CONTRIBUTIONS OF ALCOHOL USE TO TEENAGE PREGNANCY

An initial examination of geographical and evidence based associations

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1. Key Points and Recommendations

- **From the data analyses:**
    a. Alcohol-related hospital admissions in young people (aged 15-17 years) have been used here as a proxy measure of alcohol misuse in these age groups[1], and have been compared with teenage conceptions (in females aged under 18[2]).
    b. At both lower tier local authority and ward levels there is a significant positive relationship between teenage conceptions and alcohol-related hospital admissions in young people. This relationship is independent of deprivation.
    c. After taking deprivation[3] at ward level into account, the teenage conception rate was 34 per 1000 females (aged 15-17 years) in wards with the lowest levels of alcohol-related hospital admissions, compared with 41 per 1000 females in wards with the highest levels of alcohol-related hospital admissions.
    d. Local authorities that have seen increases in teenage conceptions between 2006 and 2007 have also seen disproportionate annual increases in teenage alcohol-related hospital admissions.
    e. While England as a whole saw a 0.8% increase in alcohol-related hospital admissions in young people, local authorities which documented increases in teenage conceptions saw a five-fold greater increase (5.2%).

- **From the evidence review:**
    a. A rapid evidence review, although not a full structured systematic review, was conducted to provide an overview of some of the key studies examining associations between alcohol consumption and sexual behaviours.
    b. Early regular alcohol consumption is associated with early onset of sexual activity.
    c. Any amount of current drinking by teenagers is associated with being sexually active, especially binge drinking and drinking in greater quantities.
    d. Alcohol use at first sex is associated with lower levels of condom use at first intercourse.
    e. Beginning to drink alcohol at an early age is strongly associated with having a higher (or multiple) number of sexual partners. Those drinking more and at higher frequencies are at greater risk of having multiple partners.
    f. Evidence of a routine association between non-condom use and alcohol consumption is equivocal. However, there is better evidence to support higher levels of non-condom use in those who binge drink or have alcohol problems.
    g. In young people there is some evidence of an association between the misuse of alcohol and sex without any contraception. However, the

[1] Alcohol consumption data are not consistently available at geographies below the regional or national level

[2] Here, defined as under 18 conceptions as a rate per 1000 women aged 15-17 (ONS, 2008)

[3] Income deprivation affecting children (CLG 2007)

relationship between risk and increasing levels of consumption is unclear.

h. Alcohol consumption, and especially binge drinking and drinking greater quantities, is associated with an increased risk of becoming pregnant in females and getting someone pregnant in males.
i. There is good evidence to suggest that alcohol consumption in young people contributes to levels of regretted sex and that increasing consumption is associated with a greater probability of having experienced regretted sex.
j. There is good evidence to suggest an association between drinking in young people, especially binge drinking, and increased risk of forced sex.

- **Suggested further steps**
  a. Better intelligence on the relationships between alcohol and teenage pregnancy could be developed from existing data sets. Comprehensive analyses of the relationships between alcohol-related hospital admissions and teenage conceptions should be undertaken once new data are available.[4]
  b. Additional data sets are likely to provide a more comprehensive picture of the relationships between alcohol consumption, teenage conceptions, and also other key sexual health issues. Use of the National Drug Treatment Monitoring Data[5] may improve understanding of links. For some parts of the country, accident and emergency department data relating to alcohol can also be utilised. Such analyses should examine relationships with alcohol and levels of terminations, and with sexually transmitted infections (including Chlamydia) as well as with teenage conceptions.
  c. We would suggest that this combination of data sets (on sexual heath and substance use such as alcohol and drugs) is used to create a model of youth (i.e. under 18 year olds) behaviour at ward, local authority and NHS/primary care trust levels across England. Unlike typical analyses on single issues this could help inform strategies for delivering holistic support for young people.
  d. A model using sexual health, alcohol and drugs data could also be used to examine the match of service need to service provision for young people at local levels.
  e. Research studies on the relationships between alcohol and sexual health issues in England are relatively few and far between. High quality research on understanding how these issues are linked in England is urgently needed.
  f. Adequate evidence is already available to suggest strong links between alcohol, teenage conceptions and other sexual health issues. Future developments in both alcohol and sexual health services should examine how prevention messages and initiatives can be delivered to address both issues together.

[4] Such analyses will require single year unsuppressed data for all wards and local authorities.

[5] NDTMS now also collects data on individuals in alcohol treatment as well as in treatment for drug misuse problems.

g. Services dealing with sexual health or substance misuse should be encouraged to provide seamless support for young people who may present with either a sexual health or an alcohol problem, recognising they will often have problems with both.

2. Introduction

Rates of teenage pregnancy in the United Kingdom are the highest in Western Europe (EU-15) (DH 2009) and more than a quarter of young people in Britain have had sex before the age of 16 (Wellings et al. 2001). Recent evidence suggests that it is as high as 29% in females and 27% in males (French et al 2007). Teenage pregnancy has a considerable effect on individual, family and community wellbeing and is associated with poor health and wellbeing outcomes including: increased risk of low birth weight babies, a 60% higher infant mortality rate, poor mental health status of teenage mothers, and poor economic wellbeing (DfES 2006). A study in Greater London amongst 15-18 year old school pupils showed that girls who have sex under-16 may be three times more likely to become pregnant than girls who wait until they are older than 16, with the highest rates occurring in early school leavers with no qualifications (Testa and Coleman 2006). In a British survey of young people, almost one in three females (n=6,399) who had left school by the age of 16 years had become a mother before the age of 18 (Wellings et al. 2001). As well as a lack of qualifications, teenage pregnancy is also associated with poor parental supervision, deprivation, city living, low educational expectations, and poor access to services (DfES 2006). Consequently, lowering rates of teenage conception is a government priority (HM Government 2007).

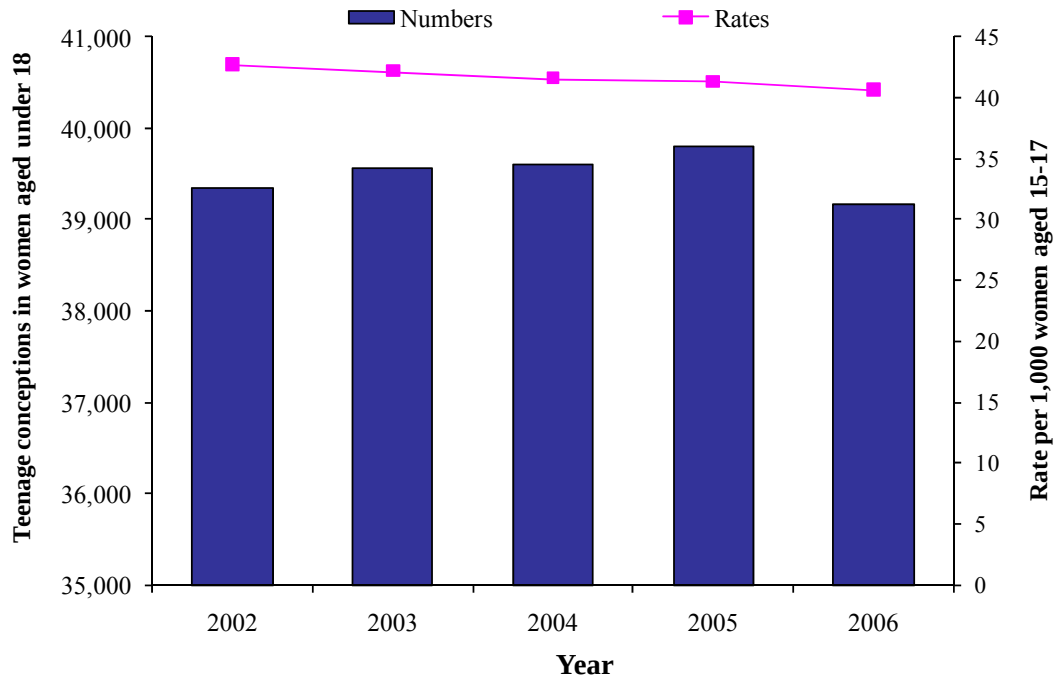
Evidence from countries with low teenage birth rates suggests school-based sex education, easy access to contraception including post-coital methods, and access to abortion services can reduce teenage birth rates (Narring et al. 1996). Based on such evidence, the UK government launched the Teenage Pregnancy Strategy in 1999, with an ambitious target of halving teenage pregnancy rates by 2010 (Wilkinson et al. 2006). The strategy comprised five main components: a national media campaign; joint action to ensure national and local coordination; improved education on sex and relationships; improved access to services; and support for teen parents to return to education, training, or employment (DCSF 2008).

