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National Obesity  
Observatory



# Obesity and alcohol: an overview

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## Key points

- There is no clear causal relationship between alcohol consumption and obesity. However, there are associations between alcohol and obesity and these are heavily influenced by lifestyle, genetic and social factors
- Many people are not aware of the calories contained in alcoholic drinks
- The effects of alcohol on body weight may be more pronounced in overweight and obese people
- Alcohol consumption can lead to an increase in food intake
- Heavy, but less frequent drinkers seem to be at higher risk of obesity than moderate, frequent drinkers
- The relationships between obesity and alcohol consumption differ between men and women
- Excess body weight and alcohol consumption appear to act together to increase the risk of liver cirrhosis
- There is emerging evidence of a link between familial risk of alcohol dependency and obesity in women

## Introduction

The relationship between obesity<sup>a</sup> and alcohol consumption is complex. Associations between the two are heavily influenced by a number of factors including: patterns and levels of drinking; types of alcoholic drinks consumed; gender; body weight; diet; genes; physical activity levels and other lifestyle factors. However, there is a lack of clear evidence of the roles and interactions of all these factors, and the issue remains poorly understood.

This paper aims to provide a brief overview of current understanding of the key issues related to obesity and alcohol in the following areas:

- Alcohol consumption and energy intake
- Patterns and levels of drinking
- Alcohol, obesity and liver cirrhosis
- Alcohol dependency and obesity
- Obesity, alcohol and gender.

## Alcohol and energy intake

Alcohol accounts for nearly 10% of the calorie intake amongst adults who drink.<sup>1</sup> It has an energy value of 7kcal/g, second only to fat which is the most energy dense macronutrient at 9kcal/g. Therefore daily energy intake may rise considerably when alcohol is consumed.<sup>2</sup> A recent survey by Alcohol Concern found that many people are

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<sup>a</sup> Obesity is defined as a BMI greater or equal to 30 in adults

unaware how many calories they are consuming in the form of alcoholic drinks,<sup>3</sup> and they often fail to include them in their assessment of daily calorie consumption.<sup>2,b</sup>

The effects of alcohol on body weight may be more pronounced in overweight and obese people. Other factors such as smoking, physical activity, psychosocial factors, caffeine consumption and medication may further modify this association.<sup>4</sup>

A recent review suggests that in the short term, small amounts of alcohol consumed prior to meals cause a clear and consistent increase in food intake.<sup>5</sup> Heavy drinking has also been reported to lead to overeating. A study of freshman students in the US reported that those who typically drank an average of 4–5 drinks per episode were more likely to report increases in appetite following drinking compared to those who consumed 2–3 drinks per episode. Nearly half of students in the study reporting overeating and making unhealthy food choices following drinking. Heavier drinkers demonstrated significant increases in BMI during their first semester, relative to non-drinkers and those who drank at lower levels.<sup>6</sup>

## Patterns and levels of drinking

A large body of research suggests that the association between alcohol and obesity is non-linear, differing in relation to patterns and levels of drinking.<sup>7</sup>

Heavy drinkers<sup>c</sup> are at higher risk of obesity than moderate drinkers. For example, findings from the British Regional Heart Study, a prospective cohort study of British men, reported that heavy drinkers<sup>d</sup> aged 40–59 had the highest prevalence of weight gain and obesity at five year follow-up.<sup>8</sup> Further results from the same study also found heavy drinking to be associated with increased weight gain in men aged 60–79.<sup>9</sup> Similar results were found following analysis of data from the National Health and Nutrition Examination Survey (NHANES) of adults in the United States. Researchers found that the odds of overweight and obesity were significantly higher among binge drinkers and/or heavy drinkers (consuming four or more drinks per day) than among those who consumed the same amount of alcohol over multiple sessions.<sup>10</sup>

Binge drinking<sup>e</sup> has also been associated with an array of adverse behaviours including poor diet, unhealthy weight control, body dissatisfaction and sedentary behaviour.<sup>11</sup> Analysis of data from the National Health Interview Surveys (NHIS) a nationally representative survey of the United States population, found that for both men and women, those who consumed the greatest quantity of alcohol the least frequently (ie binge drinkers), were the most overweight.<sup>12</sup> Similarly, a cross sectional study of men and women in Denmark found that for a given level of alcohol intake, obesity was inversely associated with drinking frequency, whereas the amount of alcohol consumed

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<sup>b</sup> The recommended daily calorie (kCal) intake is 2,605 kcal for men and approximately 2,079 kcal for women. One unit of alcohol contains 56kcal. (SACN 2011)

<sup>c</sup> There are many different definitions of heavy drinking, which can range from over 1 to over 4 drinks a day for women and over 2 to over 5 drinks a day for men. Studies also vary in the measurements they use which can include standard drinks, units and grammes of alcohol.

<sup>d</sup> Heavy drinking in the British Regional Heart Study was defined as 21–42 units per week, including weekend drinking of over 6 units per day and daily drinking of 3–6 units per day.

