans on alcohol consumption. *Health Economics*, 13, 1063-1080.
- Rehm, J., Room, R., Graham, K., Monteiro, M., Gmel, G., & Sempos C. T. (2003). The relationship of average volume of alcohol consumption and patterns of drinking to burden of disease: An overview. *Addiction*, 98(9), 1209-1228.
- Reid, J. (2005, February 23). Oral testimony given at Health Select Committee, , United Kingdom.
- Rosengren, A., Wilhelmsen, L. & Wedel, H. (1993). Separate and combined effects of smoking and alcohol abuse in middle-aged men. *ACTA Medica Scandinavia*, 223, 111-118.
- Sargent, R. P., Shepard, R. M., & Glantz, S. A. (2004). Reduced incidence of admissions for myocardial infarction associated with public smoking ban: before and after study, *BMJ*, 328, 977-980.
- Scollo, M., Lal, A., Hyland, A., & Glantz, S. (2003). Review of the quality of studies on the economic effects of smoke-free policies on the hospitality industry. *Tobacco Control*, 12, 13-20.
- Shiffman, S. M., Fischer, L. A., Paty, J., Gnys, M., Hickcox, M., & Kassel, J. D. (1994). Drinking and smoking: A field study of their association. *Annals of Behavioral Medicine*, 16, 203-209.
- Smoke Free Europe Partnership. (n.d.). *Smoke Free Europe makes economic sense: A report on the economic aspects of smokefree policies*. Retrieved October 3, 2005, from http://www.smokefreeeurope.com/economic_report.htm
- Thomson, G., & Wilson, N. (2006). One year of smoke free bars and restaurants in New Zealand: Impacts and responses. *BMC Public Health*, 6, 64.
- Treno, A. J., Alaniz, M. I., & Gruenewald, P. J. (2000). The use of drinking places by gender, age and ethnic groups: An analysis of routine drinking activities. *Addiction*, 94, 537-551.
- Vaillant, G.E., Schnurr, P.P., Baron, J.A., et al. (1991). A prospective study of the effects of cigarette smoking and alcohol abuse on mortality. *J Gen Intern Med*, 6, 299-304.
- United Kingdom Department of Health. (2007). *Policy and guidance: Alcohol misuse*. Retrieved from www.dh.gov.uk/en/Policyandguidance/Healthandsocialcaretopics/Alcoholmisuse/index.htm
- U.S. Department of Health and Human Services. (2005). *Helping patients who drink too much: A clinician's guide*. (NIH Publication No. 07-3769). Retrieved May 25, 2006, from <http://pubs.niaaa.nih.gov/publications/Practitioner/CliniciansGuide2005/guide.pdf>

Table 1: Demographic characteristics by region and drinking status at pre-legislation baseline.

