COGNITIVE ASPECTS

Alcohol Use Disorders and Hazardous Drinking among Undergraduates at English Universities

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(Received 10 January 2011; in revised form 21 February 2011; accepted 22 February 2011)

Abstract — Aims: To report on alcohol use disorders and hazardous drinking from a survey of university students in England in 2008–2009. Methods: A cross-sectional survey using the Alcohol Use Disorders Identification Test (AUDIT) was carried out in a purposive sample of 770 undergraduates from seven universities across England. Results: Sixty-one per cent of the sample (65% men; 58% women) scored positive (8+) on the AUDIT, comprising 40% hazardous drinkers, 11% harmful drinkers and 10% with probable dependence. There were large and significant differences in mean AUDIT scores between the universities taking part in the survey. Conclusions: Undergraduates at some universities in England show very high levels of alcohol-related risk and harm. University authorities should estimate the level of hazardous drinking and alcohol use disorders among students at their institutions and take action to reduce risk and harm accordingly. Research is needed using nationally representative samples to estimate the prevalence of alcohol risk and harm in the UK student population and to determine the future course of drinking problems among students currently affected.

INTRODUCTION

Heavy drinking among university students in the UK is a topic of medical (e.g. Gill, 2002; Royal College of Psychiatrists, 2003) and media (e.g. Bunyan, 2008) concern. However, there has been no large survey of drinking and alcohol-related harm among students at multiple universities in the UK since the publication by Webb et al. (1996). These authors surveyed 3075 students from 10 universities regarding their use of alcohol and other drugs. The main findings for alcohol were that 61% of men and 48% of women exceeded ‘sensible’ weekly drinking limits recommended by medical authorities and that 28% of the sample reported binge drinking.

Since that report, studies of the drinking habits of British students have been confined either to single universities (Beenstock et al., 2010; Bewick et al., 2008a; Faulkner et al., 2006; Norman et al., 1998; Penny and Armstrong-Hallam, 2010; Williams and Clark, 1998; Woolfson & Maguire, 2010), medical/dental students (Newbury-Birch et al., 2000; Underwood and Fox, 2000; Webb et al., 1998) or both (Granville-Chapman et al., 2001; Hannay, 1998; Pickard et al., 2000). The study by Webb et al. (1996) was confined to second-year students. In an investigation into the relationship between drinking and participation in sport (Partington et al., 2010), we surveyed undergraduates at seven universities spread throughout England during 2008–2009, and included students from a range of degree courses and in all years of study. We report here our general findings on alcohol use disorders and hazardous drinking in this sample. Findings on the relationship between drinking and sport participation among students will be reported elsewhere.

METHODS

Sample

The survey was not based on probability sampling or weighted to be representative of the UK or English student population. Rather, a purposive sample of universities and of full-time students therein was used to investigate the relationship between student drinking and sport participation based on the following considerations:

(a) institutions were selected to reflect their commitment to sport, measured in terms of finishing positions in the inter-university sport competition BUSA (British Universities Sports Association) league table 2006–2007. To ensure a suitable range, institutions were selected from the top, middle and bottom of this table,
(b) to sample across degree courses, the JACS (Joint Academic Coding System) codes were used to guide course selection. JACS is a classification used by the Universities and Colleges Admissions Service (UCAS), the organization responsible for the university application process, to code courses by the subjects from which they are composed. Each course can thus be categorized under an umbrella term that denotes a broad subject area. In our study, we targeted the five most popular subject areas. These were: subjects allied to medicine; biological sciences; social studies; business and administrative law; and creative arts and design,
(c) within these groupings, we ensured that at each institution one arts-based (a course falling under one of the following categories: social studies, business and administrative law and creative arts and design) and one science-based course (from one of the following
Having selected universities and courses on this basis, we approached academics to ask for their help in obtaining ethical clearance and arranging testing at their institutions. One university initially expressed an interest in taking part but then did not respond to further contact. One selected university had to withdraw from the study because it was not possible to complete the ethics procedure within the time limits available. The final sample consisted of five ‘new’ universities (i.e. former polytechnics established in the 1990s or 2000s) and two ‘old’ universities (one established in the 1900s and one in the 1960s). One university was in the North-east of England, one in the North-west, two in the Midlands, two in the South-east and one in the South-west.

