Psychology Today

Sylvia R. Karasu M.D.
The Gravity of Weight

The Double-Edged Sword of Alcohol Use

The toxic and beneficial effects of drinking and its relationship to weight

Posted Dec 20, 2015

"Monk drinking from a Barrel", France, late 13th century
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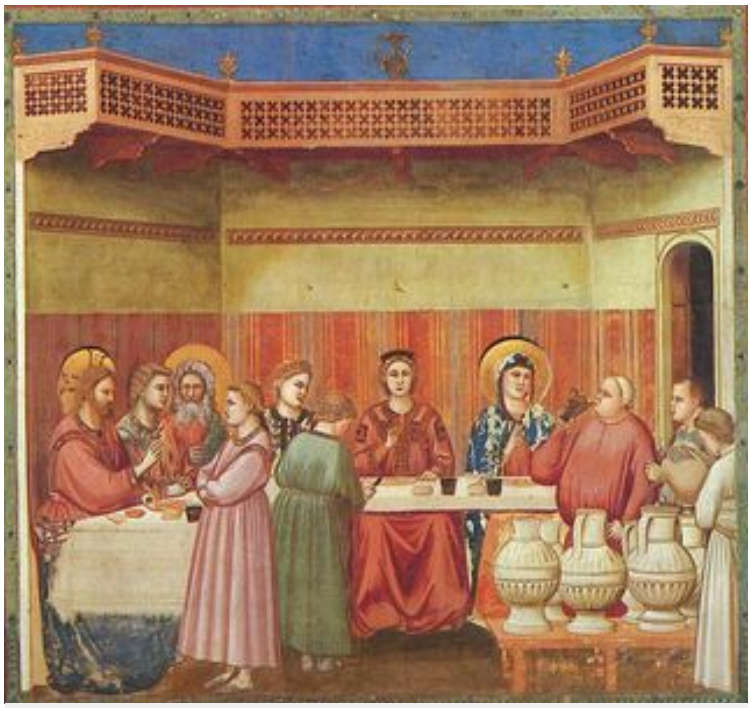
Alcohol use, at least from archeological evidence of pottery shards that contain “fingerprint compounds—biomarkers” of traces of fermented beverages, from a Neolithic settlement in Henan province in China, dates back as early as 7000 BC. (McGovern et al, *Proceedings of the National Academy of Sciences*, 2004)

Throughout history, the use of alcohol has had both positive and negative effects, often depending on the quantity and pattern of use. Alcohol has analgesic and disinfectant qualities and years ago was often considered much safer to drink than water, particularly when sanitation was poor.

The Bible is replete with references to alcoholic consumption. In the *New Testament*, for example, *John* (2:1-11) reports that Jesus’s first miracle was the turning of water into wine when wine had run out at a wedding in Cana in the Galilee. There are, of course, allusions to alcohol’s mind-altering and potentially destructive influences as well. For example, in the *Old Testament*, in *Genesis* (19: 35-37), after the annihilation of the cities of Sodom and Gomorrah, Lot’s daughters, fearing that there were no men left with whom to procreate, get their



"Marriage at Cana,"Giotto (1266-1337): site of first miracle of Jesus in which he turned water into wine

Source: Wikimediacommons.org/Public Domain

father drunk enough with wine on two successive nights in order to have sex with him, become pregnant, and preserve the family line without his realizing that he has committed incest.

In more recent years, the use of alcohol has been described as having overtly beneficial qualities but has been described as "analogous to the proverbial double-edged sword" because "perhaps no other health or lifestyle factor can cut so deeply in either direction—toxic or beneficial," say O'Keefe et al (*Mayo Clinic Proceedings*, 2014.) These researchers quote statistics from the World Health Organization that alcohol kills about 2.5 million people each year, with excessive consumption of alcohol being the third leading cause (after smoking and obesity) of premature death in the U.S.

O'Keefe et al report on studies that indicate that light to moderate alcohol use (one drink/day for women and one-two drinks/day for men) may lead to decreased hypertension, reductions in type II diabetes (and even may enhance insulin sensitivity, reduce inflammation, and elevate HDL cholesterol), and a decreased risk of heart failure. French et al (*Health Economics*, 2010), though, notes, "It is conceivable that moderate drinking is a marker for moderate living."

