Is Motivation Necessary for Maintaining Dietary Health?

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Abstract

This study will attempt to combine theories from previous works in order to better understand dietary health behaviors of consumers. More specifically, regression analysis will be implemented to isolate the effects of dietary health motivation, dietary health knowledge and socio-demographic variables on dietary health behavior. The driving theory behind this study is that in order for an individual to consume a healthy diet he or she must be knowledgeable about the role specific nutrients play in maintaining health. However, having this knowledge will not affect positive dietary behaviors single-handedly. The individual must also be *motivated* to sustain an already healthy diet or to improve a poor diet.

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1. Introduction

According to the U.S. Department of Health and Human Services, national health expenditure in the United States exceeded $2.4 trillion in 2009. This accounted for 17% of GDP and represented an average per capita expenditure of over $8,000. Interestingly, the USDA Economic Research Service (henceforth USDA ERA) reported national food expenditure in 2009 to be just over $1.2 trillion (approximately $4000 per capita). This means that consumers in the United States spent nearly twice as much on health care than they did on food. Yet as spending on food decreases, the occurrence of diet induced health problems continues to rise. A recent study conducted by the U.S. Centers for Disease Control (henceforth US CDC) found that 26.8 % of the U.S. population was obese in 2009 (according to BMI standards). According to a similar study by the US CDC, the prevalence of obesity among children in the U.S. is currently about 17%. Obesity is largely caused by poor dietary choices and places an individual at much higher risks for coronary heart disease, diabetes, high blood pressure, stroke, and certain types of cancer.

Scientists, clinical nutritionists, and dietitians have confirmed that diet is one of the most critical components to maintaining overall health. Despite this evidence however, the above data shows that people living in the U.S. are spending increasingly smaller portions of their income on diet. The purpose of this article therefore, is to better understand the dietary problems of the United States from an econometric decision making framework. The driving theory here is that in order for an individual to consume a healthy diet he or she must be knowledgeable about the role specific nutrients play in maintaining health. However, having this knowledge will not affect positive dietary behaviors single-handedly. The individual must also be *motivated* to sustain an already healthy diet or to improve a poor diet. This motivation can come from a number of sources including education, societal influences, current health status, personal aspirations, health concerns and the decisions of the household food purchaser. Measuring motivation is a challenging task because it is not obviously recognizable. For the study at hand, survey responses will be used to create an index which attempts to quantify an individual's level of health motivation. The hypotheses being tested are that health knowledge and certain socio-demographic characteristics have predictable and measurable effects on behavior, some of which are mediated by dietary health motivation. In order to measure these effects, multiple regression analyses will be employed.

2. Literature Review

The first step to understanding why people do or do not consume healthy diets is to determine how professionals, and alternatively the general public, define healthy and unhealthy diets, as well as what the perceived and actual barriers/stimulants of healthy diets are. A general definition of a healthy diet, according to many dietitians, clinical nutritionists and government agencies (i.e. USDA, US CDC, US Department of Health and Human Services) is one that helps to maintain or improve health. More specifically, a healthy diet is one that balances micronutrients, macronutrients and calories in a way that maximizes resistance to disease and maintains a healthy weight.

A study by R. Povey, et al (1998) explains, however, that healthy and unhealthy eating can be interpreted a number of different ways amongst the general public. For example, responses to their open ended questions about what constitutes a healthy diet included: eating food containing fiber, eating natural foods, eating food containing vitamins, eating fresh foods, avoiding fried foods and eating a variety of food. Similarly, an array of responses was recorded for open-ended questions concerning unhealthy diets. These included: eating foods with high fat content and high sugar content, eating fried foods, eating food with additives, and eating manufactured/processed foods. A similar study conducted by Eikenberry and Smith (2004) recorded comparable results to open ended questions about healthy and unhealthy diets. Despite this variation in answers however, they all generally align with the definition outlined by professional dietitians and clinical nutritionists. This means that the respondents of these surveys (representative of a larger adult population) had a general idea about what foods to consume in order to maintain a healthy diet, but lacked a bit in terms of detailed and structured responses.

