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Longer Opening Hours, Alcohol Consumption and Health

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Abstract

Two related issues in public policy with respect to alcohol are how increased availability influences consumption and what effect excess consumption has on individual health outcomes. This paper examines one particular source of variation in availability, bar opening hours, and how this influences alcohol consumption, physical and mental health. We focus on the extension of opening hours in England and Wales that occurred in 2005. We demonstrate a marked increase in consumption, which appears to be concentrated in heavy drinking. This increase in consumption is subsequently demonstrated to lead to deterioration in both individual physical and mental health outcomes. This has important policy implications for the regulation of alcohol availability.

JEL CODES: I12, I18
KEYWORDS: Alcohol Availability, Health, Alcohol Consumption

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I. INTRODUCTION

How alcohol availability affects consumption and how this consumption influences individual health outcomes remain contentious issues. While the medical effect of alcohol on mental and physical functions is clear, there is a large step from this to the public health question of how alcohol consumption choices by individuals influences their health. Alcohol availability is the target of substantial, and ongoing, legislative intervention but there is a relatively small evidence base on its effects on consumption, and sub-sequentially, alcohol related harms. This paper focuses on one particular form of availability that has been the subject of extensive government regulation, the opening hours of bars, and subsequently uses this as the basis for identifying causal effects of heavy alcohol consumption on both physical and mental health.

Recently, a body of research has developed in economics that seeks to identify the causal effect of alcohol consumption on health outcomes. The most credible of these involve using legislative variations in alcohol availability, specifically the literature that demonstrates the effect of legal drinking ages on youth's alcohol consumption (Carpenter and Dobkin, 2009; Yoruk and Yoruk 2011, 2013) and the literature on 'blue laws' and off-premise alcohol consumption (Carpenter and Eisenberg, 2009; Heaton, 2012; Marcus and Siedler, 2015). In the case of legal drinking ages this, in turn, is used to provide evidence on the effect of youth drinking on health outcomes. Most notably, Carpenter and Dobkin (2009) use these laws as a basis for a regression discontinuity design (RDD) and demonstrate a sizeable causal effect of drinking frequency on a range of alcohol related deaths. While Yoruk and Yoruk (2012) use this approach to demonstrate negative effects of alcohol consumption on young peoples' psychological wellbeing.

Rather less is known about the causal effects of alcohol consumption for wider age groups. This is an important distinction as the health effects of alcohol consumption for young people may be quite specific. For instance, the most marked effects in the work by Carpenter and Dobkin (2009, 2011) are on particular, acute, health outcomes related to excess alcohol

consumption, such as traffic accidents, alcohol poisoning and suicide. This paper contributes to this literature by using variations in on-premise alcohol availability to estimate the effect of alcohol consumption on individual health outcomes. We use the extension of bar opening hours from 11pm out to 5am in England and Wales that took place in 2005 to examine how greater on-premise drinking influences individual health. An advantage of this setting is that it affects a large cross-section of society. Simply put, a quite broad range of people attend pubs and bars in England and Wales, and the margin of change, from 11pm is one where, again, many individuals will be affected. This policy change was motivated by a desire to reduce excessive alcohol consumption caused by restrictive opening hours, so called drinking to 'beat the clock'. The view was that short opening hours were a *cause* of excessive (binge) drinking. Our initial contribution is to provide the first evidence on the effect of extending on-premise opening hours on alcohol consumption. This is an important issue as temporal availability, both on-premise and off-premise, is a major form of government regulation of alcohol consumption internationally. However, while there is recent evidence on the effect of off-premise availability on alcohol consumption (Carpenter and Eisenberg, 2009), little is known of the effect of on-premise regulation, despite quite substantial increases in this type of temporal availability that has been implemented in the past 50 years across a range of jurisdictions.[1]

We demonstrate that longer hours cause greater alcohol consumption. This is complementary to existing research that demonstrates a link between alcohol availability and consumption, either in terms of minimum legal drinking age or restrictions in off-license sales at particular times (see for instance Carpenter and Dobkin, 2009; Stehr, 2007). In addition we use this variation as the basis of estimating the effect of drinking, specifically heavy drinking, on individual health outcomes. Heavy drinking is a natural point of focus as this is where negative health effects and heavy use of health care resources are concentrated. It is, as described later, a

[1] For instance in England and Wales there has been move from 9pm closing times in the past 3 decades, while they were severe restrictions on day time opening hours on weekdays until 1988 and Sunday opening hourse until 1995.

form of consumption for which our data is particularly advantageous. We examine the effect of this behaviour on both physical and mental health outcomes. With the notable exception of Yoruk and Yoruk (2012) previous research has focused primarily on physical health with an emphasis on mortality. Here, we focus on self-reported physical and mental health indicators. This has the advantage of being more likely to pick up the short-term effects of changes in drinking behaviour but at the cost of being unable to identify extreme negative consequences such as death.