An analysis of 148 (of a total of 354) local authorities showed that the net change between 1994-1998 and 1999-2003 for teenage conception rates (for under 18s) fell by 3.2%, abortion rates increased by 7.5%, and birth rates fell 10.6% (Wilkinson et al. 2006). However, large local authority variations both in levels of conception and in methods of implementation suggest that some components of the Teenage Pregnancy Strategy may have been more effective than others (Wilkinson et al. 2006). Thus, current guidelines now focus on those considered effective, including: engaging service delivery partners, selecting senior champions to lead local work, establishing effective sexual health advice services, prioritising sex and relationship education in schools, targeting interventions in those at greatest risk, and ensuring a well-resourced youth service. [6] To a large extent however, potential links between teenage conceptions and alcohol use have not been directly addressed.

Currently, national figures indicate that between 1998 and 2006 there has been a 12.8% decrease in rates of under 18 conceptions across England (DH 2009). However, declines in recent years have been modest (Figure 1). Data for 2007 are expected to show an overall rise since 2006 (DH TPU, 2008).

[6]Every Child Matters: Change for Children Website (accessed 18 February 2009) www.everychildmatters.gov.uk/health/teenagepregnancy/about

Figure 1. Trends in teenage conceptions in England; conceptions in women aged under 18 are defined as a rate per 1000 females aged 15-17 (ONS, 2008).

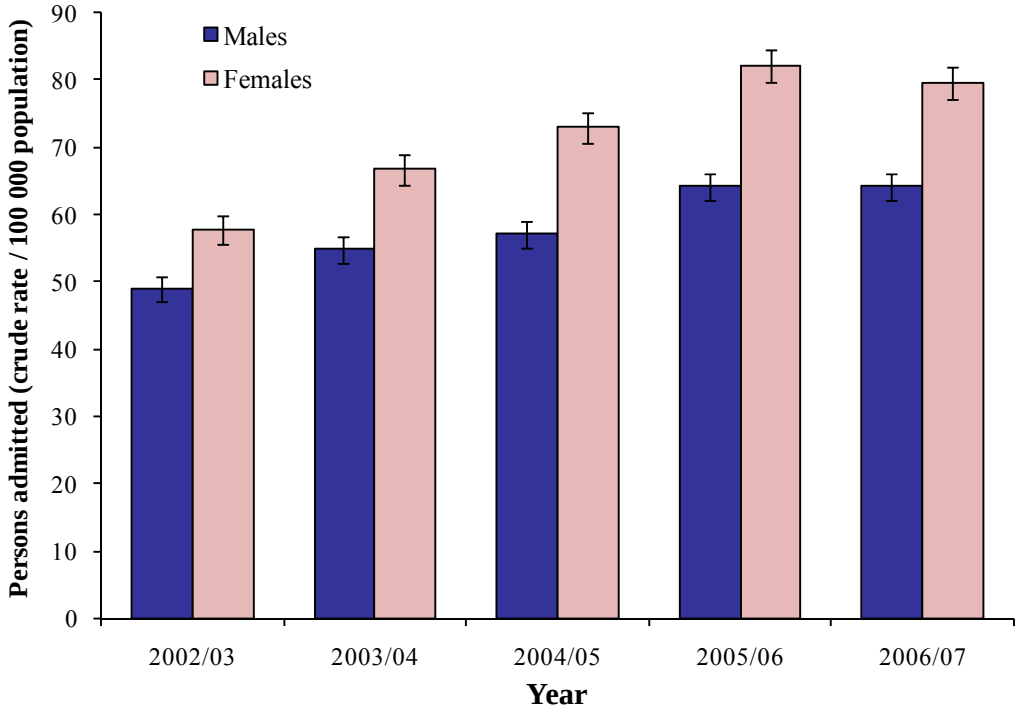


As well as teenage conceptions another major issue affecting young people is alcohol use. Between 1990 and 2006, while the proportion of young people drinking (aged 11-15 years) fell from 64% to 55%, the amounts drunk per week by those who drink doubled (Fuller 2008). Further, between 2002/03 and 2006/07, hospital admissions for alcohol specific conditions[7] in under 18 year olds in England rose from 49 to 64 per 100,000 for males and 58 to 80 per 100,000 for females (Figure 2).

This paper brings together issues relating to teenage conception and alcohol use in those under 18 in order to examine any potential roles alcohol may be playing in continued high levels of teenage conceptions. The paper examines local data on teenage conceptions, hospital admissions related[7] to alcohol consumption and the relationship between them. Further, it reviews the evidence base for links between alcohol consumption and sexual behaviour in those under 18 years and, explores new data on regretted sex and its relationship with drinking patterns in children. Finally, it summarises the evidence on whether alcohol is contributing to current levels and trends in teenage pregnancy.

[7] Alcohol specific conditions are those that are wholly caused by alcohol (e.g. alcoholic poisoning, mental and behavioural disorders due to alcohol); alcohol related conditions are those both wholly and partially attributable to alcohol e.g. injuries, assault, self-harm, epilepsy (Jones et al 2008).

Figure 2. Trends in alcohol specific hospital admissions for males and females aged under 18 in England (NWPHO, 2008)



3. Teenage Conceptions and Hospital Admissions for Alcohol

To help understand any possible relationships between trends in teenage conceptions and alcohol consumption in young people, we have analysed the lowest level geographic data that are currently available for both data sets. Teenage (under 18) conception statistics were obtained at lower tier local authority[8] and ward[9] levels and here we use alcohol-related admissions to hospital[10] (as a proxy for levels of alcohol misuse) in the same geographical areas.

3.1 Geographical patterns

Maps of teenage (under 18) conceptions in particular and alcohol-related hospital admissions across England (aged 15-17years) show very similar patterns to income deprivation affecting children[11] (Figures 3 & 4). This suggests that the local areas that have higher rates of teenage conceptions tend to be the more deprived areas of the country and also show some tendency to have higher rates of alcohol-related hospital admissions. This geographical similarity is observed at both the lower tier local authority level and at the ward level[12].