The Eikenberry and Smith (2004) study just mentioned also recorded responses to open-ended questions about motivational and prohibitive factors associated with healthy dietary behavior. On the whole, responses were related to health (preventing disease, maintaining weight, health of the family). Interestingly though, there were noticeable differences across races and income levels. For example higher income respondents generally placed more importance on “health”, whereas lower income respondents wanted to “look good”. Likewise, white respondents wanted to “feel good”, whereas black respondents wanted to “live longer”. These differences in motivational factors between socio-demographic groups are important elements to consider when designing surveys and empirical studies which have the goal of better understanding dietary choices. The results of these studies support the notion that people can be motivated in different ways to eat healthy.

Since the mid 1900’s researchers have been working to understand what drives consumer behaviors in relation to health. For example, in 1966 Hochbaum, Rosenstock and Kegels developed the Health Belief Model. This model attempted to combine established social, psychological, and behavioral theories in an effort to explain and predict individuals' health behaviors. To do this, the model uses a set of four parameters (or constructs) which include perceived susceptibility, perceived severity, perceived benefits and perceived costs (or barriers). In other words, an individual will evaluate his or her likelihood of contracting an illness (susceptibility), weight the potential consequences resulting from said illness (severity), and follow a recommended course of action to avoid the illness if the perceived benefits are greater than the costs (i.e. monetary, temporal, social, etc.). In an effort to make the model more complete, a self efficacy construct was added in 1988 which accounts for the individual's belief in their ability to complete the prescribed action (in addition to the external barriers mentioned before). Applying this model to the problem of obesity, a researcher would want to know if individuals are aware of the health risks linked to obesity, and whether or not they feel enabled to self-mediate the problem.

The Health Belief Model serves as a foundation for behavior mapping, and has been adapted for application to many topics concerning health. For example, Becker et al (1977) use the model as a framework for understanding mothers' adherence to a dietary regime for their obese children. Similar to the Health Belief Model, behavior is predicted based on an individual's valuation of an outcome and the expectation that certain actions will increase the likelihood of achieving that outcome (see figure 1). For this paper however, the authors identify three stages in the health decision process: (1) motivation to avoid sickness or get well, (2) amount of desire for a particular level of health, and (3) belief that a specific health action will prevent or ameliorate illness. Here we can see that additional information has been added to better represent the reality of individuals' health behavior (specifically the motivation component mentioned in the first stage). The original model posits "disease avoidance" as the primary incentive for acting in ways to enhance health. However in the Becker model, individuals are recognized as also having positive health motivations and/or perform healthful acts for reasons other than attaining higher levels of health status.

These alternative forces driving healthy behavior are particularly notable when examining the problem of obesity. Obesity is already unique in that the major health complications caused by it are realized in the future (it is a long term problem) and individuals are often motivated by non-health reasons to mediate the problem (i.e. body image and social status). The results of the Becker et al (1977) study indicate that their interpretation of the Health Belief Model is effective at predicting and explaining peoples' behavior. The analysis revealed that a high fear arousal in the parents of obese children resulted in the most significant weight loss, whereas the control (no intervention) group actually experienced weight gain. This implies that simply informing parents or individuals at risk of health problems linked to diet will not instigate change in diet. Some form of motivating factor (i.e. fear arousal or probability of illness occurring) is necessary to initiate long term transformations.

Taking a short step back in time, Grossman (1972) wrote that "…most students of medical economics have long realized that what consumers demand when they purchase medical services are not these services per se, but, rather 'good health.'" With this notion in mind, Grossman set out to classify "health" as a commodity. One that could be invested in and one for which a demand function could be calculated. A very basic interpretation of Grossman's model is that each person is endowed with a stock of health that naturally deteriorates over time and can also be increased through investment. In this way, each individual is both a producer and a consumer of health. Because consumers of health must make decisions about how to trade-off their time and resources between healthful pursuits and non-healthful pursuits, a utility function, and in turn a demand function, can be calculated. The commodity "health" can be represented monetarily (and through market transactions) as a function of time. That is, the amount of "good health" a person has invested in will determine the amount of time she is able to spend pursuing market and nonmarket activities, thereby bringing about a monetary return on health investment (Grossman 1972). And as with all investments there is also a rate of depreciation component to health capital, which can vary depending on age and choices. What is most interesting about the commodity health however, is the inability for individuals to sell their health on the market. Health is observable and measurable, but not a physical substance. Using this model and its resultant economic characteristics, predictions have been made about how consumers will react to changes in the price of health inputs (i.e. medical care, food, transportation, etc) and what the optimal level of health is for each consumer.