Procedure

Following ethical approval, data collection took place in term-time between March 2008 and March 2009. Care was taken to avoid times when drinking would likely be increased (e.g. ‘Freshers’ Week’) or reduced (e.g. exam periods). Specific months during which testing was conducted at each university are shown in Table 1. Questionnaire booklets were completed either at the start or end of a lecture, a procedure that has been found to yield the best response rates (Pickard et al., 2000; Webb et al., 1996, 1998). It was not recorded how many potential students in the selected lectures had not attended. Among those present, very few students declined to participate. Only 11 questionnaires were not sufficiently completed to be included in the study, giving a sample size of 770. A calculation was made of the subsample size at each university expressed as a percentage of the total number of full-time undergraduates taking a degree at that university. The mean of this statistic was 1.08% (median = 0.88%, range 0.33–2.81%).

Measures

In addition to participant information and an informed consent form, the questionnaire booklet included items on gender, age, ethnicity, degree course, year of study, membership of university clubs and societies, term-time accommodation, whether the student had ever drunk alcohol, and whether or not they were currently abstinent from alcohol and, if so, reasons for being abstinent. The confidentiality of all information was assured but university ethics procedures required that participants had to sign and print their names when giving consent. This information was not entered onto the data-file and responses were anonymized by creating participant codes.

Drinking behaviour and alcohol-related problems were recorded by the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993), a widely used 10-item screening tool developed by the World Health Organization (WHO) for the detection of alcohol use disorders, as defined in the International Statistical Classification of Diseases and Related Health Problems—10th Revision (ICD-10; World Health Organisation, 1992). In a wide variety of settings, the AUDIT has shown a sensitivity and specificity generally between 80 and 95%, with an area under the ROC curve in most studies between 0.8 and 0.9 (Reinert and Allen, 2007). The standard cut-point for a positive screen is 8+ (Conigrave et al., 1995). In addition to a positive screen, the AUDIT can be used to screen for zones of alcohol-related risk or harm (Babor and Higgins-Biddle, 2001):

(a) hazardous drinking (likely if AUDIT = 8–15 inclusive): this is not a diagnostic term in ICD-10 but hazardous use of a substance is defined in the WHO Lexicon of Alcohol and Drug Terms (World Health Organisation, 1994) as: ‘A pattern of substance use that increases the risk of harmful consequences for the user … (and) … refers to patterns of use that are of public health significance despite the absence of any current disorder in the individual user’. For the purposes of this article, hazardous drinking is not described as an alcohol use disorder;

(b) harmful drinking (likely if AUDIT = 16–19 inclusive): this is a pattern of alcohol consumption that is already causing harm, either physical or mental. Harmful use of alcohol is a diagnostic term in ICD-10 (F10.1);

(c) probable dependence (likely if AUDIT = 20+): drinking that is likely to require further diagnosis and specialized treatment for alcohol dependence, where dependence is defined as a cluster of behavioural, cognitive and physiological factors that typically include a strong desire to drink alcohol and difficulties in controlling its use. The alcohol dependence syndrome is a diagnostic term in ICD-10 (F10.2).

The concurrent validity of this zoning of AUDIT scores was supported in research by Donovan et al. (2006).

To the best of our knowledge, the only studies of student drinking in the UK to have used the AUDIT were Beenstock et al. (2010), Granville-Chapman et al. (2001), Penny and Armstrong-Hallam (2010) and Bewick et al. (2010), but none of these reported psychometric properties of the instrument in their samples. In a college student sample in the USA and using a cut-off of 8+, Kokotaiko et al. (2004) reported that the AUDIT had a sensitivity of 0.82 and a specificity of 0.78 for the detection of high-risk drinking. Clements (1998) concluded that the AUDIT was better at identifying current alcohol dependence in college students than several other instruments. The AUDIT was also found to be a valid instrument for screening alcohol use disorders among university students in Nigeria (Adewuya, 2005).

Statistical analysis

Questionnaire data were entered into SPSS (v.16). Because of the large number of tests that were run and to avoid spuriously significant results from multiple comparisons, the 1% level was taken to indicate significance rather than the conventional 5% level. Owing to the marked positive skewness
### Table 1. Sample characteristics and AUDIT scores for each university subsample and all participants