Our estimates suggest that increases in heavy drinking have marked negative consequences on both physical and mental health. We use our first stage estimates of the effect of longer opening hours on consumption to compute implied alcohol unit consumption to health relationships for both physical and mental health. The take home message from our paper is that longer on-premise alcohol availability leads to overall increases in alcohol consumption in the form of heavy drinking and that this, in turn, has detrimental effects on individual mental and physical health through increased heavy drinking.

II. BACKGROUND AND DATA

The main policy change of interest in our paper is the legislative change that extended the legal closing hours in two constituent parts of Great Britain, England and Wales. Prior to the legislative change public houses in England and Wales were not allowed to stay open (and serve alcohol) after 11:00 pm. Following the Licensing Act of 2003, licensed venues could apply to remain open later, up to a maximum of 5:00 am. All pre-act licensed venues had the automatic right to a new license on application provided there was no variation in hours or conditions. Applications for increased hours licenses are made to the local government authority (of which there are 382 in England and Wales). In case of refusal, applicants have the right to appeal the decision at a magistrate's court.

The policy change came into effect in all of England and Wales on the 24th of November 2005. By April 1, 2006 (the first available official statistics) some 50,114 venues had been granted these licenses. Four years later in 2010 this had increased to 78,879 venues. This is out of approximately 130,000 total premises licensed to sell alcohol in England and Wales. Hence, most venues increased hours, and the majority of these changes occurred just after the legislation took force. According to survey data collected by the UK Department for Culture, Media and Sport (DCMS), of those venues that increased their hours 50% increased their licensed hours to 12 am, another 30% went to 1 am and the remainder went to even later hours (DCMS, 2006). The first disaggregated information on extended hours licenses is from 2007 (DCMS, 2007) and it provides variation in the density of extended hours licenses by region. For instance, the highest number of extended licenses per thousand people is 1.99 while the mean is 1.31 with a standard deviation of 0.34.

INSERT TABLE 1

Table 1 shows extended licence numbers and license density (number of licenses per thousand people). This is provided by year and region from 2007, the earliest year of data. A number of points are worth noting. Focusing on density, the first point noted is the marked cross-sectional variation. For instance, in 2007 the East (East Anglia) had 0.77 extended hours licenses per individual, while the South West had over 50 percent more (1.171). A second point is that density, on average, increases markedly over time, almost doubling in 3 years in some regions. Hence, this is a major, sustained, increase in late night availability. Finally, while, on average, there are marked within region increases in availability these patterns vary by region. Some regions are characterised by a large expansion over time (see for instance the North West and the North East), while others such as Yorkshire and the East Midlands have more subdued growth from essentially the same base in 2007. Together this suggests substantial regional

variation in both the initial level of licenses applied for and granted, but also in the pattern of change beyond this point.

Our empirical work uses two representative data sets for England and the United Kingdom as a whole. Together these data sources allow us to paint a broad picture of the relationship between opening hours and alcohol consumption. Our primary data source is the Health Survey of England (HSE). The HSE is a yearly repeated cross-sectional data source that has been running since 1991. We restrict our sample to individuals above the legal drinking age (18 years or older). A main focus of the debate on alcohol consumption in the UK and elsewhere is binge drinking, i.e. heavy drinking over a relatively short period. While a range of alcohol consumption measures are available in the HSE our main measure is drawn from the question how many units of alcohol you consumed on your heaviest day of drinking in the last 7 days. We use this question for two reasons. First, it is a measure of heavy drinking; the effect of this on individual health is naturally of importance. In addition, there are problems with consistency across survey waves with the other alcohol questions in the HSE. We recognise this is not a perfect measure as it may understate binge drinking insofar as heavy drinkers may be more likely to have numerous days of heavy drinking in the week.[2] Nonetheless we can use it to provide some indication of changes on heavy drinking that result from the pub extension.