[8] Conceptions data are published for upper tier local authorities at LAD1 level (unitary authorities, metropolitan districts, counties and London boroughs). Here we have obtained the district data within the counties providing lower tier local authorities at LAD2 level (unitary authorities, metropolitan districts, non-metropolitan districts and London boroughs)

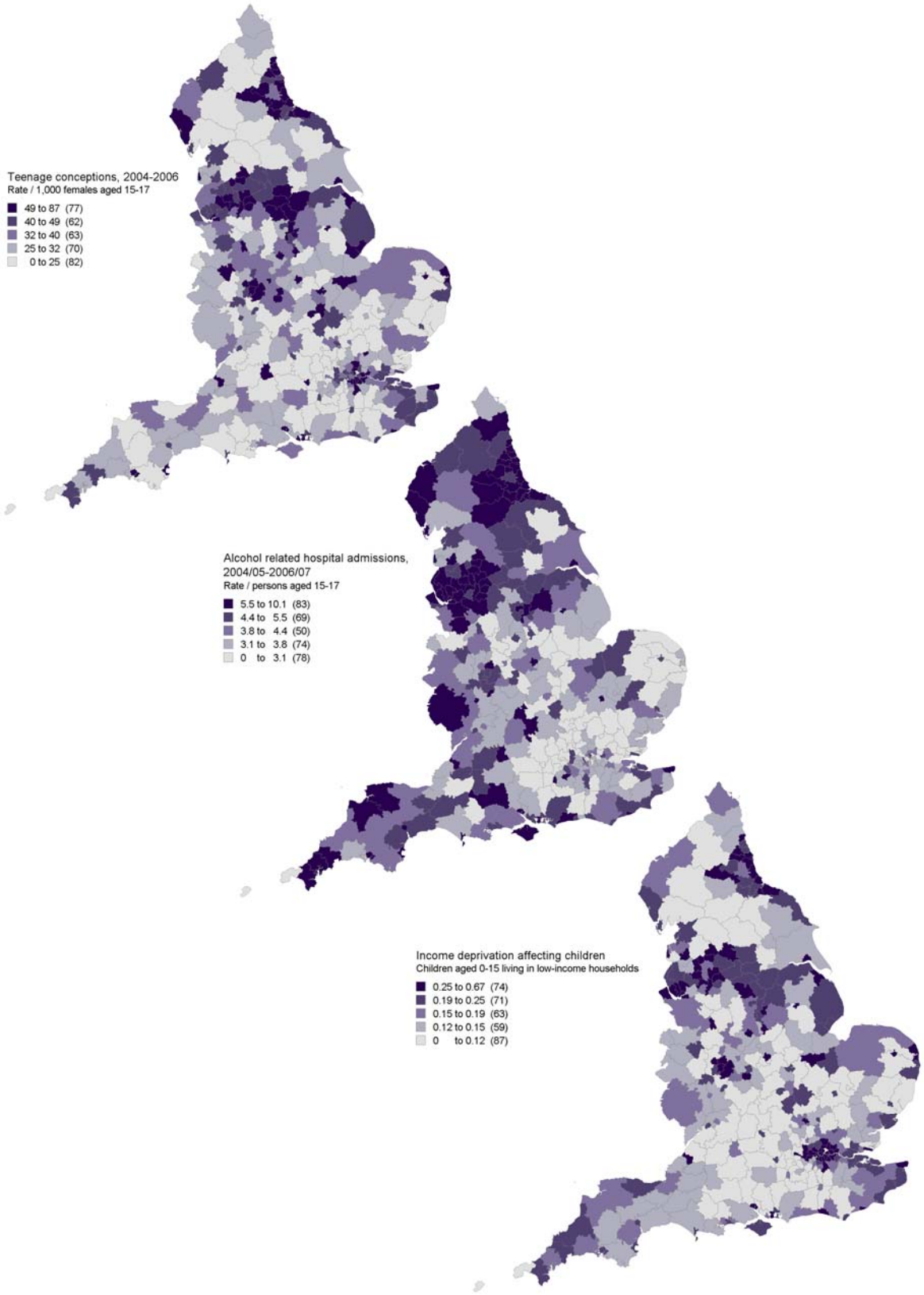
[9] Census Area Statistics (CAS) or Statistical Table (ST) wards depending on number of cases. www.statistics.gov.uk/geography/faq_statistical_cas_wards.asp

[10] Conditions either wholly or partially attributable to alcohol e.g. injuries, assault, epilepsy (Jones et al 2008)

[11] This measure of deprivation is a component of the Indices of Multiple Deprivation, 2007. www.communities.gov.uk/communities/neighbourhoodrenewal/deprivation/deprivation07

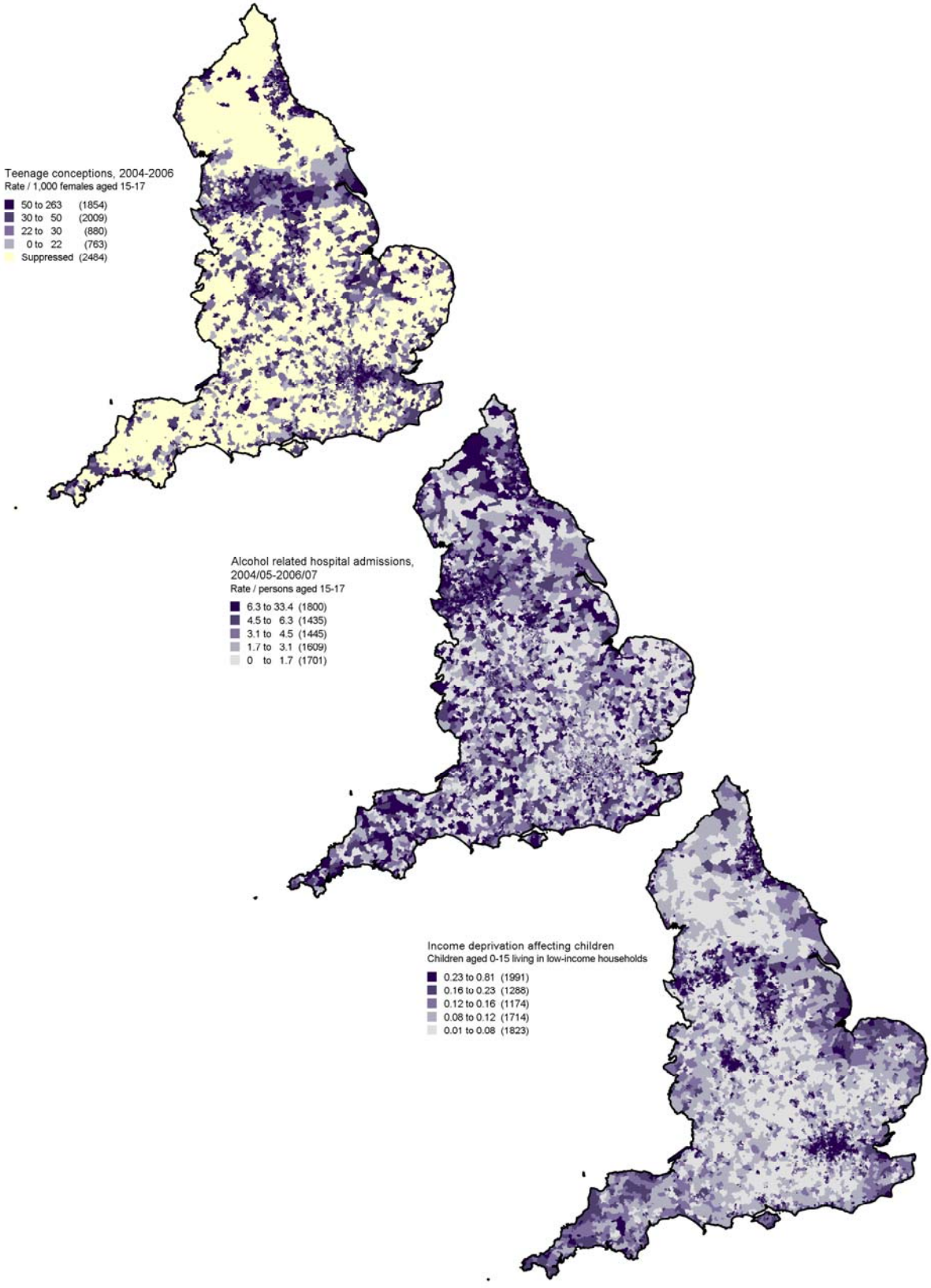
[12] At Ward level geography, small numbers of events make the measurement of robust rates slightly more subject to random variation.