<table>
<thead>
<tr>
<th>University</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>Overall sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>South</td>
<td>South</td>
<td>North</td>
<td>North</td>
<td>Midlands</td>
<td>Midlands</td>
<td>South</td>
<td></td>
</tr>
<tr>
<td>When founded?</td>
<td>1990s</td>
<td>1990s</td>
<td>2000s</td>
<td>1990s</td>
<td>1960s</td>
<td>1900s</td>
<td>1990s</td>
<td></td>
</tr>
<tr>
<td>N (%)</td>
<td>178 (23.1)</td>
<td>149 (19.4)</td>
<td>122 (15.8)</td>
<td>143 (18.6)</td>
<td>72 (9.4)</td>
<td>56 (7.3)</td>
<td>50 (6.5)</td>
<td>770 (100.0)</td>
</tr>
<tr>
<td>Mean age (SD)</td>
<td>23.6 (6.5)</td>
<td>26.8 (8.6)</td>
<td>20.5 (3.6)</td>
<td>19.0 (1.6)</td>
<td>20.0 (1.8)</td>
<td>19.9 (1.8)</td>
<td>24.4 (5.5)</td>
<td>22.3 (6.1)</td>
</tr>
<tr>
<td>Male (%)</td>
<td>50.00</td>
<td>19.60</td>
<td>39.30</td>
<td>42.00</td>
<td>40.30</td>
<td>33.90</td>
<td>48.00</td>
<td>38.80</td>
</tr>
<tr>
<td>Ethnicity (% 'White')</td>
<td>28.8</td>
<td>94.0</td>
<td>93.4</td>
<td>95.8</td>
<td>88.9</td>
<td>76.8</td>
<td>62.0</td>
<td>75.4</td>
</tr>
<tr>
<td>Type of degree course</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% sport</td>
<td>59.6</td>
<td>0.0</td>
<td>52.5</td>
<td>55.2</td>
<td>0.0</td>
<td>67.9</td>
<td>100.0</td>
<td>43.8</td>
</tr>
<tr>
<td>% science</td>
<td>0.0</td>
<td>54.7</td>
<td>0.0</td>
<td>0.0</td>
<td>73.6</td>
<td>32.1</td>
<td>0.0</td>
<td>19.8</td>
</tr>
<tr>
<td>% arts</td>
<td>40.4</td>
<td>45.3</td>
<td>47.5</td>
<td>44.8</td>
<td>26.4</td>
<td>0.0</td>
<td>0.0</td>
<td>36.4</td>
</tr>
<tr>
<td>Year of study</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% 1st</td>
<td>39.9</td>
<td>25.9</td>
<td>99.2</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>48.6</td>
</tr>
<tr>
<td>% 2nd</td>
<td>57.3</td>
<td>17.7</td>
<td>0.0</td>
<td>0.0</td>
<td>98.6</td>
<td>100.0</td>
<td>2.0</td>
<td>33.3</td>
</tr>
<tr>
<td>% 3rd</td>
<td>2.8</td>
<td>56.5</td>
<td>0.8</td>
<td>0.0</td>
<td>1.4</td>
<td>0.0</td>
<td>98.0</td>
<td>18.1</td>
</tr>
<tr>
<td>Term-time accommodation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% on campus</td>
<td>5.2</td>
<td>6.0</td>
<td>56.6</td>
<td>49.0</td>
<td>30.6</td>
<td>8.9</td>
<td>0.0</td>
<td>24.1</td>
</tr>
<tr>
<td>% off campus</td>
<td>12.1</td>
<td>53.0</td>
<td>9.0</td>
<td>9.1</td>
<td>45.8</td>
<td>69.6</td>
<td>24.5</td>
<td>27.2</td>
</tr>
<tr>
<td>% family/other</td>
<td>82.8</td>
<td>40.9</td>
<td>34.4</td>
<td>42.0</td>
<td>23.6</td>
<td>21.4</td>
<td>75.5</td>
<td>48.8</td>
</tr>
<tr>
<td>% abstainers</td>
<td>34.6</td>
<td>10.7</td>
<td>15.8</td>
<td>1.4</td>
<td>20.1</td>
<td>23.2</td>
<td>19.3</td>
<td>17.7</td>
</tr>
<tr>
<td>% 'never drinkers'</td>
<td>25.4</td>
<td>0.0</td>
<td>0.8</td>
<td>0.0</td>
<td>4.2</td>
<td>8.9</td>
<td>10.2</td>
<td>7.7</td>
</tr>
<tr>
<td>% current abstainers</td>
<td>9.2</td>
<td>10.7</td>
<td>15.0</td>
<td>1.4</td>
<td>15.9</td>
<td>14.3</td>
<td>9.1</td>
<td>10.0</td>
</tr>
<tr>
<td>Mean AUDIT (SD, range)</td>
<td>5.3 (5.7, 0–26)</td>
<td>8.3 (5.2, 0–24)</td>
<td>13.5 (7.1, 0–29)</td>
<td>14.1 (5.8, 3–34)</td>
<td>9.6 (6.2, 0–28)</td>
<td>10.6 (7.0, 0–31)</td>
<td>8.9 (7.5, 0–31)</td>
<td>9.9 (6.9, 0–34)</td>
</tr>
<tr>
<td>% AUDIT positive</td>
<td>29.8</td>
<td>53.0</td>
<td>82.0</td>
<td>85.0</td>
<td>66.7</td>
<td>69.6</td>
<td>49.0</td>
<td>60.6</td>
</tr>
<tr>
<td>% hazardous</td>
<td>25.1</td>
<td>43.0</td>
<td>47.5</td>
<td>45.7</td>
<td>50.0</td>
<td>41.1</td>
<td>32.7</td>
<td>40.1</td>
</tr>
<tr>
<td>% harmful</td>
<td>2.3</td>
<td>6.7</td>
<td>12.3</td>
<td>21.4</td>
<td>11.1</td>
<td>21.4</td>
<td>8.2</td>
<td>10.9</td>
</tr>
<tr>
<td>% probable dependence</td>
<td>2.3</td>
<td>3.4</td>
<td>22.1</td>
<td>17.9</td>
<td>5.6</td>
<td>7.1</td>
<td>8.2</td>
<td>9.6</td>
</tr>
</tbody>
</table>
of AUDIT scores and the absence of any transformation that would render this variable approximately normal, non-parametric statistics were used throughout. Differences between groups on continuous variables were examined by the Mann–Whitney U-test in the case of two groups or the Kruskal–Wallis analysis of variance by ranks in the case of more than two groups. Relationships between categorical variables were examined by $\chi^2$ tests and correlations by Spearman’s rho. Although not relevant to the present report, the study was powered to detect a small difference in mean AUDIT scores between students participating in sport and those not participating in sport.