<sup>e</sup> In the UK, drinking surveys normally define binge drinkers as men consuming at least 8 and women at least 6 units of alcohol in a single day. (Institute of Alcohol Studies)

was positively associated with obesity.<sup>13</sup> Whilst less frequent heavy or binge drinking has been found to be associated with obesity, a number of studies have reported that frequent light or moderate alcohol consumption is not.<sup>10,12</sup>

## **Obesity, alcohol and gender**

Gender appears to influence the relationship between obesity and alcohol consumption. For example, beer consumption was associated with waist circumference gain in men but not in women in the European Prospective Investigation into Cancer and Nutrition (EPIC) study.<sup>14</sup> Findings from two prospective cohort studies in the US reported an inverse relationship between alcohol intake and BMI in women, compared to no relationship in men.<sup>15</sup>

It has been suggested that this difference between sexes may be an indirect consequence of habitual drink choice. Beer may be more favoured by men and the additional energy derived from the carbohydrate in beer may enhance the risk of weight gain. In contrast wine-drinkers would consume less energy overall per unit of alcohol.<sup>5</sup>

## **Alcohol, obesity and liver cirrhosis**

Recent research from the UK has found that excess body weight and alcohol consumption act together to increase the incidence of liver cirrhosis.

Analysis of data from the Million Women Study, a prospective cohort of middle-aged women from England and Scotland, reported that women who were overweight or obese had a greater risk of liver cirrhosis than women in the ideal weight range (BMI between 22.5 and 25). The absolute risk of liver cirrhosis with increasing BMI was substantially greater for women who drank 150g or more of alcohol per week than for those who drank less than 70g a week.<sup>16</sup> Raised BMI and alcohol consumption were also found to be associated with liver disease in two large prospective cohort studies of men in Scotland. The combination of a high BMI and alcohol consumption resulted in a greater risk of cirrhosis than would be expected from the additive effects of the two separate factors.<sup>17</sup>

Similar findings have also been reported from other countries. For example, evidence from the 2005–2008 NHANES cross sectional survey of adults in the United States suggests that the co-occurrence of obesity and excessive drinking may place adults at an increased risk of liver disease.<sup>18</sup> This was also the conclusion of a study of older adults from the United States.<sup>19</sup> Findings from a cohort study in China found that the risk of alcohol consumption and obesity together was far greater than the risk of either one on its own inducing liver disease.<sup>20</sup>

## **Obesity and risk of alcohol dependency**

Research from the US highlights an emerging link between familial risk of alcohol dependency and obesity, particularly for women but also for men.

Analyses of repeated cross-sectional surveys found that women with a family history of alcohol dependency had 49% higher odds of obesity than those without a family

history. The authors hypothesised that the women may be particularly sensitive to the increasingly obesogenic environment and may tend to overeat foods that are high in fat, salt and sugars.<sup>21</sup> A smaller US study of female twins also found a significant interaction between disordered eating and family history of alcoholism.<sup>22</sup>

Both binge-drinking and binge-eating can be seen as examples of impulsive behaviours, and it has been suggested that alcohol might become a component of the risk for weight gain as a consequence of impulsive behavioural choices.<sup>5</sup>

## **Discussion**

This report highlights the complex nature of the association between alcohol and obesity. There is a multifaceted association between obesity and alcohol consumption, heavily influenced by individual characteristics including body weight, diet, genetic factors, gender and physical activity levels as well as frequency, pattern, amount of consumption and types of drinks consumed.<sup>4</sup> In addition, some studies fail to take into account lifestyle choices such as sedentary behaviour. For example, alcohol is often a complement to sedentary activities such as watching television and attending sporting events, which may further promote weight gain.<sup>7</sup>

This report also draws out a number of issues that may be useful for practitioners working to tackle obesity: many people do not seem to think of alcohol calories as part of their daily intake; the effects of alcohol on body weight are more pronounced in overweight and obese people; and alcohol consumption can lead to increased food intake. Furthermore, recent evidence of a strong link between obesity and liver cirrhosis in people with excess body weight is worrying and highlights the compounding effects of both obesity and alcohol. This is particularly important in the light of research showing an alarming increase in all liver disease amongst young people.<sup>23</sup>

Much of the research regarding alcohol to date focuses on alcohol dependency, binge drinking and associated crime and disorder.<sup>24</sup> The relationship with obesity does not appear to have been a research priority. Further research to help clarify this complex relationship would be helpful and potential areas for investigation include:

- An examination of the relationship between alcohol intake and obesity in the context of broader lifestyle behaviours
- The relationship between obesity, liver cirrhosis and alcohol consumption, with a focus on young people
- An investigation into the relationship between weight status and unhealthy eating behaviours following heavy/binge drinking episodes
- Research into the link between familial risk of alcohol dependency and obesity in England.

Despite the complexity of the relationships between alcohol and obesity, there is clearly a need for a better understanding of how these issues are linked. This would provide insight to help develop prevention programmes and interventions to tackle the public health consequences of high levels of obesity and alcohol consumption.