Variable (n, %)		Scotland				Rest of the United Kingdom			
		All (n=525)	Abstainer (n=121) 23.1%	Moderate Drinker (n=253) 48.1%	Heavy ^a Drinker (n=146) 27.7%	All (n=534)	Abstainer (n=102) 19.0%	Moderate Drinker (n=321) 60.0%	Heavy Drinker (n=109) 20.4%
Sex	Female	260, 49.5%	67, 26.0%	123, 47.7%	68, 26.4%	270, 50.5%	71, 26.5%	146, 54.5%	51, 19.0% *
	Male	265, 50.5%	54, 20.6%	130, 49.6%	78, 29.8%	264, 49.5%	31, 11.7%	175, 66.3%	58, 22.0%
Age	18-24	60, 11.5%	8, 13.8%	10, 17.2%	40, 69.0% *	69, 12.9%	10, 14.5%	41, 59.4%	18, 26.1%
	25-39	129, 24.6%	18, 14.0%	71, 55.0%	40, 31.0%	161, 30.2%	29, 18.1%	97, 60.6%	34, 21.3%
	40-54	171, 32.6%	36, 21.3%	94, 55.6%	39, 23.1%	149, 28.0%	25, 16.8%	87, 58.4%	37, 24.8%
	55+	164, 31.3%	58, 35.8%	78, 48.1%	26, 16.0%	155, 29.0%	38, 24.8%	95, 62.1%	20, 13.1%
Ethnicity	White	500, 95.3%	107, 21.6%	244, 49.3%	144, 29.1% *	475, 88.9%	78, 16.6%	289, 61.4%	104, 22.1% *
	Other	23, 4.4%	14, 60.9%	8, 34.8%	1, 4.3%	57, 10.7%	23, 40.4%	30, 52.6%	4, 7.0%
Education ^b	Low	272, 51.9%	77, 28.6%	134, 49.8%	58, 21.6% *	275, 51.4%	71, 26.1%	156, 57.4%	45, 16.5% *
	Moderate	157, 29.9%	28, 18.2%	68, 44.2%	58, 37.7%	154, 28.9%	19, 12.4%	95, 62.1%	39, 25.5%
	High	94, 18.0%	16, 17.0%	49, 52.1%	29, 30.9%	104, 19.4%	11, 10.6%	68, 65.4%	25, 24.0%
Income ^c	Low	184, 35.1%	60, 32.8%	81, 44.3%	42, 23.0% *	141, 26.5%	40, 28.4%	82, 58.2%	19, 13.5% *
	Moderate	146, 27.8%	36, 25.0%	63, 43.8%	45, 31.3%	150, 28.1%	32, 21.6%	91, 61.5%	25, 16.9%
	High	155, 29.6%	18, 11.7%	96, 62.3%	40, 26.0%	207, 38.7%	23, 11.2%	125, 60.7%	58, 28.2%
Smoking Status ^d	Smoker	309, 58.9%	82, 27.1%	123, 40.6%	98, 32.3% *	305, 57.1%	58, 19.1%	163, 53.6%	83, 27.3% *
	Non-smoker	216, 41.1%	39, 18.1%	129, 59.7%	48, 22.2%	229, 42.9%	43, 18.9%	158, 69.6%	26, 11.5%
Cigarettes per day ^e	1-20	247, 80.1%	58, 23.8%	105, 43.0%	81, 33.2% *	251, 82.4%	49, 19.6%	134, 53.6%	67, 26.8%
	21+	62, 19.9%	24, 41.4%	18, 31.0%	16, 27.6%	54, 17.6%	9, 17.0%	28, 52.8%	16, 30.2%

^a Drinking status was calculated from the total number of drinks of alcoholic beverages consumed in a typical week at baseline. For males, abstainers=0; 1-14 drinkers=moderate; 15+ drinks=heavy. For females, abstainer=0; 1-7 drinks=moderate; 8+ drinks=heavy.

^b Education; low=secondary/vocational level 3 or less; moderate=college/university (no degree); high=completed university or post graduate.

^c Income; low=30,000 or under; moderate=30,000 – 44,999; high=45,000 and over (€ in Ireland, £ in the UK)

^d Smoking was defined as any cigarette smoking in the past 30 days

^e In the subset of smokers

*p<0.05, Chi-square test of each variable by drinking status level.

Table 2: Mean (SE) alcoholic beverages consumed in a typical week at pre-legislation baseline by smoking status, drinking status, and region (among those who reported alcohol consumption at baseline and completed both survey waves, n = 828).

Smoking Status ^a	Drinking Status ^b	Region	Alcoholic Beverages Consumed in a Typical Week at Baseline (mean, SE)				
			All ^c	At Home	In Pubs/Bars		
Smoker	Moderate (n=286)	Rest of the U.K.	5.00 (0.24)*	2.78 (0.36)	2.67 (0.36)		
		Scotland	5.91 (0.32)	3.11 (0.42)	1.79 (0.31)		
	Heavy (n=181)	Rest of the U.K.	23.45 (1.52)	11.00 (1.44)	7.66 (0.91)		
		Scotland	25.47 (2.02)	8.64 (1.26)	12.02 (1.89)		
		Non-Smoker	Moderate (n=287)	Rest of the U.K.	4.44 (0.24)	2.26 (0.24)	1.00 (0.17)
				Scotland	4.30 (0.25)	1.92 (0.24)	1.47 (0.34)
Heavy (n=74)	Rest of the U.K.	17.05 (1.80)	10.66 (2.10)*	4.22 (1.34)			
	Scotland	17.59 (1.13)	6.73 (0.81)	6.88 (1.23)			

^a Smoking was defined as any cigarette smoking in the past 30 days

^b Drinking status was calculated from the total number of drinks of alcoholic beverages consumed in a typical week at baseline. For males, 1-14 drinkers=moderate; 15+ drinks=heavy. For females, 1-7 drinks=moderate; 8+ drinks=heavy.