**Ethical approval**

Ethical approval for the survey was granted by Northumbria University Ethics Committee. Approval from each participating university’s ethics committee was obtained as needed.

**RESULTS**

**Characteristics of the overall sample**

The far right-hand column of Table 1 shows demographic and other background characteristics of the overall sample.

**AUDIT scores in the overall sample**

The mean, standard deviation and range of AUDIT scores in the overall sample are shown in Table 1 (missing = 12). The difference in mean AUDIT scores between genders (men = 10.7, SD = 7.1; women = 9.3, SD = 6.8) just failed to reach the pre-set level of significance (Mann–Whitney, $Z = -2.49, P = 0.013$). However, there was a highly significant difference in mean AUDIT scores between students of ‘White’ ethnicity (11.4, SD = 6.5) and those of ‘non-White’ ethnicity (5.15, SD = 6.1) (Mann–Whitney, $Z = -11.3, P < 0.0005$). When those students who stated that they had never drunk or tasted alcohol were excluded from the analysis (see Abstinence below), there remained a highly significant difference in mean AUDIT scores between students of ‘White’ (11.5, SD = 6.4) and ‘non-White’ (7.1, SD = 6.2) ethnicity (Mann–Whitney, $Z = -7.5, P < 0.0005$).

Table 1 also shows proportions of the sample categorized as AUDIT positive and falling into three AUDIT zones (missing = 12). It will be seen that 60.6% of the total sample (65.3% of men and 57.6% of women) scored positive on the AUDIT. The difference in proportions between men and women classified as AUDIT positive was not significant ($\chi^2 = 4.12, df = 1, P = 0.042$). Again, there was a highly significant difference between the proportion of ‘White’ students classified as AUDIT positive (71.0%) and the proportion of ‘non-White’ students so classified (28.0%) ($\chi^2 = 105.3, df = 1, P < 0.0005$).

**Abstinence**

A total of 130 students (17.0%; missing = 4) stated they were abstinent from alcohol at the time of the survey. Of these, 59 (7.7%; 6.4% men and 8.5% women) reported they had never drunk or tasted alcohol, mainly for religious reasons. Among the remaining 711 students who had drunk alcohol in the past, 71 (10.0%) stated that they were currently abstinent. There was a highly significant association between lifetime abstinence and ethnicity ($\chi^2 = 138.8, df = 1, P < 0.0005$), with 27.5% of ‘non-Whites’ never having drunk or tasted alcohol compared with 1.0% of ‘Whites’. Among those who had drunk in the past, the association between current abstinence and ethnicity approached significance ($\chi^2 = 5.1, df = 1, P = 0.024$), with 15.4% of ‘non-Whites’ being current abstainers compared with 8.6% of ‘Whites’.