INSERT FIGURE 1

Figure 1 shows average units consumed on the heaviest day for 'drinkers' plotted over time taken from the HSE. We plot this separately by age group. There appears to be a substantial increase in units consumed coincident with the extension of opening hours. Moreover, this does not appear to come down substantially in the following years. It is noticeable that the only large change in heavy drinking corresponds to the policy change and appears to be a level shift. It is highly suggestive of an effect of on-premise alcohol availability on heavy drinking. While it is

[2] In practice there is surprisingly little correlation between number of drinks on heaviest night and number of nights alcohol is consumed. For instance, those individuals who report drinking 5 units on their heaviest night consumed alcohol at least on 3.67 nights on average, while the number for those drinking 12 units was 3.75 nights.

particularly pronounced amongst younger individuals, this pattern occurs across all age groups. This fits with our priors that this reform had the potential to affect consumption across a broad cross-section of people.

Figure 2 provides information on the distribution of drinking across individuals. It presents data on the number of drinks on the heaviest night of drinking per person. Specifically it shows what proportion of individuals drank at least x units of alcohol on their heaviest night that week: 28% of people reported drinking at least 5 units on their heaviest day, this remains at 25% for 6 units and declines steadily.

INSERT FIGURE 2

The health measures we use are standard in the literature. For physical health we use variants of self-assessed health (SAH). This is constructed from the question: Please think back over the last 12 months about how your health has been. Compared to people of your own age, would you say that your health has on the whole been (on a five point scale) very good (1) through to very bad (5). Our measure of mental health is from the 12-item General Health Questionnaire (GHQ-12). This is a validated screening instrument for psychological distress, largely depression and anxiety (Goldberg and Williams, 1988; Goldberg et al., 1997). Respondents are presented with a number of statements concerning concentration, loss of sleep due to worry, perception of role, capability of making decisions, whether constantly under strain, perception of difficulty in overcoming problems, enjoyment of day-to-day activities, ability to face difficulties, depression, loss of confidence, self-worth, and general happiness. For both physical and mental health we examine both the ordered outcomes and binary indicators of (a) bad physical health and (b) at least one mental health problem. While both our measures of SAH and GHQ are standard, a key problem with these measures is their self-reported nature. This means that extreme health effects of increased drinking, such as mortality or long-term hospitalisation/institutionalisation will not be captured.

In addition to the HSE we use the British Household Panel Survey (BHPS) as the basis for an alternative identification of the effect of the extension on licensed premise attendance and health. While it lacks the detailed drinking information present in the HSE it contains similar health data and has two additional advantages. First, it contains individual data for a potential comparison area, Scotland and Northern Ireland. Second, it contains information on on-premise venue attendance that allows us to explore whether the increase in alcohol consumption due to the hours extension is due to pub attendees drinking more or to an increase in the distribution of people attending pubs.

3. METHOD

Consider the following reduced form model:

$$Health_i = \delta_0 + \delta_1 Units_i + \delta_2 X_i + \varepsilon_{1i} \quad (1)$$

Where *Health* is a measure of individual health outcomes, *Units* is some measure of alcohol consumption, X is a vector of controls. δ_1 is the parameter of interest and naïve estimation of this is unlikely to be reliable due to two primary reasons. First, there are likely omitted variables that influence both health outcomes and alcohol consumption. As an example, in the absence of suitable controls for income δ_1 will likely be biased upwards: alcohol is a normal good and there is a well-known correlation between health and income. Second, there is likely to be simultaneity bias insofar as individuals with very poor health may be unlikely to consume alcohol. These concerns lead naturally to a need to find some sort of exogenous variation in alcohol consumption to identify the effect of alcohol consumption on health. All models include controls for age, gender, employment status, education levels, income, number of children, region and year.

The source of variation we use is the increase in bar opening hours that occurred in England and Wales from the 24th of November 2005. Prior to the legislative change pubs in England and Wales were not allowed to stay open (and serve alcohol) after 11:00 pm. Following the Licensing Act of 2003, licensed venues could apply to remain open for longer up to a maximum of 5:00 am. This came into effect in all of England and Wales as of the 24th of November 2005.

We use two complementary identification strategies. First, using the HSE, we exploit regional-time variation in the number of extended licenses:

$$Health_{ijt} = \alpha_0 + \alpha_1 Units_{ijt} + \alpha_2 X_{ijt} + \varepsilon_{1ijt} \quad (2)$$

$$Units_{ijt} = \beta_0 + \beta_1 Licenses_{jt} + \beta_2 X_{ijt} + \varepsilon_{2ijt} \quad (3)$$

Where α_1 provides the effect of changes in alcohol consumption that occurred due to the increases in late night on-premise availability on individual health. This provides an unbiased LATE estimate of the effect of alcohol consumption on health subject to the instrumental variable being validly excluded from (2) and being relevant in (3), and instrument monotonicity. The interpretation of the LATE is the impact of changes in heavy drinking on health for those individuals marginally affected by increased late night availability of alcohol. i.e. individuals who previously would have left the bar at 11pm but now have greater opportunities to stay longer, and those who did not attend pubs before 11pm but now attend at later times due to the increase in temporal availability. The validity of our exclusion restriction relies on the effect of license density in region *j* at time *t* on the *ith* individual's health being through greater alcohol consumption. It must be noted that the resultant LATE may include effects of greater drinking on health other than the direct physiological or mental effect of consumption itself (such as increased risk of accidents).