## References

1. Bates B, Alison Lennox A, G S. National diet and nutrition survey: headline results from year 1 of the rolling programme (2008/2009). London: Food Standards Agency, 2009.
2. Dennis EA, Flack KD, Davy BM. Beverage consumption and adult weight management: A review. *Eating Behaviors* 2009;10(4):237–46.
3. Alcohol and calories. Cardiff: Alcohol Concern Cymru, 2010.
4. Suter PM. Is alcohol consumption a risk factor for weight gain and obesity? *Critical Reviews in Clinical Laboratory Sciences* 2005;42(3):197–227.
5. Yeomans MR. Alcohol, appetite and energy balance: is alcohol intake a risk factor for obesity? *Physiology & Behavior* 2010;100(1):82–9.
6. Lloyd-Richardson EE, Lucero ML, DiBello JR, Jacobson AE, Wing RR. The relationship between alcohol use, eating habits and weight change in college freshmen. *Eating Behaviors* 2008;9(4):504–08.
7. French MT, Norton EC, Fang H, Maclean JC. Alcohol consumption and body weight. *Health Economics* 2010;19(7):814–32.
8. Wannamethee SG, Shaper AG. Alcohol, body weight, and weight gain in middle-aged men. *American Journal of Clinical Nutrition* 2003;77(5):1312–7.
9. Wannamethee SG, Shaper AG, Whincup PH. Alcohol and adiposity: effects of quantity and type of drink and time relation with meals. *International Journal of Obesity* 2005;29(12):1436–44.
10. Arif AA, Rohrer JE. Patterns of alcohol drinking and its association with obesity: data from the Third National Health and Nutrition Examination Survey, 1988–1994. *BMC Public Health* 2005;5:126.
11. Nelson MC, Lust K, Story M, Ehlinger E. Alcohol use, eating patterns, and weight behaviors in a university population. *American Journal of Health Behavior* 2009;33(3):227–37.
12. Breslow RA, Smothers BA. Drinking patterns and body mass index in never smokers: National Health Interview Survey, 1997–2001. *American Journal of Epidemiology* 2005;161(4):368–76.
13. Tolstrup JS, Heitmann BL, Tjonneland AM, Overvad OK, Sorensen TIA, Gronbaek MN. The relation between drinking pattern and body mass index and waist and hip circumference. *International Journal of Obesity* 2005;29(5):490–7.
14. Schutze M, Schulz M, Steffen A, Bergmann MM, Kroke A, Lissner L, et al. Beer consumption and the 'beer belly': scientific basis or common belief? *European Journal of Clinical Nutrition* 2009;63(9):1143–9.
15. Colditz G, Giovannucci E, Rimm E, Stampfer M, Rosner B, Speizer F, et al. Alcohol intake in relation to diet and obesity in women and men. *The American Journal of Clinical Nutrition* 1991;54(1):49–55.
16. Liu B, Balkwill A, Reeves G, Beral V. Body mass index and risk of liver cirrhosis in middle aged UK women: prospective study. *Bmj*. 2010;340:c912.(doi):10.1136/bmj.c912.

17. Hart CL, Morrison DS, Batty GD, Mitchell RJ, Smith GD. Effect of body mass index and alcohol consumption on liver disease: Analysis of data from two prospective cohort studies. *Bmj* 2010;340(7747):634.
18. Tsai J, Ford ES, Zhao G, Li C, Greenlund KJ, Croft JB. Co-occurrence of obesity and patterns of alcohol use associated with elevated serum hepatic enzymes in US adults. *J Behav Med* 2011.
19. Loomba R, Bettencourt R, Barrett-Connor E. Synergistic association between alcohol intake and body mass index with serum alanine and aspartate aminotransferase levels in older adults: the Rancho Bernardo Study. *Alimentary Pharmacology & Therapeutics* 2009;30(11-12):1137–49.
20. Shen Z, Li Y, Yu C, Shen Y, Xu L, Xu C, et al. A cohort study of the effect of alcohol consumption and obesity on serum liver enzyme levels. *European Journal of Gastroenterology & Hepatology* 2010;22(7):820–5.
21. Grucza RA, Krueger RF, Racette SB, Norberg KE, Hipp PR, Bierut LJ. The emerging link between alcoholism risk and obesity in the United States. *Arch Gen Psychiatry* 2010;67(12):1301–8.
22. Harrell ZA, Slane JD, Klump KL. Predictors of alcohol problems in college women: the role of depressive symptoms, disordered eating, and family history of alcoholism. *Addict Behav.* 2009;34(3):252–7. Epub 2008 Nov 1.
23. British Liver Trust.  
<http://www.britishlivertrust.org.uk/modules/news/StoryViewer.aspx?pid=6&intextraid=2543&fid=2460>. Accessed November 2011.
24. Institute of Alcohol Studies, IAS Factsheet: Alcohol consumption in the UK, 2010.

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