**AUDIT scores and other variables**

In the overall sample, there were highly significant differences in mean AUDIT scores according to year of study (Kruskal–Wallis, $\chi^2 = 72.5, df = 2, P < 0.0005$), with students in their first year showing a higher mean (11.9, SD = 6.9) than those in their second (7.2, SD = 6.5) or third (9.3, SD = 6.0) years.

There were significant differences between mean AUDIT scores according to term-time accommodation (Kruskal–Wallis, $\chi^2 = 117.7, df = 2, P < 0.0005$), with students living on campus showing a higher mean score (13.7, SD = 6.7) than those living in student accommodation off campus (11.2, SD = 6.4) and those living with family of origin or in ‘other’ accommodation (e.g. home owners, living with partners) (7.3, SD = 6.2). There was a highly significant association between year of study and type of term-time accommodation ($\chi^2 = 214.4, df = 6, P < 0.0005$), with students in their first year tending to live on campus and those in later years tending to live off campus.

There were also significant differences between mean AUDIT scores according to the type of degree course (Kruskal–Wallis, $\chi^2 = 17.3, df = 2, P < 0.0005$), with students on sports courses showing a higher mean score (10.9, SD = 7.0) than those on science-based courses (9.5, SD = 5.8) and those on arts-based courses (8.8, SD = 7.3).

Lastly, there was a low but significant correlation between AUDIT score and age ($\rho = -0.357, P < 0.0005$), with older students tending to show lower AUDIT scores.

**Differences between universities**

Table 1 shows large differences between the seven universities taking part in the survey in terms of demographic and other background characteristics of the university subsamples. For example, University A had a much lower proportion of ‘White’ students than the other institutions, University B had a much lower proportion of male students together with a higher mean age and University D had a much lower proportion of abstainers. There were also considerable variations across subsamples in the types of degree course being taken, years of study and the nature of term-time accommodation.

Table 1 also shows large and highly significant differences in mean AUDIT scores between the seven universities (Kruskal–Wallis, $\chi^2 = 177.40, df = 6, P < 0.0005$), with a range from 5.3 to 14.1 and a spread of means between these extremes. Both the lowest and the highest mean AUDIT scores came from new universities (A and D, respectively); means for the two older universities (E and F) were closer to that for the overall sample. In the two universities showing the highest mean AUDIT scores, over 80% of the subsample was AUDIT positive.

Of particular note are the differences in mean AUDIT scores according to the geographical location of the
Predictors of AUDIT positive status

A binary logistic regression analysis (LRA) was run to identify independent predictors of AUDIT positive status. In particular, the aim of the LRA was to determine which background variables predicted an AUDIT positive status after the effects of variation across universities in AUDIT scores had been extracted. Thus the seven-category university variable was entered as a first step in the analysis, with University A as the reference category. Then all relevant variables shown in Table 1 (i.e. age, ethnicity (‘White’ vs. ‘non-White’), gender, type of degree course, year of study, term-time accommodation (with ‘Family/Other’ as the reference category)) were entered in a second block. The final regression model is shown in Table 2.

Overall, the model significantly predicted AUDIT positive status ($\chi^2 = 232.3$, df = 10, $P < 0.0005$), with 74.3% correct identifications. Significant predictors were the university attended, younger age, ‘White’ ethnicity and term-time accommodation. Variables that did not predict an AUDIT positive status when the effects of university had been taken into account were gender, type of degree course, year of study, term-time accommodation and those in student accommodation.

With regard to the overall sample, our main finding is of very high rates of alcohol use disorders and hazardous drinking in this sample of undergraduates in 2008–2009. Just over three-fifths of the sample were positive on a widely used and well-validated measure of alcohol risk and harm (the AUDIT). Forty-one percent (41%) fell into the category of ‘hazardous drinker’ (AUDIT 8–15 inclusive), 11% were classified as likely to be ‘harmful drinkers’ (AUDIT 16–19 inclusive) and a further 10% were deemed to be ‘probably alcohol dependent’ (AUDIT 20) (see Table 1). Combining harmful drinkers and those with probable dependence, one in five (21%) of the students in this sample showed a likelihood of having a diagnosable alcohol use disorder.

According to the pre-set criterion for statistical significance, there were no significant differences between men and women in mean AUDIT scores or proportions AUDIT positive.