As an alternative identification strategy we utilise the BHPS. This allows the use of comparison areas, Scotland and Northern Ireland, in a difference in difference strategy.

$$Health_{ijt} = \gamma_0 + \gamma_1 LongerHours_{it} \times England/Wales_{ij} + \gamma_2 LongerHours_{it} + \gamma_3 England/Wales_{ij} + \gamma_4 X_{ijt} + \varepsilon_{ijt} \quad (4)$$

Where $LongerHours_t$ equals one for time after the extension of drinking hours (24th of November 2005), 0 otherwise. $England/Wales$ is an indicator variable that equals 1 if the respondent resides in England or Wales, and 0 if they reside in Scotland or Nth Ireland. The key policy parameter is the interaction of these two variables such that γ_1 provides the Difference-in-Differences estimator. Thus, γ_1 estimates the change in health outcomes associated with longer opening hours in England/Wales compared to the change in Scotland/Nth Ireland over

the same period. This additional comparison group comes at the loss of information on units of consumption. Estimating (4) provides a policy level ITT effect of increased opening hours.

Finally, while the BHPS does not contain information on alcohol consumption *per se* it contains information on attendance of licensed venues. This can be used to (a) examine the effect (if any) of the hours extension on attendance patterns and (b) increase credibility of the policy estimate by examining whether any health effects are concentrated amongst those who report pub attendance.

4. RESULTS

4.1 Did the Increase in Availability Change Attendance and Consumption Behaviour?

Our initial step is to examine whether the increase in on-premise alcohol availability was associated with an increase in consumption and changes in attendance behaviour. The top panel of Table 3 provides estimates of the link between changes in alcohol availability resultant from the Licensing Act legislative change and number of drinks consumed in the heaviest drinking session during the week. This provides initial evidence that variation in the on-premise late night availability of alcohol influences consumption. Identification comes from regional and time variation in the number of extended licenses. For ease of interpretation license numbers are in thousands, while license density is the number of licenses per thousand people. Hence, our results demonstrate that providing 1,000 extended hours licenses in a specific region is associated with an increase in consumption of 0.1 units on the heaviest night of drinking. While an increase in 1 license per one thousand people increases consumption by 0.77 units.

INSERT TABLE 3

These average associations may hide non-linear effects of increased alcohol availability on different levels of drinking. The remainder of Table 3 provides the relationship between increased late night availability and heavy drinking at increasingly high thresholds. Estimates are probit marginal effects. Two things are worth noting. First, it appears that increased availability increases consumption across all thresholds from 5 units through to an extreme of greater than

16 units.[3] Second, the largest effects in percentage point terms are at the 6 units or greater threshold declining monotonically from this point. However, as demonstrated in Figure 2, these are increases of quite different bases. For instance, the 7 percentage point increase per 1,000 licenses per person is on a base of 25 percent (hence a 28 percent increase in incidence), while for 12 or more drinks and 16 or more drinks the percentage increases in incidence are 36 percent and 29 percent, respectively. This suggests that increase late night availability has substantial effects on alcohol consumption across the distribution of drinking. Moreover, these increases are sizeable. Finally, given that there is no evidence in diminution of this effect at higher levels of consumption and this is where alcohol harms may be concentrated, this provides an initial indication that the extension of availability may have led to negative health outcomes.

An important issue related to this is whether these increases in consumption reflect simply an intensification of drinking by existing pub patrons, or an expansion in the number of individuals who attend pubs. We explore this by asking the question, did the increase in availability change pub attendance behaviour of individuals? The BHPS contains information on how frequently individuals 'went out for a drink at a licensed venue'. This is an ordinal variable which takes values from 'never', once a year or less, several times a year, at least once a month and at least once a week. As the BHPS contains longitudinal data for England/Wales and Scotland and Northern Ireland we can use this information to estimate a difference in difference model where frequency of going out to licensed venues is the dependent variable. Initially, we estimate an ordered probit where the dependent variable is the frequency of attending licensed premises. Subsequently, to aid interpretation and readily facilitate the introduction of individual fixed effects we collapse this information into a binary variable that takes the value 1 if the individual attends licensed venues at least once per month, and zero otherwise.