Figure 3. Lower tier local authority rates of a) teenage conceptions, b) alcohol-related hospital admissions (ages 15-17) and c) income deprivation affecting children[13].



[13] Data sources: a) teenage (under 18) conceptions per 1000 women aged 15-17 (ONS, 2008); b) alcohol related hospital admissions in persons aged 15-17 (NWPHO, 2009); c) Income deprivation affecting children (CLG, 2007).

Figure 4. Ward rates of a) teenage conceptions, b) alcohol-related hospital admissions (ages 15-17) and c) income deprivation affecting children[14]



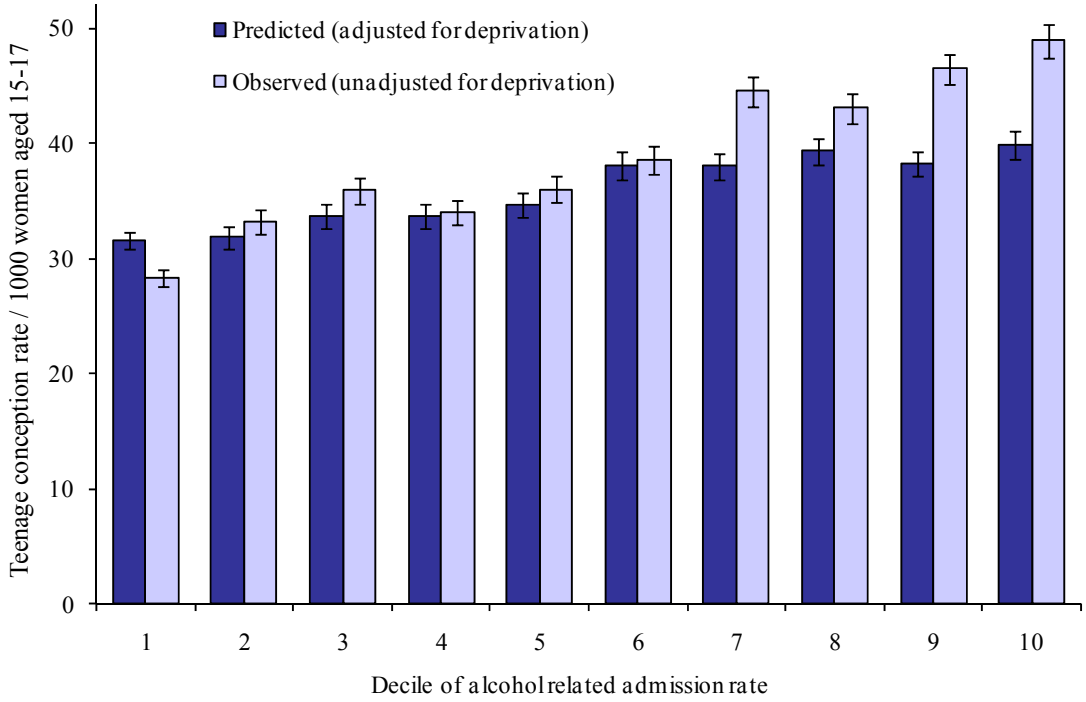
[14] Data sources: a) teenage (under 18) conceptions per 1000 women aged 15-17 (ONS, 2008) – data where the number of conceptions are under 5 have been suppressed (coloured yellow); b) alcohol related hospital admissions in persons aged 15-17 (NWPHO, 2009); c) Income deprivation affecting children (CLG, 2007).

Statistical relationships

As both teenage conception rates and alcohol-related admission rates in young people are related to deprivation, it is possible that any link between alcohol consumption and conceptions are confounded by deprivation. We therefore undertook further statistical modelling[15] to examine the relationship remaining after adjustment for levels of income deprivation affecting children. Using lower tier local authority data, alcohol hospital admission rates for those aged 15-17 years were grouped into deciles. The observed rate of teenage conceptions increased from around 28 per 1000 in the areas with lowest alcohol-related admission rates to almost 49 per 1000 in areas with the highest alcohol-related admission rates (Figure 5).

After adjustment for levels of income deprivation affecting children, the predicted relationship between alcohol admission rates and teenage conception remains highly significant but shows a slightly reduced gradient (Figure 5). Thus, the relationship between alcohol hospital admission rates and teenage conception rates cannot be fully explained by levels of deprivation[16]. After adjusting for levels of deprivation, the predicted measure of teenage conceptions increased from around 32 per 1000 in the areas with lowest alcohol-related admission rates to 40 per 1000 in areas with the highest alcohol-related admission rates.

Figure 5. Observed and predicted teenage conception rate by deciles of alcohol-related hospital admission rate 2004-2006; showing measures unadjusted and adjusted for income deprivation affecting children (lower tier local authority level data)

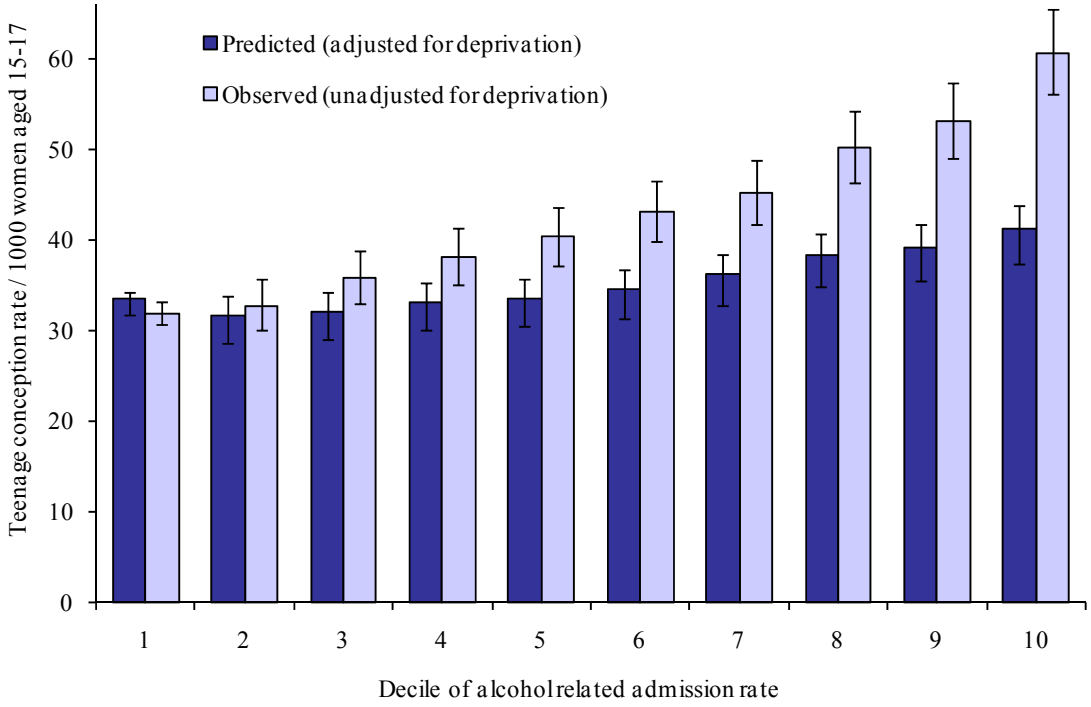


[15] Using STATA v10, Poisson regression was used to model the area-level association between conception rates (the dependent variable) and hospital admission for alcohol specific conditions, with and without adjustment for deprivation. Likelihood ratio tests were used to assess significance of single or multiple variables in nested regression models. The Akaike Information Criteria (AIC) was used to compare overall fit of non-nested models.

