The Relationship Between Alcohol Consumption, Dietary Habit and Obesity: A Review

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Abstract: Obesity around the world is a major public health concern. Media reports and statistics indicate that most nations around the world are not spared from this concern and are disproportionately affected. The purpose of this paper is to re-examine prior researches conducted in this domain and to further explore the associated factors that predict variation in body mass index (BMI). This review is an attempt to close the gap in literature using time discounting and further extends health economic theoretical model to provide a better understanding of the development of obesity. Specifically, this paper reviews the effect of alcohol consumption and dietary habits and its effect on BMI. Prior researches suggest that dietary habits factor could play a mediating role between alcohol consumptions on variation in BMI. Importantly, a conceptual model is proposed and is adapted from the health economic theory (HET), following, which, a set of propositions are developed, and directions for future research are recommended.

Key words: Health economic model; Time discounting; Alcohol consumption; Dietary habit; Obesity.

INTRODUCTION

The prevalence of overweight and obesity is increasing worldwide at an alarming rate. Both developed and developing countries are affected. In low-income countries, obesity is more common in middle-aged women, people of higher socioeconomic status and those living in urban communities. In more affluent countries, obesity is common not only in the middle-aged, but is also becoming increasingly prevalent among younger adults and children. Furthermore, it tends to be associated with lower socioeconomic status, especially in women, and the urban–rural differences are diminished or even reversed (WHO, 2009). According to (Nammi, et al., 2004), obesity is described as the state of imbalance between the expenditure of calories versus caloric intake, which ultimately leads to excess fat accumulation and can be measured by Body Mass Index (BMI). Recent statistics showed that approximately 300 million people in the world are obese (Wilborn, 2005). For instance, the prevalence of obesity in the United States (U.S) alone is a major public health concern. According to the 2003-04 National Health and Nutrition Examination Survey, 32 percent of U.S adults age 20 years and older are obese, with men at 31 percent and women at 33 percent (Ogden, et al., 2006). In 2003-04 approximately 30 percent of U.S non-Hispanic white adults were obese as were 45 percent of non-Hispanic blacks and 37 percent of Mexican-Americans (Ogden, et al., 2006). The number of overweight and obese people, particularly children, has also reached epidemic levels in developed and newly industrialized countries. It has also started to rise in developing countries in which deficiency diseases and malnutrition still represent a major public health problem.

The health consequences of obesity are many and varied, ranging from an increased risk of premature death to several non-fatal but debilitating complaints that adversely impact quality of life. Obesity is a major risk factor for non communicable diseases (NCDs) such as non-insulin-dependent diabetes mellitus, cardiovascular diseases (heart disease, stroke and hypertension) and cancer, and in many industrialized countries it is associated with various psychosocial consequences. Abdominal obesity is a particular area of concern as it is associated with elevated risks to health in comparison to a more peripheral fat distribution. Obesity has very high costs for societies, as the resulting disabilities and diseases create huge burdens for families and health systems. The experience of developed countries demonstrated that the cost of morbidity and mortality associated with increasing obesity would be overwhelming for developing countries.

Objectives of the Study:

The major purpose of this paper is to re-examine the extent to which a health economic theoretical approach can predict variation in BMI. Particularly, time discounting factors, measured by alcohol consumption, and dietary habits factors are closely examined. In addition, this study seeks to examine the relative significance of time discounting factors in explaining changes in BMI. In so doing, this study seeks to close the gap in literature research by re-examining the factors contributing to obesity and what is lacking in terms of behavioral science perspective. Several studies have examined the influence of alcohol consumption, and dietary habits on weight gain. However, to date no study has examined the possible mediating effect of dietary habits between alcohol consumption and on obesity. Thus, the overall goal of this paper is to develop and propose a conceptual framework that better captures obesity development. Specifically, this paper review the literature and re-
examine the role of alcohol consumption and dietary habit and its variation effects on BMI. (see figure 1 for illustration).

Thus, this paper attempts to address the following research questions:
1. Does alcohol consumption contribute to obesity?
2. Does dietary habit contribute to obesity?
3. Does dietary habit mediate the relationship between alcohol consumption and obesity?

Fig. 1: Proposed Conceptual Framework.