The implications of these general health models for this study are that future research in health behavior modeling must be conducted with a consideration for the multidisciplinary nature of the subject. Because humans often interact in complex social environments, sciences like psychology, sociology and geography provide valuable information to economists trying to understand consumers' decision making processes.

This study also makes use of path analysis concepts, which date back to the dawn of the 20th century, when geneticist Sewell Wright began developing its techniques. In his paper "The Method of Path Coefficients," he defines path analysis as "…a flexible means of relating the correlation coefficients between variables in a multiple system to the functional relations among them." Path analysis has typically been represented as a causal relationship diagram, as seen in fig. 2. In this diagram, exogenous variables (those that are independent or external to the workings of the model) are represented by a rectangle. They will often have double-headed arrows on one side (representing covariance or correlation calculations) and the tail of a single-headed arrow on the other side (representing a causal pathway). Endogenous variables (or those that are partially or fully subject to the workings of the model) will also be represented by rectangles. However, endogenous variables will always have the head of an arrow on one side (as seen by variable C in fig. 2), and can sometimes have the tail of another causal arrow on the other (again see variable C in fig. 2). A good way to remember how exogenous and endogenous variables are classified is to note whether they are regressed on another variable. In the case of exogenous variables, they will always be regressed on, whereas endogenous variables can be the regressor or the regressand.

3. Hypothesized Relationships and Data

The fundamental theory behind the generation of these hypotheses is that motivation is an essential component for explaining dietary health behaviors of consumers. Without motivation, an individual with otherwise adequate means for maintaining a healthy diet (i.e. high enough income or high level of nutrient knowledge) will not engage in healthy eating practices. We therefore have the following hypotheses:

H1: Individuals with higher levels of health motivation will exhibit higher levels of healthy dietary behaviors than individuals with lower levels of health motivation.

H2: Nutrient knowledge will be positively correlated with dietary behavior such that a respondent with higher levels of nutrient knowledge will also exhibit higher levels of healthy dietary behavior.

H3: The effect of a respondent's nutrient knowledge on dietary behavior is mediated by motivation such that individuals with higher levels of motivation and higher levels of nutrient knowledge will exhibit higher levels of healthy dietary behaviors than individuals with lower levels of health motivation and high levels of nutrient knowledge.

H4: The effect of a respondent's health status on dietary behavior is such that lower levels of health status (i.e. less healthy individuals) will result in higher levels of healthy dietary behavior.

H5: Older respondents will exhibit healthier dietary behaviors than will younger respondents, regardless of motivation level.

H6: The effect of a respondent's education level on dietary behaviors is such that higher levels of education will correspond to higher levels of healthy dietary behavior.

H7: The effect of income on dietary behavior will be such that higher levels of income will result in higher levels of healthy dietary behavior.

H8: Females will exhibit higher levels of healthy dietary behaviors than men.

H9: The effect on dietary behavior of the specific socio-demographic variables education level, income, and gender will be mediated by motivation.

The data for this project originated from a web-panel survey conducted by Ipsos-Observer. Ipsos-Observer is a private consulting firm specializing in consumer research and public opinion polls on socially important issues, including tracking trends in food consumption. This particular survey drew an appropriately stratified sample of 9000 households, from which 3,456 responses were collected (yielding a 38.4% response rate). The primary focus of the survey was to elicit information about the respondent's soy consumption behaviors and soy food perceptions. Because studying these soy related consumer characteristics is not the primary objective of this thesis, most of these data will not be used. However as discussed in section 3.1, the survey also asked questions concerned with the general health status, dietary health motivation, dietary behavior and nutrient knowledge of the respondents, as well as several key demographic variables relevant to this study (age, gender, income, and education level). The responses collected for these questions are the secondary data source used for the analyses in this study.

4. Specification of Empirical Models

The three statistical software packages used for the analysis were Microsoft Excel, SPSS, and AMOS. The first step in conducting these analyses is to test the validity of the data being used with various statistical techniques. As Bentler and Chou (1987) mentions, no matter how tight the model fit is estimated to be, if the correct procedures for attaining survey responses are not followed, then the results are actually meaningless. As Table 1 shows, the Cronbach Alphas calculated for the variables Motivation (0.798) and Behavior (0.867) were not ideal, but nonetheless acceptable. To further test the data for acceptability, a correlation matrix was computed for the set of independent variables and as Table 2 shows, there is very little problem with correlation between independent variables.