[16] Additional adjustment for area level educational attainment did not further reduce the strength of the association between alcohol-hospital admission rates and teenage conception rates (data not shown).

Statistical modelling was repeated using ward level data for teenage conceptions and alcohol-related hospital admissions in young people. This use of smaller geographies leads to an even stronger association between deciles of alcohol-related hospital admissions and teenage conception rates. Observed rates for teenage conceptions increased from around 32 per 1000 in the areas with lowest alcohol-related admission rates to around 61 per 1000 in areas with the highest alcohol-related admission rates (Figure 6). After adjustment for levels of income deprivation affecting children, the association between alcohol-related hospital admissions and teenage conception rates was less strong (ranging from 33 up to 41 per 1000), but again remained highly statistically significant.

Figure 6. Observed and predicted teenage conception rate by deciles of alcohol-related hospital admission rate 2004-2006; showing measures unadjusted and adjusted for income deprivation affecting children (ward level data)



3.2 Trend and relationships

It is important to note that these ecological analyses are not able to establish a causal link between alcohol consumption and teenage conception. However, investigating trends at both local authority and ward level can help to provide additional evidence of such relationships; since areas that experience an increase in alcohol-related hospital admissions may be more likely to show increases in teenage conception rates. Even with limited data currently available, there is already some evidence that this trend relationship exists at a national level (based on upper tier local authority[17] analyses).

[17] Conceptions data are published for local authorities at LAD1 level (unitary authorities, metropolitan districts, counties and London boroughs) (ONS, 2008)

Provisional data for the first three quarters of 2007 indicate that there has been a significant increase in rates of teenage conceptions since 2006 (DH TPU, 2008). The 20 authorities (of 147 upper tier authorities) that are showing the greatest increase account for 62% (714 conceptions) of the increase in numbers since 2006 across all of England (Table 1).

Table 1. Under-18 conception trends from 2006 to 2007 for England and upper tier local authorities[18]

Geographical area	Rate change since 2006		Change in number of teenage conceptions since 2006		
	Q3 2007 rate	% change since 2006	Q1 – Q4 2006	Q4 06 +Q1,2&3 07	Diff. in number
England	42.0	**3.3%**	39,170	40,322	**1,152**
20 authorities with greatest % change in teenage conceptions since 2006	41.8	**23.2%**	3,609	4,323	**714**

By totalling the number of alcohol-related hospital admissions within those same 20 authorities (i.e. the ones with the greatest increase in teenage conceptions), we observe that these areas also account for a large proportion of the increase in alcohol-related admissions (Table 2). Between 2005/06 and 2006/07, there was a 5.2% increase in the number of alcohol-related admissions for persons aged 15-17 in these areas compared with a 0.8% increase in all of England. In total, 85% of the entire increase in admissions (62 of 73 persons aged 15-17 admitted to hospital) were in the authorities with the highest increase in teenage conceptions (Table 2). More detailed analyses of the relationships between trends in alcohol-related hospital admissions in young people and teenagers is not possible without access to additional information.

Table 2. Alcohol-related hospital admission in young people (aged 15-17) trends from 2005/06 to 2006/07 for England and upper tier local authorities[18]

Geographical area	Rate change since 2005/06		Change in number of hospital admissions since 2005/06		
	2006/07 rate	% change since 2005/06	2005/06	2006/07	Diff. in number
England	4.8	**0.8%**	9,500	9,573	**73**
20 authorities with greatest % change in teenage conceptions since 2006	5.6	**5.2%**	1,187	1249	**62**

4. Teenage conceptions and Alcohol – the evidence base

The following section comprises a rapid review of evidence linking alcohol use and sexual activity in young people. While it is not intended to be a structured systematic review, evidence statements based on those studies reviewed are provided at the beginning of each section. Note, most studies available are cross-sectional and consequently while evidence can describe strong associations between alcohol consumption and sexual behaviours, they cannot establish causation.

4.1 Alcohol and age of first sex

Evidence Statement (1)
Early regular alcohol consumption is associated with early onset of sexual activity

In Arras (France), a school survey of 4,255 adolescents (mean age 15.8 years; Choquet et al. 1992)[18] found regular alcohol consumption (defined as drinking at least twice a week) was more common amongst those who had had sexual intercourse compared with those who had not in under 15 year olds, especially for girls. In the Health and Development Study, a longitudinal research project in Christchurch (New Zealand; Fergusson and Lynskey 1996)[19], researchers surveyed 953 15-16 year olds. Those who misused alcohol[20] (n=79) were more likely to report early onset of sexual activity (before the age of 16 years) after adjustment for correlated risk factors such as childhood diversity, novelty seeking and affiliation with delinquent peers – although accounting for the risk factors reduced (but did not remove) the links between alcohol and early onset of sexual activity the relationship remained significant. Again, the relationship was stronger for girls than boys (boys: Odds Ratio (OR) 2.9; 95% CI 1.4-6.0, P<0.005; girls: OR 6.2; 95% CI 2.6-23.4, P<0.01).

In South East Scotland, a study amongst 16-20 year olds (n=335) in 1985 (Robertson and Plant 1988)[21] showed a significant positive association between having had early sexual intercourse and having begun drinking at an early age in both males and females. Furthermore, over half of males and nearly half of females stated they had consumed alcohol before their first sexual intercourse. In a survey of 1,341 Europeans aged 16-35 (including 144 individuals from Liverpool, England), alcohol use before the age of 16 was associated with having sex before the age of 16 in both genders (OR 3.47). Importantly however, drinking before age 16 was associated with a greater risk in girls (OR 5.7) having sex before this age, compared with the risk in boys (OR 2.47, Bellis et al. 2008).

[18] Forty-two schools were randomly selected for involvement in the study, and within those schools, pupils from one in three classes were invited to participate (Choquet et al. 1992).
[19] The Health and Development Study involved participants born in mid-1977 in Christchurch (New Zealand; Fergusson and Lynskey 1996).
[20] Alcohol misuse was defined through the frequency of drinking (at least once a week), quantities of alcohol consumed (typical amount being greater than 90ml pure alcohol and having consumed at least 180ml at least once in the last three months), and experience of five or more alcohol-related problems in the last year (based on the Rutgers Alcohol Problem Index; Fergusson et al 1995).
[21] Participants were 189 16-20 year olds who were married in 1982 and 146 unmarried 17-18 year olds in 1982 in South East Scotland (taken from the Electoral Register; Robertson and Plant 1988).

4.2 Alcohol and sexual activity

Evidence Statement (2)
Any amount of current drinking by teenagers is associated with being sexually active, especially binge drinking and drinking in greater quantities.