The main limitation of the study for present purposes is that it was not designed as a prevalence study. Neither universities nor students within universities were selected at random and no attempt was made to use probability sampling methods to arrive at a sample representative of the student population in England at the time of the survey. Thus the high levels of AUDIT scores obtained may be due, in part at least, to atypically heavy drinking by students at the participating universities. No claims about the prevalence of alcohol use disorders or hazardous alcohol consumption in the student body at large can therefore be based on our data. It should be noted that similar limitations apply to the largest study of student drinking in the UK yet reported (Webb et al., 1996) and that no study yet carried out in the UK or its constituent countries has used random sampling methods that would allow an accurate estimation of student population parameters regarding alcohol consumption and problems. Such studies have been carried out in other countries, for example by Wechsler et al. (1994) in the USA. In view of the suggestion from the present study and from others in comparatively recent times (e.g. Beenstock et al., 2010; Newbury-Birch et al., 2000; Penny & Armstrong-Hallam, 2010; Webb et al., 1996) of high levels of alcohol-related risk and harm, a survey based on a nationally representative sample is needed to estimate the true extent of alcohol risk and harm among students in the UK.

Neither is it possible from our data to arrive at any sound conclusions regarding trends over time in drinking behaviour and alcohol-related harm among students in England or the UK. This is partly because of the non-representativeness of the samples reported in surveys of student drinking but also because of differences in methods used to record drinking and harm. One of the strengths of the current study is that it is one of the first in the UK to have used the AUDIT. The AUDIT is now the instrument of first choice in the study of drinking behaviour and alcohol-related harm among students in the UK. It is recommended that the AUDIT be used routinely in future surveys of student drinking in the UK to enable trends in drinking to be detected and international comparisons to be made.

### Table 2. Final regression model for prediction of AUDIT positive status

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University*</td>
<td>0.120</td>
<td>0.324</td>
<td>0.138</td>
<td>1</td>
<td>0.711</td>
<td>1.128</td>
</tr>
<tr>
<td>University(B)</td>
<td>1.155</td>
<td>0.349</td>
<td>10.981</td>
<td>1</td>
<td>0.001</td>
<td>3.176</td>
</tr>
<tr>
<td>University(C)</td>
<td>1.282</td>
<td>0.344</td>
<td>13.891</td>
<td>1</td>
<td>0.000</td>
<td>3.605</td>
</tr>
<tr>
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<td>0.353</td>
<td>0.118</td>
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<td>0.731</td>
<td>1.129</td>
</tr>
<tr>
<td>University(E)</td>
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<td>0.386</td>
<td>0.995</td>
<td>1</td>
<td>0.319</td>
<td>1.469</td>
</tr>
<tr>
<td>University(F)</td>
<td>0.385</td>
<td>0.386</td>
<td>0.995</td>
<td>1</td>
<td>0.319</td>
<td>1.469</td>
</tr>
<tr>
<td>University(G)</td>
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<td>0.372</td>
<td>2.233</td>
<td>1</td>
<td>0.135</td>
<td>1.332</td>
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<tr>
<td>Age</td>
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<td>0.020</td>
<td>16.435</td>
<td>1</td>
<td>0.000</td>
<td>0.921</td>
</tr>
<tr>
<td>Ethnicity(White)</td>
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<td>0.241</td>
<td>23.593</td>
<td>1</td>
<td>0.000</td>
<td>3.225</td>
</tr>
<tr>
<td>Accommodation</td>
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<td>0.083</td>
<td>16.435</td>
<td>1</td>
<td>0.000</td>
<td>1.271</td>
</tr>
<tr>
<td>On campus</td>
<td>0.912</td>
<td>0.270</td>
<td>11.390</td>
<td>1</td>
<td>0.001</td>
<td>2.781</td>
</tr>
<tr>
<td>Off campus</td>
<td>1.023</td>
<td>0.238</td>
<td>18.539</td>
<td>1</td>
<td>0.000</td>
<td>2.781</td>
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<tr>
<td>Constant</td>
<td>0.476</td>
<td>0.512</td>
<td>0.864</td>
<td>1</td>
<td>0.353</td>
<td>1.609</td>
</tr>
</tbody>
</table>

*Reference category is University A

### DISCUSSION

(Add any discussion related to the findings and implications)
The inclusion of five new universities in the present survey might be thought to be a particular source of bias, but it should be noted that the effects on the data of including the new universities seem to have balanced themselves out since they provided both the highest and lowest mean AUDIT scores in the sample. The institutions with mean scores closest to the overall sample mean were the two longer-established universities.