O'Keefe et al maintain that while red wine has been particularly implicated in beneficial effects because of the compounds of polyphenols, most evidence indicates it is the ethanol itself "rather than any other specific compound of a drink, that is the primary factor for both conferring health benefits and causing toxicity, depending on the pattern of consumption and dosing." Wine

Portrait of Robert Louis Stevenson by Girolamo Nerli (1880-1926): Stevenson called wine "bottled poetry" in his travel memoir "The Silverado Squatters"

Source: Wikimediacommons.org/Public Domain

drinkers, though, may have a healthier lifestyle than those who drink primarily beer or hard liquor.

Heavier use (2.5 drinks/day for women and 4 drinks/day for men) has been associated with progressively increased risk of death in a dose-dependent relationship. O'Keefe et al, explain that at higher doses alcohol is clearly a cardiotoxin, and they caution that those who do not drink should not be encouraged to start because it is not possible to predict for whom regular use of alcohol will lead to that "slippery slope that many individuals cannot safely navigate."

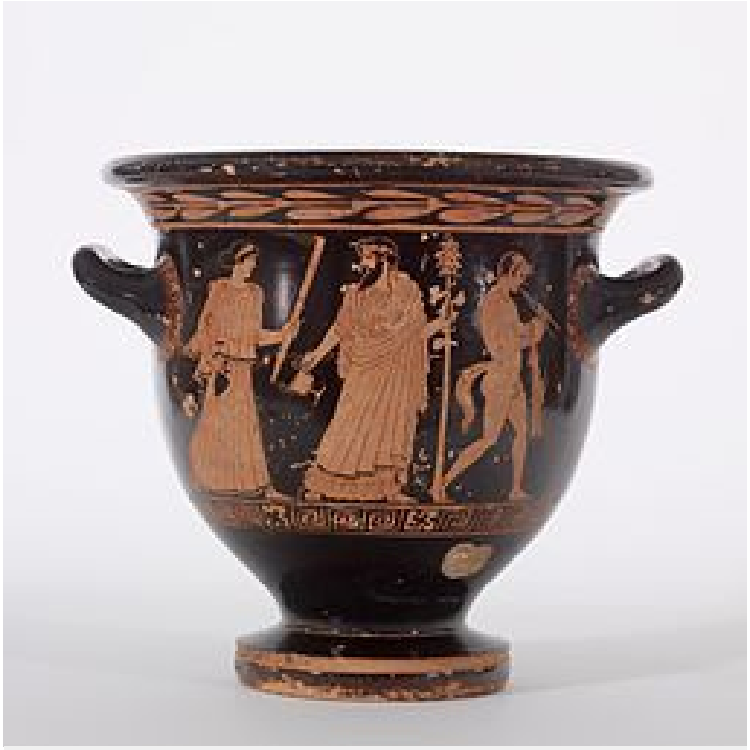
What about the relationship, though, of alcohol to weight? In their recent update, Traversy and Chaput (*Current Obesity Reports*, 2015) reviewed both cross-sectional and longitudinal studies and found considerable variation among the findings, with some studies indicating an association between drinking and weight gain and others not finding any association. There are many reasons for the discrepancies, including differences in the pattern of drinking. They clarify that some studies do not necessarily control for physical activity of their participants and some do not even necessarily quantify how much alcohol is consumed (e.g. using a "yes/no" scale.) They summarize that while light-to-moderate drinking (in the *National Health and Nutrition Examination Study* – NHANES III—heavy drinkers have 4 or more per day and light-to-moderate have 1 or 2 drinks/day) is not associated with weight change or changes in waist circumference, heavy drinking is more consistently associated with weight gain. Traversy and Chaput also looked at experimental studies, often using wine or beer intake (e.g. adding alcohol to diets of those on a metabolic unit.) They found, again, that moderate alcohol use does not lead to weight gain, but they caution that studies are often short-term (e.g. 4 to 10 weeks) and may not be long enough for firm conclusions. Studies, as well, are often not consistent for comparison in their definitions of "light, moderate, and heavy" drinking and even more importantly, studies often rely on self-report (rather than actual objective measurements), not only of the amount of alcohol

consumed but of height and weight and that can make a study fundamentally worthless due to the well-known distortion involved in self-reporting.