In a qualitative study in Perth (Australia) during 2006, of 68 girls aged 14-19 using sexual health services, being drunk was reported as a legitimate reason for initiating sex (Skinner et al. 2008). Miller et al. (2007) analysed the data from 14,114 American high school students involved in the 2003 Youth Risk Behaviour Surveillance (YRBS). Here, current drinkers (who did not binge[22]) had a two-fold higher risk of being currently sexually active (OR 2.2; 95% CI 1.9-2.6) than non-drinkers, while current binge drinkers had a five-fold higher risk of being currently sexually active (OR 5.5; 95% CI 4.5-6.5). The prevalence of sexual activity increased linearly with frequency of binge drinking: prevalence of being currently sexually active[23] was 36.8% in non-bingers and 83.8% in those bingeing on 10 or more days in the past 30 days. This study also found that current drinkers (who did not binge) had a two-fold higher risk of substance use (including alcohol use) before sex, compared with abstainers (OR 2.3; 95% CI 1.5-3.4). Current binge drinkers had a 10-fold higher risk of substance use (including alcohol use) before sex (OR 10.3; 95% CI 7.1-14.8). A separate analysis of these data focusing on pupils in Hawaii (14-18 years n=2,657) in 1997-1998 (Ramisetty-Mikler et al. 2004) found that children who had initiated drinking at or by the age of 10 years (the proportion of whom is not provided) were twice as likely to use alcohol at the time of sexual activity compared with children who started drinking at 15 years or older (OR 2.1; 95% CI 1.2-3.7, $P \leq 0.01$).

4.3 Alcohol and condom use at first sex

Evidence Statement (3)
Alcohol use at first sex is associated with lower levels of condom use

In America, Cooper et al 1994 analysed data from 1,176 sexually experienced 13-19 year olds in Buffalo, New York from October 1989 to December 1990[24]. Drinking proximal to first intercourse was <u>not</u> found to be associated with condom use. However, a more recent analysis of the 1994-95 Longitudinal Study of Adolescent Health data on 6,867 American school children (12-18 year olds) found that girls who reported they were inebriated at first sexual intercourse were significantly less likely than girls who were sober to use a condom at first intercourse (OR 0.43 $p<0.001$; Dye and Upchurch 2006). No such association was found in boys. Whatever the level of alcohol consumption, as age at first intercourse increased, the probability of condom use increased. In Scotland, Robertson and Plant (1988) looked at the relationship between alcohol and condom use at first intercourse. They found that 13% of males who had drunk alcohol at time of intercourse had used contraception whereas 58% of those who had not drunk had used contraception ($P<0.001$). Of females, 24% of those who drank before first intercourse had used contraception compared with 68% of

[22] Current drinking is defined as having had at least one alcoholic drink in the last 30 days. Binge drinking is defined as drinking five or more drinks in a row at least once in the last 30 days (Miller et al 2007).
[23] Being currently sexually active was defined as having sexual intercourse with at least one person in the last three months (Miller et al. 2007).
[24] Participants were identified through random digit telephone dialling, and then interviewed face-to-face, with more sensitive information being collected via a self-completion questionnaire (Cooper et al 2004).

those who had not drank (P<0.001). A meta analysis,[25] conducted on thirteen studies from 1966 to 2000, investigated the links between alcohol consumption and condom use (Leigh 2002). Of these, two asked about first sexual encounter (one in America published in 1995, one in Norway published in 1990). This meta-analysis found that those who drank at their first sexual encounter were less likely to use condoms than those who did not (OR 0.54, 95% CI 0.44-0.66).

4.4 Alcohol and number of sexual partners

Evidence Statement (4)

Beginning to drink alcohol at an early age is strongly associated with having a higher (or multiple) number of sexual partners. Those drinking more and at higher frequencies are at greater risk of having multiple partners.

The majority of studies exploring the relationship between alcohol consumption and the number of sexual partners in young people originate from the American YRBS[26] System. An early, national cohort (April-May 1990) of the YRBS, was used to explore drinking and number of sexual partners in 11,631 American students aged 14-18 years (Lowry et al. 1994). Compared with students who reported no substance use (for alcohol, tobacco and illegal drugs), those who used only alcohol or cigarettes were more likely to have had four or more sexual partners (OR 2.7; 95% CI: 1.7-4.2). Analysis of the YRBS was also conducted on 2,657 Hawaiian school children (aged 14-18 years) in 1997-1998 (Ramisetty-Mikler et al. 2004). Both non-episodic and episodic drinkers[27] were more likely to have had multiple partners compared with abstainers: episodic drinkers were over five times more likely to have had multiple partners in the past three months (OR 5.7; 95% CI 2.6-12.4, P≤0.001); and in non-episodic drinkers the likelihood was 3-fold higher (OR 2.9; 95% CI 1.1-7.6, P≤0.05). Risk also increased with earlier age of initiation into alcohol use with the likelihood of having had two or more lifetime partners doubling if alcohol use was initiated at 13-14 years compared with abstainers (OR 1.9; 95% CI 1.0-3.6, P≤0.05). Finally, an exploration of the YRBS data from North Carolina in 2005 of 994 students showed that in 11-13 year olds, the number of sexual partners was strongly associated with the age of initiation of alcohol use. In students over 13 years, number of partners was associated with initiation of drinking, current drinking and binge drinking (Kim-Godwin et al 2007).[28]

Three longitudinal studies have investigated the link between alcohol consumption and multiple partners in America. The Pittsburgh Adolescent Research Center project monitored 240 sexually active adolescents aged 14-21 years between 1991 and 1995 (Cook et al 2002). Both males and females with alcohol use disorders[29] were significantly more likely to report higher numbers of sexual partners than those

[25] A meta-analysis is a statistical technique which is used to combine the results from a number of independent studies. This is then used to provide an overall understanding of the impact of a given factor, such as the effect of alcohol on condom use.
[26] Youth Risk Behaviour Surveillance
[27] Episodic drinkers were defined as those who drank five drinks or more at least once within a two-hour period on any day (Ramisetty-Mikler et al. 2004).
[28] Data from the national American Youth Risk Behaviour Surveillance (YRBS) System were analysed from 619 middle (11-13 years) and 375 high school (>13 years) students in North Carolina in 2005 (Kim-Godwin et al. 2007).
[29] The existence of an alcohol use disorder was assessed through an adapted version of the Structured Clinical Interview for DSM-III-R (Cook et al. 2002).

without such a disorder. In Buffalo, New York, in a sample of 561 15-18 year olds, those who had been drunk at an early age were at a higher risk of engaging in sexual risk-taking behaviours, including having multiple partners (Thomas et al. 2000). Further, in a study in Brooklyn, New York, 1,034 mainly Black and Hispanic young people were monitored over three years (Stueve and O'Donnell 2005).[30] Initiation of alcohol use at 12-13 years (26% of sample reported this) was significantly associated with an increased risk of having two or more lifetime sexual partners, compared with those not drinking at this early age (OR 1.54; 95% CI 1.10-2.26, P≤0.05).

A longitudinal Health and Development Study in Christchurch, New Zealand evaluated how 859 adolescents progressed between 16 to 21 years (Fergusson and Lynskey 1996), and followed 854 of the participants as they progressed between 21 to 25 year olds (Wells et al. 2004)[31]. Here, drinking at age 16 years was significantly associated with the number of sexual partners between both 16-21 and 21-25 years of age. Moreover, the number of sexual partners increased linearly with rising consumption of alcohol at 16 (P<0.001). While the authors noted that other factors in addition to alcohol consumption could be involved, such as family background, personal characteristics, a general propensity for impulsivity, and who people drink with, a substantial relationship between alcohol and sexual behaviour was still found when these factors were accounted for. The authors suggested this may be because alcohol disinhibits individuals and/or because those wanting sexual activity drink in order to obtain it.