INSERT TABLE 4

[3] For illustrative purposes 16 units of alcohol would be more than 5 pints of higher strength (5.2%) beer or a bottle and a half of 13.5% wine in one sitting.

Table 4 reports the difference in difference estimates of the effects of the bar hours extension on licensed venue attendance. These reveal that extending hours appears to have increased the likelihood of a given individual attending a licensed venue. This, as revealed by the ordered probit results, appears to be true on average across the whole distribution on attendance. Subsequent estimates suggest that it increased frequent attendance and this effect remains once individual fixed effects are introduced and hence the focus is on within individual effects. The magnitude of this effect is in the order of 3 percentage points (on a base of 50%), and is statistically significant at the one percent level. This provides the first suggestive evidence of an individual response to greater alcohol availability in terms of an increased likelihood of on-premise venue attendance.

4.2 Drinking and Health

We now consider the effect of alcohol consumption on individual health. Our starting point is to estimate the effect of heavy drinking on individual physical and mental health. We focus on the HSE which provides the clearest metric in terms of units of consumption. Hence our initial results provide the conditional association between units of consumption in the individual's heaviest drinking session in a week and a range of health outcomes. There are a number of approaches to using these variables, for both physical and mental health we initially report estimates for binary indicators of poor health, then increasingly numerate ordinal indicators of poor health. Table 5 presents estimates of the relationship between self-reported physical and mental health, and drinking. Estimates of the binary outcomes are probit marginal effects, while the ordered outcomes are ordered probit average effects. For both measures, physical health problems are decreasing in number of units consumed. This persists across higher levels of drinking for the binary indicator, albeit not statistically significant for 10 or more units. For the ordered outcome, there is some indication of a worsening of health at high levels of consumption. While caution must be taken with these estimates they provide an initial indication of the potential importance of non-linearities in consumption effects on health. For

mental health, there is essentially no statistically significant relationship with alcohol consumption.

INSERT TABLE 5

A range of reasons exist why these estimates cannot be treated as causal, essentially related to alcohol consumption being a choice that is likely related to individual health (both mental and physical). As a step towards gaining causal effects we combine our health measures with the variations in alcohol consumption due to the extension of drinking hours and regional-time variation in licenses that was demonstrated in the previous section. Table 6 presents resultant IV estimates of the effect of alcohol consumption on health. The first panel demonstrates the first stage estimates of the impact of the extension of opening hours. Following the previous discussion we estimate these as effect on number of units, but also as binary indicators of increasing numbers of units. As per Table 3, these provide evidence that increased late night license availability is strongly associated with alcohol consumption. For all indicators they pass the standard thresholds for weak instruments for all measures of alcohol consumption considered.

The bottom panel provides resultant IV estimates for each of our physical and mental health measures. In contrast to the estimates in Table 5, there is a clear relationship between alcohol consumption and poorer health outcomes. For instance, an additional unit of consumption is associated with a 0.5pp increase in the likelihood of reporting a physical health problem. This average effect masks increasingly large impacts of high levels of consumption. Moving across the 8, 10 and 12 drink thresholds is associated with a 8pp, 12 pp and 16pp increase in the likelihood of reporting a physical health problem. It is noticeable, however that these results do not carry over to the ordinal measures of physical health (SAH). Results are similarly strong for mental health and of a larger magnitude. A one unit increase in consumption leads to a 1pp increase in the likelihood of reporting a mental health problem and goes as high as 36pp for consuming greater than 12 units. These results hold across the 12 point ordinal

measure of mental health problems. This, together, provides evidence that increased consumption due to increased availability leads to a marked worsening of physical and mental health outcomes.

INSERT TABLE 6

An alternative approach to estimate the effect of increased alcohol availability on health outcomes is to exploit the regional nature of the bar hours extension and use Scotland and Northern Ireland as a comparison group in a difference in difference approach using the BHPS. It is important to note that this, when compared to the earlier identification approach, provides the overall policy effect of longer hours on health, rather than the specific effect of greater alcohol consumption. This has both benefits and shortcomings. On one hand it is not possible to directly map alcohol consumption to health. At the same time it provides the overall effect of greater alcohol availability on health. This includes the effects of greater alcohol availability on individual health that do not result from that given individual consuming more alcohol. For instance, if longer hours change the risk of being involved in a traffic accident or a victim of crime due to changes in the density of people out at given times.

