

Association Between Alcohol Calorie Intake and Overweight and Obesity in English Adults

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We investigated the contribution of alcohol-derived calories to the alcohol–obesity relation. Adult alcohol calorie intake was derived from consumption volume and drink type in the Health Survey for England 2006 (n = 8864). We calculated the odds of obesity with survey-adjusted logistic regression. Mean alcohol calorie consumption was 27% of the recommended daily calorie intake in men and 19% in women on the heaviest drinking day in the last week, with a positive association between alcohol calories and obesity. Alcohol calories may be a significant contributor to the rise in obesity. (*Am J Public Health*. 2014; 104:629–631. doi:10.2105/AJPH.2013.301643)

Research suggests that alcohol consumption may represent a sizable risk factor for weight gain.^{1–6} The association, posited to be a product of differential drink type preference, is typically strongest among men,^{7–10} who are more likely to favor beer, which is carbohydrate rich.^{11,12} Alcohol has been found to account for approximately 10% of adult drinkers' total energy intake on average in the United Kingdom¹³ and 16% in the United States,¹⁴ with men consuming about 3 times the amount consumed by women.¹⁴ In the United Kingdom, the general population has poor knowledge of alcohol calories, with 4 of 10 unaware of alcohol calories and their food equivalents.¹⁵ Given that both obesity and hazardous alcohol consumption are issues of public health concern, understanding the relation between alcohol calories and weight

gain is important, as are efforts to raise awareness of alcohol calories as empty.¹⁵

In a recent publication discussing alcohol as a risk factor for obesity, a call was made for research investigating the influence of drink type.¹² Accordingly, this study sought to estimate drink-specific alcohol-derived calories and explore the contribution of such intake to the alcohol–obesity relation.

METHODS

The Health Survey for England 2006 was a cross-sectional and nationally representative survey of the general English population residing in private households. Further information is available elsewhere.¹⁶

Variables

Alcohol. Adult participants (> 17 years) who reported consuming alcohol in the past week (75% of drinkers) were asked to estimate the frequency and quantity of drinks consumed on the day of heaviest drinking in that week.¹⁷ Alcohol calories were calculated by multiplying drink-specific consumption with the number of calories estimated that they contained,¹⁸ according to assumed standard drink strengths.¹⁹ Alcohol calories were categorized according to the proportion of UK sex-specific recommended daily calorie allowance (RDA).

Overweight and obesity. Weight was measured by scale, and height was measured by stadiometer²⁰; overweight was defined as a body mass index (BMI; defined as weight in kilograms divided by height in meters squared) of 25 or greater, and obesity was defined as a BMI of 30 or greater.

Covariates. Factors likely to influence the relation between alcohol calories and BMI were identified according to a recent systematic review of the relation between alcohol units and weight.²¹ Variables included age, education, physical activity, and smoking. Drink type also was selected.

Of the 8864 participants who had valid alcohol data, 7030 provided complete information; missing data were not imputed. Five participants provided BMI but not drinking data.

Statistical Analysis

Design factors and weighting. To account for the multistage study design, we used

a design-adjusted estimation procedure, with nonresponse weights applied.^{22–24}

Analysis. We constructed 3 stepwise multivariate logistic regression models to estimate the association between alcohol calories and both overweight and obesity: (1) age-adjusted, (2) covariate-adjusted, and (3) covariate-adjusted plus drink type. We used a design-adjusted Wald test to select covariates.

RESULTS

Men who reported drinking alcohol in the week prior to the Health Survey for England interview consumed the equivalent of 677 alcohol calories on their heaviest drinking day, and women reported an average of 382 alcohol calories (Table 1), equivalent to 27% and 19% of their respective RDA.

Although the majority of adults (62% men, 77% women) consumed the equivalent of less than 25% of their RDA through alcohol on their heaviest drinking day, 15% of the men and 6% of the women consumed the equivalent of 50% or greater (Table 1).

After adjustment for age (Table 2, model 1), the odds of obesity were significantly higher with increased consumption of alcohol calories. This association remained after adjustment for demographic, socioeconomic, and lifestyle factors, with those in the highest alcohol calorie quartile at 70% ($P < .001$) greater risk for obesity than those in the bottom quartile (Table 2, model 2). A positive gradient was evident across each alcohol calorie group. Additional adjustment for drink type (Table 2, model 3) slightly attenuated the association between alcohol calories and obesity. Similar to overweight (results not shown, available from authors), those who reported consuming beer ($P = .001$), spirits ($P = .001$), or more than 1 drink type ($P = .044$) were at increased risk for obesity relative to wine drinkers.