4.5 Alcohol and routine condom use

Evidence Statement (5)
Evidence of a routine association between non-condom use and alcohol consumption is equivocal. However, there is better evidence to support higher levels of non-condom use in those who binge drink or have alcohol problems.

Evidence on the association between general condom use and alcohol consumption is equivocal, although some studies have found an association between the two.

- A 1988 American study interviewing 1,773 16-19 year olds by telephone in Massachusetts, found that those who drank five or more alcoholic drinks per day (5% of sexually active people surveyed) were 2.8 times less likely to use condoms compared with non-drinkers (95% CI:1.42-5.41; Hingson et al. 1990).
- Data from the YRBS in North Carolina America (n=994) in 2005 showed that non-condom use in older students was also associated with current and binge drinking (Kim-Godwin et al. 2007).
- A cross-sectional survey of 16-30 year old residents in Muirhouse and Easterhouse, Scotland (n=1,378), showed that 15% of females and 22% of males reported they were less likely to use a condom after drinking (Bagnall and Plant 1991).

[30] This survey involved seventh grade students in 1994-96, three-quarters of whom were followed up in 1995-96 in tenth grade (Stueve and O'Donnell 2005).
[31] The Health and Development Study involved participants born in mid-1977 in Christchurch (New Zealand; Fergusson and Lynskey 1996).

- In a survey of 1,874 full-time students in Tyne Tees,[32] the likelihood of them having sex without a condom with someone they just met increased with alcohol consumption (McEwan et al. 1992).

However, a number of studies have found no association between non-condom use and alcohol consumption. Using national data from the YRBS in America, an analysis of 14,114 high school students (12-≥18 years) in 2003 showed that compared with abstainers, there was no association between condom use and current drinking (OR 1.0; 95% CI 0.8-1.3; Miller et al. 2007) and only a weak association with binge drinking (OR 1.2; 95% CI 0.9-1.6; Miller et al. 2007). Nevertheless, the likelihood of non-condom use increased linearly with binge drinking frequency: 35.8% of drinkers who did not binge in the last 30 days reported non-condom use, increasing to 49.7% in those bingeing on 10 or more days.

Studies have investigated the link between alcohol consumption and condom use during the last occurrence of sexual intercourse or with last sexual partner. These found no evidence that alcohol consumption was associated with non-condom use. National data from the YRBS System (n=11,631) from April-May 1990 in America showed that, compared with students who reported no substance use, those who used only alcohol or cigarettes were no more or less likely to have used a condom at last sexual intercourse (OR 1.2; 95% CI: 0.8-1.8; Lowry et al. 1994). However, females with an alcohol use disorder[33] were significantly less likely to report using a condom during their last sexual intercourse than those without, although there was no significant difference for males. Further, in a subset of 898 13-19 year olds in Buffalo, New York, surveyed in 1989-90 (total sample n=1,176), drinking proximal to first intercourse with most recent partner was not associated with condom use (Cooper et al. 1994).

4.6 Alcohol and contraception use in general

Evidence Statement (6)
In young people there is some evidence of an association between the misuse of alcohol and sex without any contraception. However, the relationship between risk and increasing levels of consumption is unclear.

The majority of research investigating use of contraceptives during sex and its association with alcohol focuses on condom use. However, a small number of studies address contraceptive use and unprotected sex in general. A European survey of 15-16 year olds conducted in 2003 showed that amongst 2,068 UK participants, 8% had engaged in unprotected sex following alcohol consumption (Hibell et al. 2004). This was higher in girls (11%) than in boys (6%). In the Christchurch, New Zealand study, those who misused alcohol[34] (n=79) were more likely to report having unprotected sex than those who did not misuse after adjustment for other risk factors (boys: OR 6.9, 95% CI 2.5-18.9, P<0.001; girls: OR 4.5; 95% CI 1.7-11.9, P<0.001; Fergusson

[32] A postal survey was established which randomly sampled 1,874 full-time students in Tyne Tees and an additional 300 university students were recruited for interview between November 1989 and March 1990 (from 16 years old upwards; McEwan et al. 1992).
[33] Existence of an alcohol use disorder was assessed through an adapted version of the Structured Clinical Interview for DSM-III-R (Cook et al. 2002).
[34] Alcohol misuse was defined through the frequency of drinking (at least once a week), quantities of alcohol consumed (typical amount being greater than 90ml pure alcohol and having consumed at least 180ml at least once in the last three months), and experience of five or more alcohol-related problems in the last year (based on the Rutgers Alcohol Problem Index; Fergusson et al 1995).

and Lynskey 1996). In Alicante, Spain, of 384 female adolescents aged 13-20 years who visited family planning services (January 2001 to June 2003), health records showed that 48.4% had reported unprotected intercourse or inadequate use of contraception which was related to regular alcohol drinking (Gómez et al 2007). Finally, modelled data from the American National Longitudinal Study of Youth (1997) determined that alcohol was associated with a 11-16% (girls) and 10-17% (boys) increase in the probability of non contraception use (Sen 2002). However, data also suggested a lesser effect associated with heavy drinking (5 or more drinks at a stretch).

4.7 Alcohol and conception

Evidence Statement (7)
Alcohol consumption and especially bingeing and drinking greater quantities is associated with an increased risk of becoming pregnant in females and getting someone pregnant in males

An analysis of national data from 14,114 high school students (12-≥18 years) involved in the YRBS in 2003 showed that compared with abstainers, current drinkers (who did not binge) were at an increased risk of becoming pregnant or getting someone pregnant (OR 1.7; 95% CI 1.2-2.4; Miller et al. 2007). Binge drinkers had close to a five-fold increased risk of becoming pregnant or getting someone pregnant (OR 4.7; 95% CI 3.4-6.5). The prevalence for sexual risk behaviour increased linearly with frequency of binge drinking and the prevalence of pregnancy was 4.2% in non-bingers compared with 23.9% in those bingeing on 10 or more days in past 30 days. Consistent with this, the Health and Development Study (n=859)[35] in Christchurch, New Zealand showed that the number of pregnancies (for males, whether they had made a woman pregnant) increased linearly with increasing alcohol consumption at 16 years (P<0.001; Wells et al. 2004).

Research has also been performed with more vulnerable groups. A survey of 256 adolescents in America (aged 14-18 years)[36] showed that a significantly higher proportion of female alcohol dependents (18.5%) and abusers (7.4%), who were recruited through settings such as hospital settings and controls, had become pregnant than controls (0.0%; P<0.001; Clark et al. 1997). Finally, a survey of 1,034 mainly Black and Hispanic young people in Brooklyn, New York[37], showed early (12-13 yrs) initiation of alcohol use was significantly associated with lifetime pregnancy (OR 1.73; 95% CI 1.10-2.70, P≤0.05; Stueve and O'Donnell 2005).