Results from this are presented in Table 7 where again we examine the effect of the policy change on physical and mental health outcomes using the same measures as previously (SAH and GHQ). While extended hours are associated with poorer health outcomes, only mental health is statistically different from zero. This remains the case through various specifications that allow for differential pre-trends between the control and treatment area, region and year fixed effects. Hence there appears to be a clear deterioration in mental health outcomes for individuals affected by longer hours, with no effect apparent for general health outcomes.

INSERT TABLE 8

Again it is worth emphasising that these estimates have a different interpretation to the earlier IV estimates and hence the general health estimates are not necessarily in conflict.

Specifically, the overall policy effect on general health includes a range of transmission mechanisms other than alcohol consumption where the effect of the liberalisation is ambiguous. For instance previous evidence on this reform demonstrates that the extended hours led to a reduction in the traffic accidents and motor vehicle casualties (Green, Heywood and Navarro 2014).

5. CONCLUSIONS

Despite the ongoing policy debate in the area there is remarkably little convincing causal evidence on the effect of alcohol availability on consumption and individual health outcomes. Of this evidence the focus has been on alcohol availability in terms of legal drinking ages and variations in the timing of off-premise opening times. Arguably one of the most significant forms of regulation on alcohol availability is licensing laws for on-premise sales. This paper adds to that evidence base by first examining the effect of a large increase in on-premise temporal availability in England and Wales. We demonstrate that extending bar opening hours led to a marked increase in alcohol consumption in the form of heavy drinking.

This extension is then used as a source of exogenous variation in estimates of the effect of alcohol consumption on health outcomes. We demonstrate deterioration in both physical and mental health outcomes due to increased alcohol consumption, specifically heavy drinking. Subsequent results demonstrate that these negative effects are concentrated among older individuals and women. Together this provides a body of evidence demonstrating how increased alcohol availability in England and Wales led to increased consumption, heavy drinking and led to poorer physical and mental health outcomes. This may have important policy implications in other jurisdictions considering similar changes.

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FIGURE 1. Units of Alcohol Consumed on Heaviest Day in Last Week.

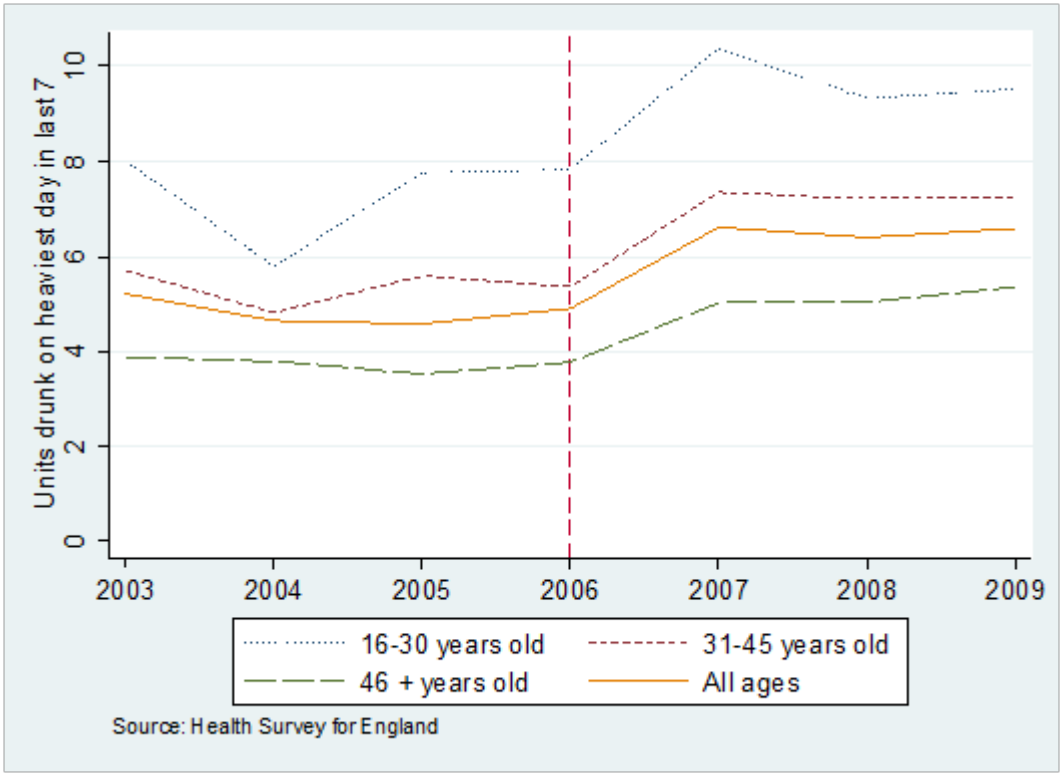

FIGURE 2. Proportion of people drinking at least # units in their heaviest day, Health Survey of England 2003-2009.