After the variables in the data collection were deemed acceptable, a series of regression models were used to test the hypothesized causality relationships. The first of these used the Health Behavior index as the dependent variable, and the Motivation index and Knowledge level as independent variables. Behavior is regressed on Motivation and Knowledge separately to establish the significance of these variables in explaining dietary behavior. The model specifications were:

1. $\text{Behavior} = \alpha + \beta 1\text{Motivation} + \varepsilon i$
2. $\text{Behavior} = \alpha + \gamma 1\text{Knowledge} + \mu i$

The coefficients $\beta 1$ and $\gamma 1$ measure the extent to which their respective variables (Motivation and Knowledge) affect the dependent variable (Behavior) independent of each other. The results of these equations are summarized in Table 3. As we can see, the R-squared values for the regressions (0.560 and 0.028) are not ideal, but acceptable nonetheless. More importantly, the results show that when subjected to a simple t-test (with 95% confidence level), the coefficient of Motivation ($\beta 1$=0.512, t-value=66.31) is significantly and positively affecting Behavior, and likewise Knowledge is a significant independent variable ($\gamma 1$=0.239, t-value=10.080). This is in line with hypotheses H1 and H2, indicating that Motivation and Knowledge are positively correlated with dietary behavior. To further the empirical analysis and to test hypothesis H3, equation three combines Motivation and Knowledge into a multiple regression equation:

3. $\text{Behavior} = \alpha + \beta 1\text{Motivation} + \gamma 1\text{Knowledge} + \varepsilon i$

As Table 3 shows, the value of the coefficient for motivation (0.509), as well as its t-statistic (64.622), hardly changed from the previous regression results. For the Knowledge variable however, the value of the $\gamma 1$ coefficient (0.022) and its t-statistic (1.389) changed considerably. We now see in combination with Motivation, Knowledge is not significant in explaining dietary health behaviors. This specific type of change in coefficient values and t-statistics is a clear indication that the effect of nutrient knowledge on dietary behavior is partially mediated by motivation. To confirm this, a regression of Motivation on Knowledge was computed:

4. $\text{Motivation} = \alpha + \gamma 1\text{Knowledge} + \varepsilon i$

The results of this regression do in fact validate hypothesis H2, that Motivation has a mediating effect on Knowledge. That is, individuals with high levels of dietary nutrient knowledge and high levels of positive dietary motivation will engage in healthier dietary behaviors than individuals with high levels of dietary nutrient knowledge and low levels of positive dietary motivation.

In order to give higher credence to this assertion, a series of successive regressions were calculated that included certain socio-demographic variables. Age, Gender, Income, Education Level and the Health Status of individuals have all been shown to have significant impacts on dietary behavior (as outlined in section 3.1), and therefore will be included in the primary regression. This initial equation took the form:

5. Behavior = α + β1Health Status + β2Age + β3Education + β4Income + β5Gender + εi

In this model we are measuring the simple linear relationships between dietary behavior and the independent variables. In Table 4, we can see that the coefficients and significance levels for the newly added socio-demographic variables were all statistically significant in explaining dietary behavior. We see that all of the coefficients, except that for gender, were positive. The negative gender coefficient indicates that women engage in healthier dietary behaviors than men (remember that gender was a dummy variable coded as women = 0, men = 1).

To begin testing for the mediating effects of Motivation on the socio-demographic variables, four more regressions were calculated:

6. Behavior = α + β1Motivation + β2Knowledge + β3Age + β4Gender + β5Income + β6Education + β7Health Status + ε
7. Behavior = θ + η1Knowledge + η2Age + η3Gender + η4Income + η5Education + η6Health Status + ξ

8. Behavior = $\lambda + \gamma 1$Motivation + $\gamma 2$Age + $\gamma 3$Gender + $\gamma 4$Income + $\gamma 5$Education + $\gamma 6$Health Status + μ
9. Motivation = $\theta + \eta 1$Knowledge + $\eta 2$Age + $\eta 3$Gender + $\eta 4$Income + $\eta 5$Education + $\eta 6$Health Status + ξ

The results of equation 6 are quite interesting when compared to those of equation 5. For example, there are now two negative coefficients, Gender and Health Status. As shown in Table 4, the magnitude of the Health Status coefficient (-0.256) and t-statistic (-4.704) did not change significantly; however the negative sign is now implying that individuals with a healthier state of being will engage in healthier dietary behaviors when motivation and knowledge are accounted for. This implies that the positive affect of Health Status on Behavior is due to the absence of Motivation. In other words, when Motivation is included, the positive dietary effects are embedded in Motivation and the net effect becomes negative. This result is somewhat perplexing and is perhaps worthy of its own in depth study. Given the results of Becker et al 1977, one would expect that individuals with a higher prevalence of health problems would possess the motivation to be more acutely aware of their dietary behaviors. According to these results however, the opposite is true.