[35] This involved the longitudinal monitoring of 859 adolescents born mid 1977 as they progressed from 16 to 21 years and 854 as they progressed from 21 to 25 year olds in Christchurch (Wells et al. 2004).
[36] This study recruited participants through interventions such as hospital based treatment, juvenile justice, and a residential programme (Clark et al. 1997). In total, 132 of these were classified as alcohol dependents and 51 as alcohol abusers. Alcohol dependence and abuse was assessed through the use of the DSM-III-R. An additional 73 control subjects were recruited through random digit telephone dialling.
[37] Survey of individuals in the seventh grade in 1994-96, three-quarters of whom were followed up in 1995-96 in tenth grade (Stueve and O'Donnell 2005).

4.8 Alcohol and regretted sex

Evidence Statement (8)
There is good evidence to suggest that alcohol consumption by young people contributes to levels of regretted sex and that increasing consumption is associated with a greater probability of having experienced regretted sex.

In a European-wide survey of 15-16 year olds, the UK sample (n=2,068) showed that 9% of boys and 12% of girls (11% overall) engaged in sex after drinking which they regretted the next day (Hibell et al. 2004). In a survey of English and Scottish young people (13-16 year olds; n=11,625) those who had been drunk or stoned had elevated odds of regretting their first time of having sex compared with non-users (OR 1.4; 95% CI 1.12–1.78; Wight et al. 2008). In a large cross sectional study of 9,833 15-16 year olds in North West England in 2007, increases in alcohol-related regretted sex were strongly associated with increased number of alcohol units drank per week, drinking frequency and especially frequency of binge drinking (see Box 1). Age may also be associated with alcohol-related regretted sex; in a survey of sexual uses of alcohol in 1,341 Europeans aged 16-35 (including 144 from Liverpool), the risk of regretted sex after alcohol or drug use was greater (OR 1.38; 95% CI 0.77-2.46) in the youngest age category (16-20 years) compared with the oldest age category (26-35 years; Bellis et al. 2008).

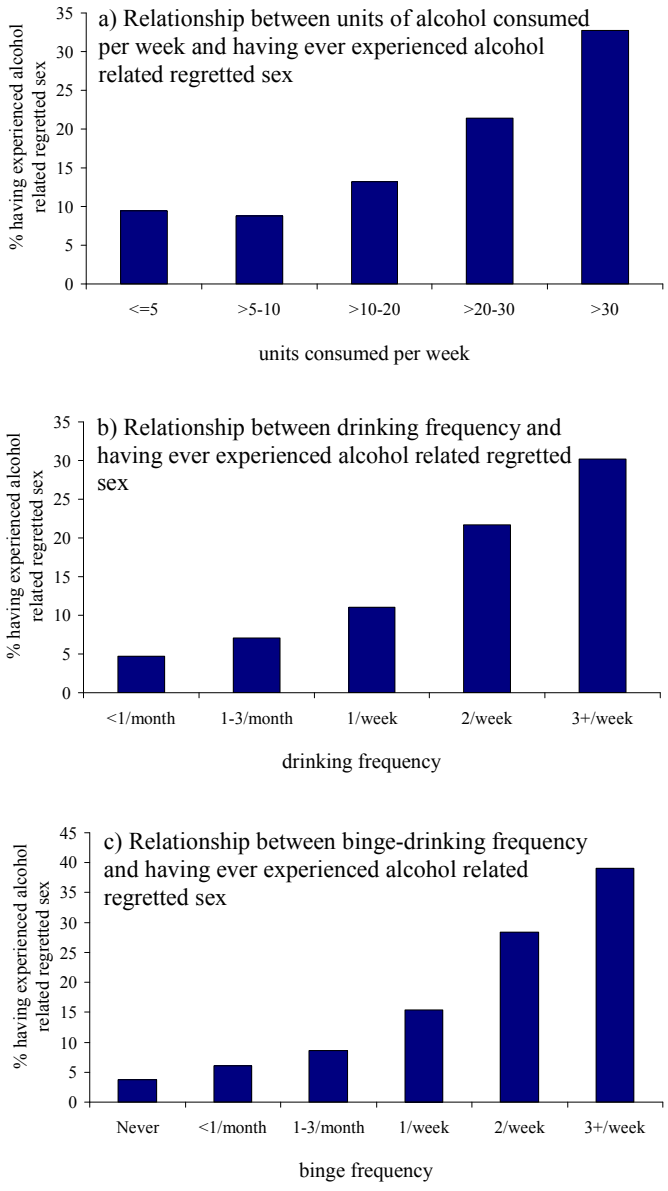
4.9 Alcohol and risk of sexual assault

Evidence Statement (9)
There is good evidence to suggest an association between drinking among young people, especially binge drinking, and increased risk of forced sex.

In a national analysis on the effect of current and binge drinking on risky health behaviour in 14,114 high school students (12-$\geq$18 years) in the American national YRBS in 2003, current drinkers (who did not binge) had an increased risk of being forced to have sex compared with abstainers (OR 1.6; 95% CI 1.2-2.1; Miller et al. 2007). For those who did binge, the risk of forced sex was even higher (OR 3.7; 95% CI 2.8-4.9). The prevalence increased linearly with frequency of binge drinking: the prevalence of forced sex was 8.2% (95% CI 6.4-10.0) in non-bingers compared with 28.8% (95% CI 21.6-36.0) in those bingeing on 10 or more days in past 30 days. This is supported by smaller scale analyses of the same data. In students over 13 years, age of initiation of drinking, current drinking and binge drinking were associated with forced sex and dating violence in the YRBS North Carolina data analysis (n= 994; Kim-Godwin et al. 2007). Further, in America, a cross-sectional survey of 1,236 16-20 year old women from 17 states in 2000, found that 10.2% of female 'ever' drinkers questioned had been sexually victimised compared with 1.4% of 'never' drinkers ($p<0.0001$; Champion et al. 2004). For females whose first drink of alcohol was at the age of 12 or younger, the risk of victimised sex was 8-fold higher (OR 8.1; 95% CI 2.8-23.8; $p=0.0001$) and for those who first drank at 15, the risk was 6-fold higher than non-drinkers (OR 6.1; 95% CI 2.4-15.1; $p=0.0001$).

Box 1. Underage alcohol consumption and regretted sex in the North West of England

Figure 7. Relationships between drinking behaviours and having experienced alcohol related regretted sex in 15 and 16 year olds



In order to examine the relationship between drinking behaviours in children and a range of health related outcomes, a large study of school children aged 15 and 16 was undertaken in the North West of England in 2007. The survey measured frequency of drinking, amounts consumed per week and frequency of binge drinking (here drinking five or more alcoholic drinks in one session) and their relationship with harms including regretted sex following alcohol consumption.

A total of 9,833 children aged 15 and 16 were surveyed and analyses were restricted to those that drank alcohol (n = 8,263). Results (see Figure 7) show strong increases in having experienced alcohol related regretted sex with increases in units consumed per week (Figure 7, a), frequency of drinking (Figure 7, b) and frequency of binge drinking (Figure 7, c). After correcting for demographic and other confounding factors, binge drinking was the behaviour most strongly associated with regretted sex. Those bingeing three or more times a week experienced a seven fold increase in the odds of having experienced regretted sex after drinking alcohol (compared to children who drink but never binge drink). As well as drinking behaviours, other factors were also associated with increased risks of having experienced alcohol-related regretted sex. Thus, higher rates were seen in girls, children that have greater personal income each week and those that buy their own alcohol. Lower rates were seen in those children who accessed alcohol through their parents.

Results are consistent with findings elsewhere which describe a strong association between binge drinking and risky sexual behaviour. Thus, in a survey of over 15,000 12 to 20 year olds in America there was a strong relationship between level of binge drinking and having been pregnant or having got someone pregnant (Miller et al 2007).

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