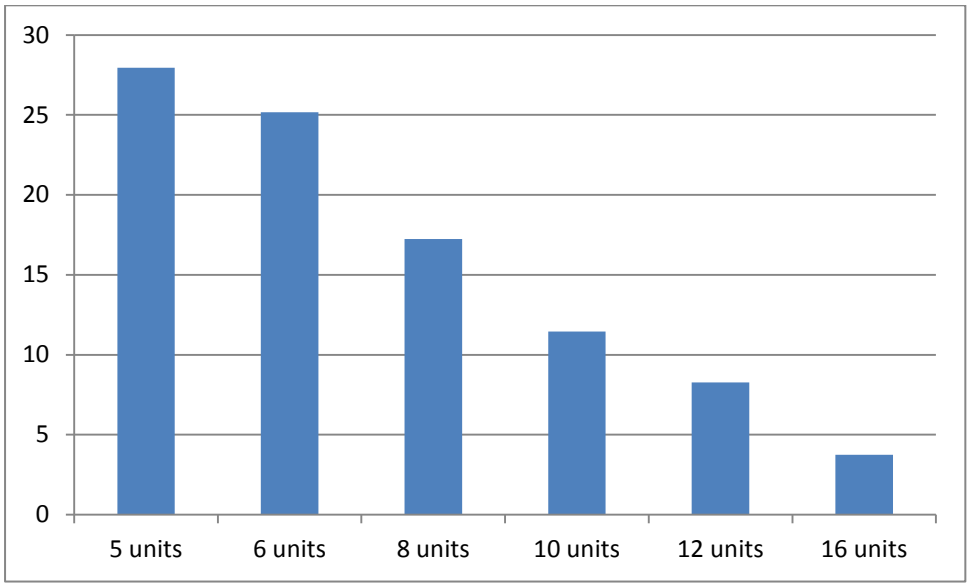

TABLE 1. Number of extended premises licenses by region and year

	2007		2008		2009	
	#	Density	#	Density	#	Density
North East	2561	0.999	2930	1.670	3112	1.761
North West & Merseyside	5890	0.858	9092	1.470	10044	1.618
Yorkshire & the Humberside	3940	0.791	5821	1.159	6001	1.186
West Midlands	5244	0.974	6557	1.281	6996	1.361
East Midlands	3644	0.828	4479	1.011	5443	1.223
East	4187	0.771	4651	0.916	6101	1.192
London	8648	1.144	11443	1.492	13438	1.733
South East	7544	0.908	10136	1.211	10838	1.285
South West	6060	1.171	7828	1.853	8090	1.907

Source: Department for Culture, Media and Sport

TABLE 2. Descriptive statistics, 2003-2009

	HSE	BHPS
Physical Health Problems Binary	7.766	10.137
Physical Health Problems 5pt	2.059	2.207
Mental Health Problems Binary	13.819	20.375
Mental Health Problems 12pt	1.342	1.907

TABLE 3. The effect of extended licences and License Density on the number of units drunk in the heaviest day. HSE 2003-2009. Alcohol Availability and Drinking

	# Late Night	Licence Density
# units	0.1088***	0.7722***
	(0.0187)	(0.0644)
R^2	0.148	0.149
>5 Drinks	0.0096***	0.0664***
	(0.0016)	(0.0041)
R^2	0.111	0.111
> 6 Drinks	0.0104***	0.0711***
	(0.0015)	(0.0050)
R^2	0.114	0.115
> 8 Drinks	0.0074***	0.0542***
	(0.0015)	(0.0049)
R^2	0.112	0.113
> 10 Drinks	0.0052***	0.0373***
	(0.0012)	(0.0041)
R^2	0.099	0.100
> 12 Drinks	0.0043***	0.0288***
	(0.0011)	(0.0048)
R^2	0.080	0.080
> 16 Drinks	0.0015**	0.0114**
	(0.0006)	(0.0040)
R^2	0.048	0.048
Observations	47973	47973

Note: () standard errors, *,**,*** indicate statistical significance at the 10%, 5% and 1% level, respectively. Controls included but not reported age, gender, employment, education, income, children, region dummies and year.