Literature Review:
Health economic theory (HET) is used for the present paper to explain the relationship between time discounting, and the dependent health outcome of obesity measured by Body Mass Index (BMI). According to Huston and Finke, (2003), time discounting is established from the theory of human capital. The theory of human capital recognizes that “health is a stock within one’s own human capital” (Huston and Finke, 2003). Thus, health is an investment that one makes over time. This health investment is a function of time discounting. HET suggests that individuals who discount the future and engage in risk taking behavior are more likely to have poor health outcomes due to a lack of investment in their health (Huston and Finke, 2003). The time discounting aspect of HET suggests that lifestyle choices are centered on changes in individual preferences, which are in turn a function of the distance or time span in which a specific outcome will occur-with the saliency of the cost and benefits potentially affecting how ultimate decisions are made Areily and Zakay, (2001). If the benefits of a choice are too far off, research shows that the future is discounted and the sooner, immediate gratification of a choice outcome is preferred, even if it is smaller or less beneficial (Chapman, 2005). These changes in preferences can be systematic (Areily and Zakay, 1990).

A ‘beneficial choice’ (physical activity), will have a higher value or utility prior to the decision being made. A ‘costly choice’ (sedentary behavior), will have more value or be more enticing immediately prior to the decision being made to engage in physical activity. After the decision is made, in retrospect, the choice to lead a sedentary lifestyle becomes questionable and is less of a ‘reward’ than engaging in physical activity. Thus, when the future is devalued more than the present or the rate of discounting of the future is high; the value of future outcomes is low due to the time delay (Chapman, 2005). The choice factor in time discounting is an essential connection to economics as the concept is associated with behaviors that have tradeoffs between one activity over another. Empirical studies suggest that time discounting explains a host of behaviors including addictive and addictive-related behaviors such as gambling, drug use, alcohol consumption, needle sharing, dietary habits and smoking (Chapman, 2005; Huston and Finke, 2003; Khwaja, et al., 2006). Researchers have developed proxy constructs which include indicators of time discounting for non-experimental research. With this method, the value that one places on health status by measuring future discounting through time-based indicators consist of demographic variables, measurements of impatience, self-restraint and perceived health risk to further understand the extent to which short-term gains are preferred over long-term rewards (Read, et al., 2004; Huston and Finke, 2003; Chandran, et al., 2004; Van der pol, et al., 2000; Chapman, 2000). Such indicators of self-control and demographics were found to be better determinants of wellness outcomes as a function of time discounting. Thus, dietary habits and alcohol consumption are used to gauge time discounting. One’s investment in their stock of health would then involve increased physical activity and decreased intake of alcohol and tobacco. Therefore, those who do not discount the future and do invest in their health would be engaged in physical activity, and consume less alcohol and tobacco which would relate to a lower BMI.

Alcohol Consumption and Obesity:
Dallongeville, et al., (1998) conducted a study with a population sample recruited in three distinct geographical areas of France (North, East and South of France). The sample included men (n=1778) and women (n=1730) aged 35 to 64 yr old. Body mass index (BMI) was computed as weight (kg) divided by height squared (m2). Waist-to-hip ratio (WHR) was calculated as waist girth (cm) divided by hip girth (cm), and alcohol
consumption was assessed with a quantitative frequency questionnaire. The goal of the study was to assess the association between alcohol consumption and abdominal fat deposition in France, a country where wine is the most commonly consumed alcoholic beverage. The result indicated that adjustment on BMI revealed a relationship between alcohol intake and waist girth or WHR. Adjustment on BMI revealed a significant association between alcohol consumption and waist girth or WHR. Alcohol consumption was positively associated with waist girth and WHR, after adjustments for BMI, in both men and women. Total alcohol intake, rather than a specific beverage, was associated with increased waist girth and WHR. The observations suggested that total alcohol intake determines fat distribution and drinking wine did not protect from increasing abdominal fat deposition. Alcohol per se rather than alcoholic beverage consumption was associated with increased WHR.