^c From a general question about the number of alcoholic drinks consumed in the past 7 days.

* p<.05, mean comparison of U.K. versus Scotland, within smoking and drinking status.

Table 3: Pub attendance 1-year post-legislation (same or more often than pre-legislation versus less often than pre-legislation) by drinking status, smoking status, and region (n=1,045).

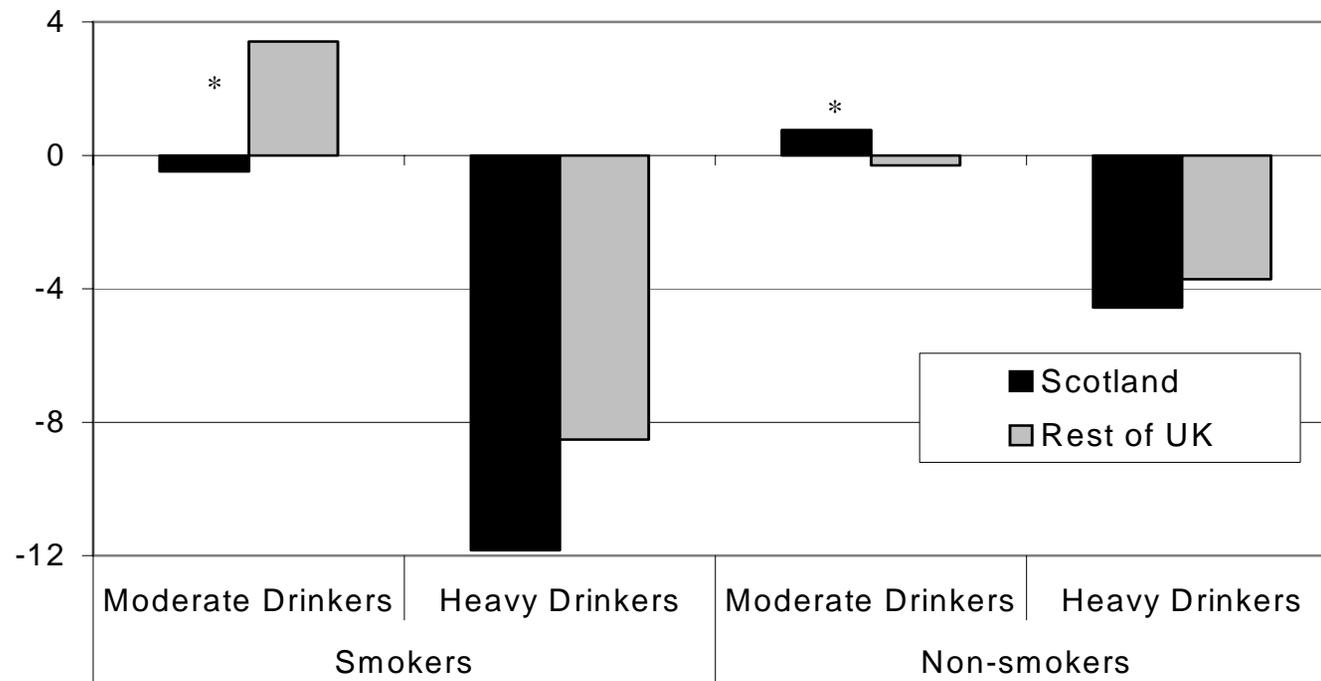
Smoking Status ^a	Pub Attendance post-legislation relative to pre-legislation	Scotland					Rest of the United Kingdom				
		n	All	Abstainer	Moderate Drinker	Heavy ^b Drinker	n	All	Abstainer	Moderate Drinker	Heavy Drinker
Smokers	More often										
	Same										
	Less often	65	21.5%	6.1%	26.8%	27.8%	61	20.3%	17.9%	21.6%	19.3%
Non-smokers	More often										
	Same										
	Less often	6	2.8%	7.9%	2.3%	0.0%	42	18.5%	9.3%	21.5%	15.4%