While high by any reasonable standards, there are grounds for thinking that our data underestimate the true rate of hazardous drinking and alcohol use disorders in the overall sample and subsamples. First, we did not record how many students had missed the lectures at which questionnaires were handed out and it is possible that missing students were heavier drinkers than those who attended (Gill, 2002). Secondly, almost all recommendations for varying cut-points on the AUDIT to achieve greater efficiency of screening have suggested that the conventional cut-point of 8+ be lowered (Reinert and Allen, 2007). This is particularly true for women where a cut-point of 5 or 6 has been recommended (Reinert and Allen, 2007). The rate of alcohol use disorders among young women in our overall sample is especially worrying given the greater vulnerability of women to the damaging effects of heavy drinking (Fuchs et al., 1995), but there is reason to believe that the true rate among female students in our sample is even higher than we report above.

Thirdly, it is well known that self-reports in surveys generally underestimate alcohol consumption (Bellis et al., 2009); the fact that our survey was not anonymous may have increased the tendency for participants to under-report drinking levels. However, it is also possible that students might overestimate consumption, especially perhaps in a group-testing situation. In a college student sample in the USA, Kraus et al. (2005) compared blood alcohol concentration estimates based on self-reported drinking data with breathalyser readings collected during the course of a night’s drinking. They concluded that students might overestimate rather than underestimate consumption levels in self-reports.

An incidental finding of the survey is of large variations in AUDIT scores between the seven universities taking part (Table 1). This is in contrast to the findings of Webb et al. (1996) who reported that ‘There were no major differences in the results from (ten) individual universities’ (p. 923, parentheses added). In our results, two universities showed very high mean AUDIT scores (13–15, Universities C and D in Table 1), one a low mean (~5, University A) and the remainder mean scores around the overall sample mean (8–11, Universities B, E, F and G). In the two universities with the highest mean AUDIT scores (C and D), over 80% of the sample was AUDIT positive and over one-third (34 and 39%, respectively) were classified as likely to have an alcohol use disorder.

Significant differences on mean AUDIT scores between universities emerged when they were grouped according to rough geographical location in England, with the two universities in the North showing a higher combined mean than two in the Midlands which was higher in turn than the mean for three in the South. This may again have been due to chance factors related to the selection of particular universities or courses of study, but it is important to note that this geographical gradient in AUDIT means reflects a broad pattern of regional variation in alcohol consumption in the general adult population (NHS Information Centre, 2010, p. 18). The finding of a very high level of risk and harm in our northern universities is supported by the results of Beenstock et al. (2010) who reported a similar AUDIT positive rate of over 80% from a single university in the North of England. Another recent study at a Midlands university reported a lower AUDIT positive rate of 52% (Penny and Armstrong-Hallam, 2010). Assuming this geographical gradient to be a valid finding, the question arises whether the differences are due to the attendance at universities of individuals from the local area or whether differences in cultural norms and attitudes to drinking between areas of England influence the drinking behaviour of students originating from other parts of the country. Because we did not ask participants for their home addresses, our data throw no light on this question.

Although not relevant to estimating the prevalence of alcohol-related harm in the student population, the findings here of relationships between AUDIT scores and other variables are of interest. First, there was a large and highly significant difference on AUDIT measures between ‘White’ and ‘non-White’ students and ethnicity remained a predictor of AUDIT positive status after the variation between universities had been accounted for. This difference was due in part to the greater proportion of lifetime abstainers among the ‘non-White’ students, but the difference in mean AUDIT scores between the two groups remained highly significant after the ‘never drinkers’ had been excluded from the analysis. These findings broadly replicate those of Webb et al. (1996) in their sample of UK university students and are also consistent with adult population data for England in which all black and minority ethnic groups have lower drinking frequencies and proportions drinking above medically recommended levels than the general population (National Statistics, 2006). The difference in our data may also have been contributed to by overseas students but, because we did not ask about nationality, we cannot confirm this.

Another finding of our survey is of higher mean AUDIT scores for students in the first year of study and in those living in on-campus student accommodation. However, when the variation between universities was accounted for in a LRA, only term-time accommodation remained as an independent predictor of AUDIT positive status. In a study at the University of Leeds, Bewick et al. (2008a) reported higher levels of consumption among students in Year 1 than among those in Years 2 and 3, and this might be explained as a consequence of relocation from the family home, a difficult period of transition and a time when there is a sudden reduction in parental supervision over drinking (White and Jackson, 2004). The finding with respect to on-campus accommodation is similar to that of Kypri et al. (2002) among students living in university halls of residence in New Zealand. In our data, however, both on-campus and off-campus accommodation were independent predictors of AUDIT positive status when contrasted with living in the family home or in other accommodation (e.g. with a partner or as a home owner). This implies that the critical factor associated with heavier drinking is leaving the family home rather than living in halls of residence or the introduction to university life in the first year of study as such.