In another study conducted by Bobak, Skodova and Marmot (2004), a random sample of 1141 men and 1212 women aged 25–64 yrs old in six districts of the Czech Republic were chosen and participants reported the frequency of drinking any alcohol, and how much wine, spirits and beer they consumed during a typical week. The purpose of the study was to examine the relation between beer intake and waist–hip ratio (WHR) and body mass index (BMI) in a beer-drinking population. Subjects were categorized into four groups according to their average weekly intake of beer: nondrinkers; <1 l (less than approximately 36 g of alcohol); 1.1–3.5 l (18–125 g of alcohol); 3.6–7l (126–250 g of alcohol); and >7 l (4250 g of alcohol). The findings of the study indicated that the frequency of drinking beer was associated with WHR and BMI in the same direction as the weekly intake, but the associations were not statistically significant. This study however, did not address the effects of heavy drinking. In terms of moderate beer drinking, the results suggested that the association between beer and obesity was weak. In another study (Rohrer, et al., 2005) used a sample (n=747) drawn from three clinics that primarily serve low-income populations in Texas, U.S. Among adults aged 35 and above. The study focused on how frequency of alcohol use was related to the risk of obesity in a community medicine clinic population. Their findings indicated that in comparison to non-drinkers, people who consumed alcohol 3 or more days per month had lower odds of being obese, and that binge drinking was not significantly related to obesity. More frequent drinking and less television time were independently associated with reduced odds of obesity in the sample of community medicine patients. Using a sample of 4,000 persons randomly chosen from an urban German population (Haenle, et al., 2006) have found that those with less than 2 hours of leisure time physical activity per week was associated with female sex, higher BMI (Body Mass Index), smoking and no alcohol consumption. To summarize, there appears to be reasonably good supportive evidence to suggest that alcohol consumption tend to have an effect on body mass index. This leads to the following proposition:

**Proposition 1:** Alcohol consumption is positively associated with obesity.

**Dietary Habit and Obesity:**

Harvey and Hill, (2001) conducted a survey of 764 health professionals in two health districts in the north of England to examine health professionals’ views of overweight people, to compare these to their views of smokers, and to explore the role of level of severity on these perceptions. It was found that the most important perceived causes of extreme overweight was food addiction. Many other factors such as personality, external stressors, mood changes, genetic factors, lack of willpower, socio-economic status and repeated dieting, were perceived as somewhat important. Compton, et al., (2006) conducted a review using searches of the MEDLINE database, from 1996 through April 2006, in the U.S. The findings of their study suggested that the weight gain associated with psychotropic medications was often associated with increased appetite (commonly a craving for sweet and fatty foods), as well as increased total caloric intake. Poor eating habits and sedentary lifestyle were risk factors for obesity in the general population and contributed to elevated rates of overweight/obesity in individuals. In the Czech Republic and Kubisova, et al., (2007) have examined a total of 201 homeless (174 males and 27 females) aged 19–70 years to describe the prevalence of some of the major cardiovascular risk factors, namely high total cholesterol and triacylglyceride levels, smoking and obesity in those members of Prague's homeless community. It was found that abdominal obesity was positively correlated with the intake of total fat and negatively correlated with protein intake. In Scotland (Akbartabartoori, et al., 2007) conducted a survey of 5,460 adults aged 16 to 74 years old. The mean cholesterol and non-high-density lipoprotein cholesterol (non-HDL-C) were significantly higher in overweight and obese subjects. After controlling for age, gender, social class, smoking, alcohol intake, and fruit and vegetable consumption, inactivity, overweight and obesity were associated significantly with higher OR for elevated cholesterol, C-reactive protein (CRP), systolic blood pressure, non-HDL-C and lower high-density lipoprotein cholesterol (HDL-C) than inactive with BMI <25 kg/m2. In England, 5,863 students took part in the HABITS (Health and Behavior in Teenagers) survey conducted by Fidler, et al., (2007). The study was conducted to assess the effect of smoking uptake on body mass index (BMI), waist circumference and height during adolescence. It was found that dieting behavior were associated with BMI. Restrained eating was associated with BMI. To summarize, there appears to be reasonably good supportive evidence to suggest that dietary habits tend to have an effect on body mass index. This leads to the following proposition:

**Proposition 2:** Dietary habits are positively associated with obesity.
Establishing the Mediating Effect of Dietary Habits: 

Alcohol Consumption and Dietary Habit: 

Akbartabartoori, et al., (2005) conducted a study using 5,460 adults aged 16–74 years of age from Scotland, to examine the associations between current recommended physical activity levels and body mass index (BMI) with some cardiovascular disease (CVD) risk factors (total cholesterol, high-density lipoprotein cholesterol (HDL-C), non-HDL cholesterol (non-HDL-C), C-reactive protein (CRP), fibrinogen, and blood pressure), general health score (GHQ12) and predicted coronary heart disease (CHD) risk. Their findings indicated that the mean cholesterol and non-HDL-C were significantly higher in overweight and obese subjects. After controlling for age, gender, social class, smoking, alcohol intake, and fruit and vegetable consumption, inactivity, overweight and obesity were associated significantly with higher OR for elevated cholesterol, CRP, systolic blood pressure, non-HDL-C and lower HDL-C than inactive with BMI <25 kg/m².