^a Smoking was defined as any cigarette smoking in the past 30 days

^b Drinking status was calculated from the total number of drinks of alcoholic beverages consumed in a typical week at baseline. For males, 0 drinks=abstainer; 1-14 drinks=moderate; 15+ drinks=heavy. For females, 0 drinks=abstainer; 1-7 drinks=moderate; 8+ drinks=heavy.

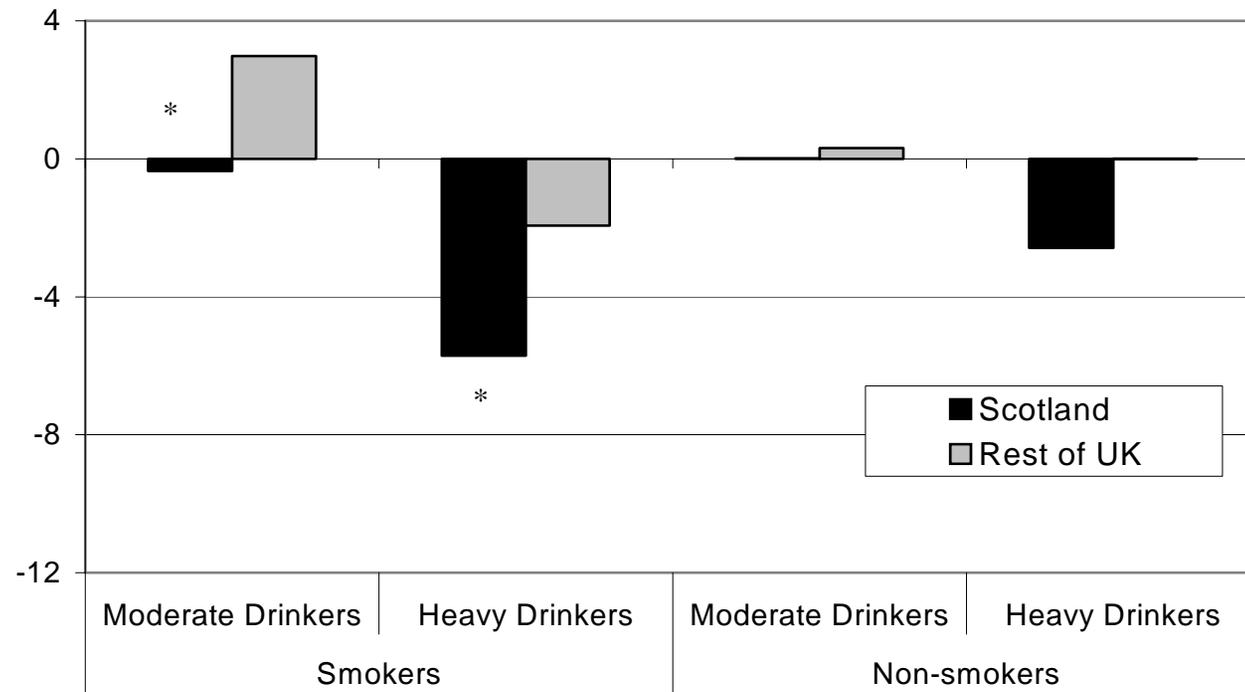
*p<.01 for chi-square test of drinker status by pub attendance in smokers only.

Figure 1a: Mean change in drinks consumed per week (post-legislation minus pre-legislation) among smokers across all locations by drinking status and region.



* p<.05

Figure 1b: Mean change in drinks consumed per week (post-legislation minus pre-legislation) among smokers in pubs or bars by drinking status and region.



* p<.05

Figure 1c: Mean change in drinks consumed per week (post-legislation minus pre-legislation) among smokers in the home by drinking status and region.