TABLE 4. The Effect of Extending Opening Hours on Frequency of Attending Licensed Premises, BHPS, 2003-2008

	Frequency of Attendance	Probability of Attending Often	
VARIABLES	(Ordered Probit)	(OLS)	(Individual FE)
Extended Hours in England/Wales	0.015	0.015*	0.026***
	(0.011)	(0.008)	(0.009)
Extended Hours	-0.128***	-0.040***	
	(0.011)	(0.006)	
England/Wales	0.368***	-0.021***	0.010
	(0.007)	(0.005)	(0.207)
Observations	40923	40923	40923
r^2		0.184	0.020
Number of pid			24028

All estimates include year dummies and controls for age, age^2, gender, education, marital status and whether the individual has dependent children. Robust standard errors clustered at the region level in parentheses. *,**,*** indicate statistical significance at the 10%, 5% and 1% level, respectively.

TABLE 5. Naïve Estimates of Binge Drinking and Physical and Mental Health, Health Survey of England 2003-2009.

	# units	>8 units	>10 units	>12 units
Physical Health Problems [0,1]	-0.0011***	-0.0057*	-0.0043	-0.0031
	(0.0003)	(0.0030)	(0.0033)	(0.0034)
Physical Health [1,…,5]	-0.0024**	0.0060	0.0410**	0.0739***
	(0.0011)	(0.0154)	(0.0172)	(0.0143)
Mental Health Problems [0,1]	-0.0001	0.0057	0.0050	0.0050
	(0.0005)	(0.0065)	(0.0076)	(0.0076)
Mental Health Problems [0,1,…,12]	-0.0004	0.0131	0.0078	0.0255
	(0.0015)	(0.0184)	(0.0232)	(0.0184)
Observations	47957	56048	56048	41348

Note: () standard errors, *,**,*** indicate statistical significance at the 10%, 5% and 1% level, respectively. Controls included but not reported age, gender, employment, education, income, children, region dummies and year.

TABLE 6. 2SLS estimates of the effect of heavy drinking on Health, HSE 2003-2009

First Stage	# units	>8 drinks	>10 drinks	>12 drinks
License Density	0.7722***	0.0542***	0.0373***	0.0288***
	(0.0644)	(0.0049)	(0.0041)	(0.0048)
R^2	0.148	0.113	0.100	0.080
Partial r^2	0.0046	0.0028	0.0018	0.0015
F-test	191.81	114.39	74.17	61.09
Second Stage				
Physical Health Problems [0,1]	0.0059**	0.0845**	0.1228**	0.1592**
	(0.0029)	(0.0416)	(0.0605)	(0.0785)
Physical Health [0-5]	-0.0197	-0.2808	-0.4082	-0.5291
	(0.0232)	(0.3299)	(0.4796)	(0.6217)
Mental Health Problems [0,1]	0.0137**	0.1951**	0.2836**	0.3677**
	(0.0067)	(0.0954)	(0.1386)	(0.1797)
Mental Health Problems [0-12]	0.0702***	0.9991***	1.4525***	1.8829***
	(0.0207)	(0.2951)	(0.4290)	(0.5561)
Observations	47973	47973	47973	47973

Note: () standard errors, *,**,*** indicate statistical significance at the 10%, 5% and 1% level, respectively. Controls included but not reported age, gender, employment, education, income, children, region dummies and year.

TABLE 7. The Effect of Extended Hours on General and Mental Health, BHPS, 2003-2008.

	(1) Physical Health Problems [0,1]	(2) Physical Health [0-5]	(7) Mental Health Problems [0,1]	(8) Mental Health Problems [0-12]
Extended Hours in England/Wales	0.008	0.038	0.025**	0.107***
	(0.007)	(0.034)	(0.011)	(0.035)
Extended Hours	-0.011**	-0.065**	-0.008	-0.025
	(0.005)	(0.030)	(0.008)	(0.027)
England/Wales	0.072***	0.196	0.044	0.335***
	(0.014)	(0.153)	(0.046)	(0.109)
Observations	87492	87492	78353	78353

Note: All estimates include controls for age, age^2, gender, education, marital status and whether the individual has dependent children, year trend, year trend interacted with treatment, region fixed effects, year fixed effects. Robust standard errors clustered at regional levels in parentheses. *,**,*** indicate statistical significance at the 10%, 5% and 1% level, respectively.