Sayon-Orea et al (*Nutrition Reviews*, 2011) performed a systematic review of 31 studies from 1984 to early 2010. They note that studies have had three different approaches: epidemiological (alcohol intake and body weight); psychophysiological investigation (alcohol and appetite regulation); and metabolic studies (effects of alcohol on energy expenditure and substrate oxidation.) They found that a positive association between weight gain and drinking was more often associated with men, but caution "this difference might be an indirect consequence of habitual drink choice" as well as the fact that men tend to drink more than women in general. They also found that wine drinkers were less likely to have weight gain and speculated that compounds in red wine such as resveratrol may be protective of weight gain. They emphasize that inconsistences may arise due to a person's smoking history as well as changes in alcohol consumption over time. They noted it is currently unclear whether alcohol consumption is a risk factor for weight gain because studies have shown positive, negative, and no effect on weight, and the "precise effect of alcohol on weight remains to be determined." Some researchers, such as McCarty and Jéquier each writing articles in the *American Journal of Clinical Nutrition*, 1999, call it the "alcohol paradox" when alcohol does not lead to weight gain.

Why would alcohol theoretically lead to weight gain? First, alcohol is both caloric and nutritionally poor: it contains 7.1 calories per gram (for comparison, on average, fat has 9 calories, and carbohydrates and proteins each have 4 calories per gram.) Alcoholic drinks also vary considerably in their caloric count. Poppitt (*Nutrients*, 2015) notes that alcohol by volume can vary between 3 to 40% and is typically divided into three groups: fermented beers and ciders; fermented wine; and distilled spirits. In terms of calories, 12 ounces of a light beer contain 103 calories; regular beer, 153 calories; 80-proof of 1.5 ounces of gin, rum, vodka, or whiskey contains 97 calories, while 9 ounces of a Piña Colada contain 490 calories. (NIH statistics: (retrieved 12/18/15: http://www.rethinkingdrinking.niaaa.nih.gov/tools/Calculators/calorie-ca...)

Secondly, most people, when they do drink, do not necessarily substitute the liquid calories of alcohol for food and hence do not compensate by eating fewer calories. In fact, for many people, alcohol, especially when imbibed either prior to or during a meal, may stimulate a person's appetite and hence increase the number of calories eaten. Further, alcohol seems to have an effect on several of the hormones involved in satiety and control of hunger, such as inhibiting the effect of leptin and glucagon-like peptide-1 (GLP-1) or increasing CCK, a hormone that suppresses hunger. Both



Greek god of wine, Dionysus, on ancient Greek red figure pottery

Source: Wikimedia Commons.org/Public Domain

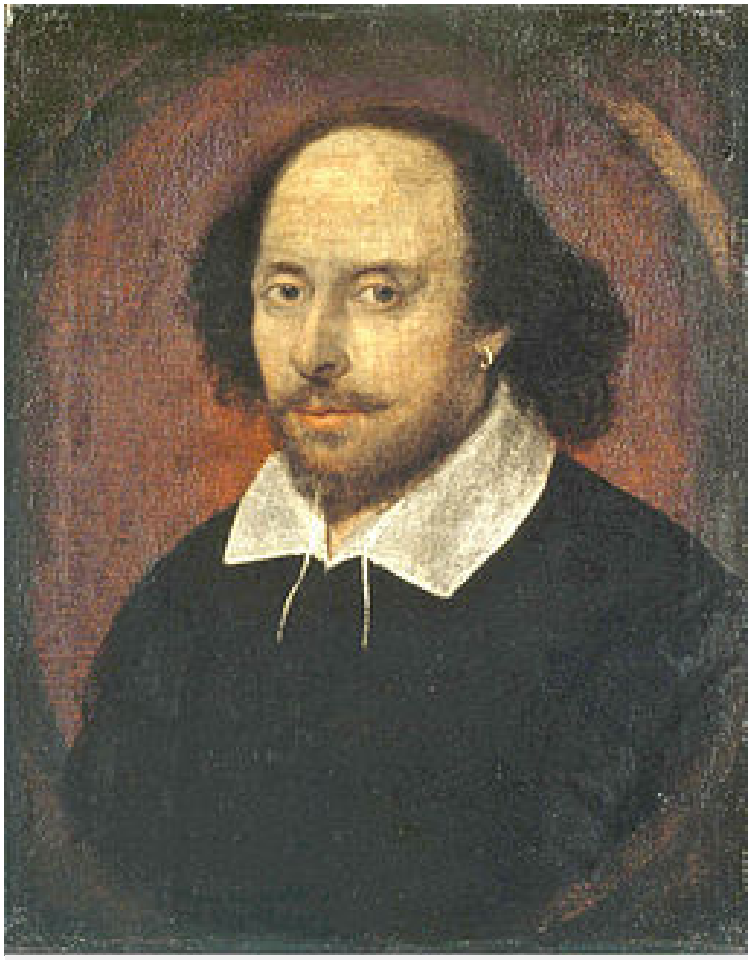
peripheral and central controls on satiety may be involved. Caton et al (*Current Obesity Reports*, 2015) also emphasize that alcohol has the psychological and physiological ability to promote an inability to resist temptation, i.e., an abandonment of restraint—and hence lead to overconsumption, and they have found that dieters and so-called "restrained eaters" are more susceptible to this effect. This has been referred to as the "what-the-hell effect" i.e.,"the "all-or-nothing" attitude that dieters sometimes have once they have broken their diet. (Herman and Polivy, 2004, in Baumeister's and Vohs' *Handbook of Self-Regulation.)*