In Haenle, et al., (2006) study, each subject was asked how much beer, wine and spirits they drank on the previous workday and over the last weekend. The total alcohol intake was calculated by multiplying weekday consumption by five and adding this figure to weekend consumption. The most common form of alcohol consumed was beer, followed by wine, must, champagne and liquor. The results revealed that less than 2 hours of leisure time physical activity per week was associated with female sex, higher BMI (Body Mass Index), smoking and no alcohol consumption. Participants consumed on average 12 grams of alcohol per day. Total cholesterol was in 62.0% (>5.2 mmol/l) and triglycerides were elevated in 20.5% (≥2.3 mmol/l) of subjects studied. Hepatic steatosis was identified in 27.4% of subjects and showed an association with male sex, higher BMI, higher age, higher total blood cholesterol, lower HDL, higher triglycerides and higher ALT. Moderate alcohol consumption (0 g to 40 g alcohol per day) was stronger associated with more than 2 hours of physical activity per week than heavy alcohol consumption (more than 40 g alcohol per day). The total cholesterol levels were strongly influenced by gender, age, alcohol consumption and BMI. The mean cholesterol levels were increasing with increasing consumption of alcohol, higher BMI and older age. There is a close association between tobacco use and alcohol consumption, more males than females were overweight (40.8% vs. 24.9%).

Proposition 3: Alcohol consumption is negatively related to healthy dietary habits, which in turns leads to higher BMI.

Conclusion and Direction for Future Research:

Health Economic Theory (HET) involves the concept of human capital investment and the importance of the individual in making optimal health decisions. The theory is underscored in behavioral economics, which joins the psychology behind decision- making with economic theory in identifying that individuals make choices based on utilities. The theory proposed that one has a certain amount of human capital, which is in turn influenced by environmental factors that makeup human capital in its entirety. The quality of this human capital stock differs between individuals and is to some degree controlled by the individual. Thus, health is viewed as being ‘endogenous’ and becomes a function of actions expended overtime in being maintained and improved (Huston and Finke, 2003). The individual is the center of this theory. In addition, there are market and socio-cultural components that affect health outcomes in terms of resources and cultural meanings of a healthy lifestyle. The theory is also sociological, as central to the theory are lifestyle factors and environmental factors including structural location in society and socio-cultural determinants that affect health outcomes. This paper has attempted to re-examine an at-risk group in terms of predictors of obesity. HET allows for a look at individual lifestyle predictors indicators. These predictors include 1) time discounting measures of dietary habits, and alcohol consumption. The research objectives of this paper was to explore the extent to which the independent variable, is a good predictor of BMI. HET informs the research objectives for this study because its centralized focus is that the individual makes lifestyle choices that impact health outcomes.

The investigation gathered could help us to understand better the development or factors affecting obesity, which is a rising concern globally, regardless of ethnicity, cultural background, or age. This study is expected to contribute to the extensive body of knowledge that exists and to address the current ongoing debate worldwide on measures which could be adopted to reduce obesity among young adults in particular. In addition, research shows that lower prevalence of abdominal obesity was found among infrequent alcohol users (Tolstrup et al., 2008). Tolstrup and colleagues, (2008) sought to test the proposition that drinking frequency was associated with changes in waist circumference. The authors suggested that drinking pattern may be related to the development of adiposity. Future research could further investigate the relationship between dietary habits and alcohol consumption to expand the current proposed conceptual model presented in this study. Furthermore, prior research have also showed that longitudinal predictors of one year weight gain among women included both increases in caloric intake and decreases in leisure-time physical activity (Chiriboga, et al., 2008). For men, anxiety scores were the top predictors of weight gain over time (Chiriboga, et al., 2008). On average, over the one year study period, the men gained .3 kg and women lost .2 kg (Chiriboga, et al., 2008). Cross-sectional data at baseline illustrated that predictors of lower body weights were current cigarette smoking, increased leisure...
time physical activity and decreased anxiety and depression scores. All in all, lower body weights at baseline for men were related to a decrease in caloric consumption from protein and greater occupational endeavors and for women, higher educational status.

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