The Gender coefficient (-0.091) and t-statistic (-0.866) on the other hand, did change substantially, so that it is no longer a statistically significant independent variable. This is a clear sign of a mediation effect, which will be elaborated on briefly. The changes in the remaining variables' coefficients are not very significant, which lend to the notion that they affect dietary behavior independently. Also worth noting from the results of equation six, however, is the negative sign of the Knowledge variable. This change in sign from equation three could imply that Knowledge is having some interaction effects with some of the socio- demographic variables. However, because the statistical significance level has not changed and there were no correlation problems reported in Table 2, we can safely ignore the sign change.

To continue the investigation of the mediation effects, equations 6 and 7 regress Behavior on Knowledge and the five socio-demographic variables, and Behavior on Motivation and the five socio-demographic variables. The purpose of these two regressions is to isolate the effects of Motivation and Knowledge on the socio-demographic variables and further extract the mediation effects. The full mediation effect of Motivation on Gender becomes much clearer upon examination of these results. We can see that when Motivation is included as an independent variable (equation 8) as opposed to Knowledge (equation 7), Gender becomes statistically insignificant and the magnitude of the coefficient is substantially reduced. Interestingly, among the remaining socio-demographic variables there is very little change in coefficients and t-statistics between equations 5 through 8. This indicates that there are no mediating effects of motivation on Age, Education Level, Income and Health Status. In other words these four socio-demographic variables affect dietary behavior independently.

The final step in testing for mediation is to regress the mediator (Motivation) on Knowledge and the socio-demographic variables. This is listed as equation 9, and the results are shown in table 4. Here we can confirm the full mediation of Motivation on Gender and the partial mediation of Motivation on Health Status. Notice that the coefficient for Health Status increases in magnitude to 1.16 and its corresponding t-statistic is increased to 10.058. Because Health Status was statistically significant in equations 5 and 6, but this magnitude was increased in equation 9, we can say that there is a partial mediation effect. The remaining variables do not show any sign of mediation. This is particularly obvious with the Income variable, which has a completely independent affect on Behavior.

5. Discussion of Results

The purpose of the regression analysis in this thesis was to isolate the effects that motivation, nutrient knowledge and socio-demographic variables have on dietary behaviors. Hypothesis 1 stated that individuals with higher levels of health motivation will exhibit higher levels of healthy dietary behaviors than individuals with lower levels of health motivation. The results of regression equations 1 and 3 (as displayed in Table 3) do in fact validate this hypothesis. The coefficient for Motivation in both regressions was about 0.51 and the corresponding t-statistics were both greater than 60. To interpret this coefficient we would say that as the motivation of the individual increases by one unit, dietary health behavior will improve by 0.51 units. This positive relationship indicates that higher levels of health motivation correspond to higher levels of healthy dietary behavior in a statistically significant manner. Similarly hypothesis 2, which predicted that nutrient knowledge would have a positive and statistically significant relationship with dietary behavior, was proven true as shown by the results of regression equation 2.

Despite the statistically significant coefficients for Motivation and Knowledge in equations 1 and 2 however, there is a considerable difference in the R-squared values. Equation 1 resulted in a relatively strong R-squared (0.56), whereas the R-squared for equation 2 was much weaker (0.02). This means that given the responses to this survey, Motivation has a much stronger effect on dietary behavior as compared to Knowledge. This difference in "goodness of fit," strikes at the core of this thesis and supports the notion that motivation to engage in healthy dietary behavior is a more accurate determinant of dietary behavior than nutrient knowledge. One issue that needs to be addressed however is the way in which the Behavior, Motivation and Knowledge variables were constructed. First, the Behavior variable is a stated, rather than a revealed variable. This means that the dietary behaviors of the respondents are not tracked by some external source, but are instead declared by the respondent. As mentioned previously, this could potentially lead to a survey response bias. Similar to the stated behaviors, motivation is a measured by the respondents' stated response to survey questions. Again, this could result in a survey response bias because a person could actually be less or more motivated than the answers to the survey questions reveal. The nutrient knowledge variable however was constructed in a more tangible manner. In this case, either the respondent knows the corresponding health effect of the listed nutrient, or he does not. This could lead to contrasting levels of motivation and knowledge, because as Povey (1998) and Eikenberry and Smith (2004) discovered, much of the general public have basic ideas about how to consume a healthy diet, but lack in specific nutrient knowledge. So for example, an individual may be motivated to eat a diet comprised primarily of fruits and vegetables, but be unaware of the specific nutritional value gained from such a diet.