Alcohol also inhibits fat oxidation. Alcohol cannot be stored in the body so it is preferentially metabolized (Sayon-Orea et al, *Nutrition Reviews*, 2011). What this means is that alcohol is oxidized immediately and the oxidation of fat and carbohydrates is delayed so that while alcohol is being metabolized, fat may tend to accumulate.

Is there any truth to the widespread belief that beer drinking promotes the abdominal accumulation of fat that is typically called the "beer belly?" Schütze et al (*European Journal Clinical Nutrition*, 2009) conducted a prospective study over an over 8-year period to assess waist circumference change in over 7800 men and over 12,700 women from the Potsdam area of Germany. Beer consumption ranged from less than 250 mL/day (about 8.5 ounces, "very light") to over 1000 mL/day (about 33 ounces, "heavy" consumption.) These researchers concluded that there is no support for the common belief in the development of a beer belly and the "observed" beer bellies may be related to the "natural variation in fat patterning and not from the fact of drinking beer." Bendsen et al (*Nutrition Reviews*, 2013) conducted a systematic review (from 1950 through 2010, including 35 observational studies and 12 experimental studies) to assess whether beer leads either to specific accumulation of fat in the abdominal area or even general obesity. These researchers acknowledged conflicting, inconsistent results among studies, often due to confounding factors, such as differences in lifestyle eating, smoking, and exercising habits. For example, they reported on one Danish study in which those who purchase beer were more likely to buy butter, sausages, ready-cooked meals, and soft drinks, whereas wine drinkers were more apt to purchase more vegetables and products with lower fat content.

The actual mechanism through which beer or other alcoholic drinks promotes abdominal fat accumulation is not known. Bendsen et al summarize by noting there is a "strong theoretical basis for the fattening effect of

beer consumption" but due to experimental studies of low quality and conflicting observational studies, "the present data provide inadequate scientific evidence" to assess whether beer at moderate levels (less than 500 mL/day) is associated with either abdominal or general obesity though the researchers cannot rule out that larger quantities of beer might lead to increased fat accumulation (and even particularly abdominal obesity.)



Portrait of William Shakespeare, 1610, in the National Portrait Gallery. In Shakespeare's "Macbeth," the Porter says that drink "provokes the desire, but it takes away the performance." References to drink in Shakespeare's 38 plays are so common there is even a book by Buckner B. Trawick called "Shakespeare and Alcohol."

Source: Wikimediacommons.org/Public Domain

Bottom Line: Though it makes theoretical sense that excessive calories from alcohol will lead to increased weight, studies to date have yielded conflicting evidence, i.e., the so-called "alcohol paradox." Nevertheless, during this holiday time, moderation in both food and drink obviously makes weight gain less likely.

About the Author

Sylvia R. Karasu, M.D., is a clinical professor of psychiatry at Weill Cornell Medical College and the senior author of *The Gravity of Weight.*

In Print: *The Gravity of Weight: A Clinical Guide to Weight Loss and Maintenance*

Online: my own website