It is well known that alcohol consumption and related problems decrease with age (Moore et al., 2005). Our findings
of a lower level of consumption and problems in later years of study and of a negative correlation between age and AUDIT score suggest that the process of ‘maturing out’ of alcohol problems has already started, a process that could be expected to continue after students leave university and assume the roles and responsibilities of adulthood (O’Malley, 2004). Nevertheless, longitudinal research from the USA shows in general terms that a substantial proportion of individuals with drinking problems in late adolescence continue to show problems in later life (Donovan et al., 1983; McCarty et al., 2004; Schulenberg and Maggs, 2002; Schulenberg et al., 1996). What is now needed are longitudinal studies of heavy-drinking university students in the UK. In particular, we need to know how many currently hazardous drinkers will go on to develop alcohol use disorders and how many will revert to lower-risk drinking in later years.

Even though many heavy-drinking students will cut down drinking in future, the data show that drinking is causing considerable harm among students in our sample at present, at least among the majority of universities in the study. Thus, 11% of the overall sample were classified as likely to be harmful drinkers and would be likely to have already incurred some alcohol-related harm; this rose to over 20% at two universities (Table 1). A further 10% of the overall sample showed probable alcohol dependence, rising to 18 and 22% at the same two universities. While the two universities in question evidenced exceptional levels of potential alcohol use disorders among their students, these levels were also high at four of the other institutions in the study (all but University A which approximated levels in the general adult population: Drummond et al., 2005). Aside from acute or chronic alcohol problems and dependence, there is also evidence of a direct relationship between heavy drinking and poor academic performance (e.g. Gill, 2002; Perkins, 2002; Singleton, 2007).

Our findings suggest that universities should carry out their own surveys of the drinking behaviour of their students, using the AUDIT, to assess the level of alcohol-related risk and harm among them. In the interests of early intervention and secondary prevention, hazardous drinkers should be offered forms of web-based intervention that have been developed and evaluated for use among university students (Bewick et al., 2008b, 2010; Kypri et al., 2009). These require only low administration, yet are highly accessible and have been found to be of benefit in the student population. Harmful drinkers could be offered the kind of brief single-session motivational interviewing approach evaluated in further education colleges by McCambridge and Strang (2004), although it should be noted that the beneficial effects of this intervention originally reported were apparently short-lived (McCambridge and Strang, 2005). The efficacy of brief intervention delivered by a physician in college health clinics in the USA has recently been demonstrated at 12-month follow-up (Fleming et al., 2010). Although strongly supported by a large body of research from the USA (Carey et al., 2007), the research development of effective brief interventions among university students in the UK has been neglected and should now be given a high priority.

WHO guidance for the AUDIT zone of probable alcohol dependence (Babor and Higgins-Biddle, 2001) states that such individuals ‘are likely to require further diagnosis and specialized treatment for alcohol dependence’ (p. 27) but stresses that the AUDIT is not a diagnostic instrument and that it is unwarranted to conclude or inform the individual concerned that alcohol dependence has been formally diagnosed. It is also possible that some individuals scoring <20 on the AUDIT require specialized treatment.

With regard to primary prevention, the appeal has been made to the need for ‘better education’ on alcohol in universities (Webb et al., 1996). Unfortunately, education is an ineffective means of preventing alcohol-related harm in the general population compared with measures like price controls and restrictions on alcohol availability and marketing (Babor et al., 2010). The same conclusion applies to student drinking and the introduction of a minimum price per unit of alcohol nationally, as recommended in recent guidance from the National Institute for Health and Clinical Excellence (2010), would probably help to reduce harm among students. On a more local level, much might be achieved by university and local government authorities and by student unions to limit the easy availability of cheap alcohol and to restrict marketing and promotion of its products among students by the alcohol industry (British Medical Association, 2009).

Acknowledgements — The authors are grateful to Dr Deborah Dawson for advice on longitudinal studies of alcohol problems among young people and to Dr Mick Wilkinson for advice on statistical issues. We also thank all our colleagues at the participating universities who helped arrange ethical approval and testing.

Funding — This research was funded by the Alcohol Education & Research Council (Grant R07/04).

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Alcohol Use Disorders among English Undergraduates


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