DISCUSSION

Associations with obesity mirror findings from studies of alcohol units,²¹ suggesting that the alcohol–obesity relation may be in part a product of caloric factors. Although the United States had lower levels of per capita alcohol consumption and a lower prevalence of hazardous drinking than in the United

TABLE 1—Proportion of Drinkers Within Each RDA-Equivalent Group, by Sex, Among Adults Aged 18 Years and Older Who Drank Alcohol in the Last Week: Health Survey for England 2006

RDA Equivalent	No.	Proportion (95% CI)	SE
Men (n = 4454)			
> 0%–24%	2859	0.616 (0.598, 0.635)	0.009
25%–49%	1015	0.235 (0.221, 0.249)	0.007
50%–74%	336	0.084 (0.074, 0.093)	0.005
75%–99%	165	0.044 (0.036, 0.051)	0.004
≥ 100%	79	0.021 (0.016, 0.026)	0.003
Women (n = 4410)			
> 0%–24%	3474	0.773 (0.759, 0.787)	0.007
25%–49%	701	0.168 (0.156, 0.179)	0.006
50%–74%	153	0.039 (0.033, 0.046)	0.003
75%–99%	54	0.013 (0.010, 0.017)	0.002
≥ 100%	28	0.007 (0.004, 0.009)	0.001
Overall (n = 8864)			
> 0%–24%	6333	0.689 (0.676, 0.702)	0.01
25%–49%	1716	0.204 (0.194, 0.213)	< 0.001
50%–74%	489	0.063 (0.057, 0.070)	< 0.001
75%–99%	219	0.030 (0.025, 0.034)	< 0.001
≥ 100%	107	0.014 (0.011, 0.018)	< 0.001

Note. CI = confidence interval; RDA = recommended daily calorie allowance. The proportion for mean alcohol calories (kcal) for men was 677.2 (95% confidence interval [CI] = 650.8, 703.7; SE = 13.5), for women was 381.9 (95% CI = 368.2, 395.7; SE = 7.0), and overall was 540.4 (95% CI = 522.8, 558.0; SE = 9.0).

TABLE 2—Multivariate Analysis of the Association Between Alcohol Calories Consumed on Heaviest Drinking Day in Last Week and Odds of Obesity Among Adults Aged 18 Years and Older: Health Survey for England 2006

Variable	Model 1 ^a (n = 7832), OR (95% CI)	Model 2 ^b (n = 7030), OR (95% CI)	Model 3 ^c (n = 7030), OR (95% CI)
Alcohol calories			
> 0%–24% RDA equivalent (Ref)	1.00	1.00	1.00
25%–49% RDA equivalent	1.22* (1.06, 1.42)	1.20* (1.02, 1.41)	1.16 (0.99, 1.38)
50%–74% RDA equivalent	1.39* (1.10, 1.77)	1.37* (1.06, 1.76)	1.32* (1.01, 1.72)
≥ 75% RDA equivalent	1.67** (1.28, 2.19)	1.70** (1.28, 2.25)	1.65* (1.22, 2.22)
Drink type			
Wine (Ref)			1.00
Beer			1.34* (1.13, 1.59)
Spirits			1.46* (1.17, 1.82)
Sherry			0.97 (0.57, 1.65)
Alcopops			1.51 (0.97, 2.35)
> 1 type			1.27* (1.04, 1.55)

Note. CI = confidence interval; OR = odds ratio; RDA = recommended daily calorie allowance.

^aModel 1 adjusted for age only.

^bModel 2 adjusted as per model 1, plus education status, physical activity, sex, and smoking status.

^cModel 3 adjusted as per model 2, plus drink type.

P* < .05; *P* < .001.

Kingdom,^{25,26} the proportion of energy intake from alcohol is greater in the United States.^{13,14} This may be attributable to intercountry differences in drink type preference, with greater proportions of US drinkers consuming beer and spirits²⁵—the drink types most strongly related in this brief's analyses to the risk for obesity. Such data hint at the importance of drinking culture as a mediator of the alcohol–obesity relation. Policymakers in both countries must give attention to such consumers,¹⁴ and future research should examine the association between other conditions and alcohol calories. This study did not consider the calorie content of mixers,²⁷ which may account for the significant associations between spirits and obesity. ■

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Contributors

N.J. Shelton developed the original idea and funding application. C.S. Knott cleaned the data. Both authors analyzed the data and wrote the brief.

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Human Participant Protection

Ethical approval for the 2006 survey was obtained from the London Multi-Centre Research Ethics Committee.

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