Hypothesis 3 was also validated through the regression analysis. This hypothesis posited that the effect of a respondent's nutrient knowledge on dietary behavior is mediated by motivation such that individuals with higher levels of motivation and higher levels of nutrient knowledge will exhibit higher levels of healthy dietary behaviors than individuals with lower levels of health motivation and high levels of nutrient knowledge. The numerical validation of this claim can be extracted from the parameter coefficient estimates displayed in Table 3. Because the coefficient for the Motivation variable was highly statistically significant in equations 1 and 3 (t-statistics were 66.31 and 64.62), and the Knowledge variable coefficient was not significant in equation 3 (t-statistic 0.016), but significant in both equation 2 and 4 (t-statistics were 10.08 and 12.3335), we cannot reject hypothesis 3.

Hypotheses 4 through 9 were primarily concerned with the socio-demographic variables' effects on healthy dietary behavior. In these hypotheses income level, gender and education level were all expected to have their effects mediated by motivation. Age and health status, on the other hand, were not expected to be mediated by motivation. The reasoning behind these assertions comes primarily from the results of the Moorman and Matulich (1993) study.

Hypothesis 4 stated that regardless of motivation, the lower a person's health status is, the higher the level of healthy dietary behaviors they will exhibit. This hypothesis was in fact validated by equation 5, where we see that the coefficient for health status (0.354) was positive statistically significant in explaining dietary behavior (t-stat = 4.44). This means that higher values for the health status variable (which again indicate that a respondent has higher levels of health problems) correspond to higher levels of healthy dietary behavior. Next, hypothesis 5 predicted that older respondents will exhibit healthier dietary behaviors than will younger respondents, without accounting for motivation levels. The validation of this hypothesis is seen in equation 5 where the coefficient for age is positive (0.051) and statistically significant (t-stat = 9.02). Again, this positive correlation means that as the age of the respondent increases, the dietary behaviors improve. Hypothesis 6 posited that education level will also be positively correlated to healthy dietary behaviors. Equation 5 again validates this hypothesis, for we can see that the coefficient for education level (0.29) is both positive and statistically significant (t-stat = 7.344). This means that higher educated respondents will engage in healthier dietary behaviors. Hypothesis 7 is concerned with income and predicts that higher income earners will exhibit healthier dietary behaviors. The coefficient for income in equation 5 (0.056) and t-stat (4.613) confirm this hypothesis. Finally hypothesis 8 accurately predicts the affect of gender on dietary behaviors. The coefficient is negative (-0.87) and statistically significant (t-stat = -5.57), indicating that women engage in healthier dietary behaviors than men.

Hypothesis 9 is concerned with the mediation effects of motivation on the socio-demographic variables, and as we shall see in the following analysis this hypothesis was not entirely validated. First, concerning the health status variable, Table 4 shows this variable was in fact partially mediated by motivation, contrary to the hypothesis (that it would independently affect dietary behavior). To explain this effect, we first look at equation five. Here we see that health status is statistically significant (t-stat = 4.44) when it is treated as an independent variable. Next, equation 6 shows that when motivation and knowledge are added as independent variables, the coefficient for health motivation (-0.257) and its t-stat (-4.704) both become negative. To clarify this effect, we would say that individuals with lower health status (i.e. higher levels of health problems) engage in healthier dietary behaviors. Then when motivation is added to the equation, all of this positive effect is mediated by motivation so that the overall effect becomes negative. To solidify that this is a partial mediation we look at equation 9. Here we see the coefficient for health status increased and became more statistically significant when motivation was regressed on health status as a dependent variable. As discussed in previous sections, these three criteria indicate partial mediation.

Hypothesis 9 also excluded age from those variables having mediation effects imposed on them by motivation speculating that it independently affects dietary behavior. To test this, we will again take a preliminary look at equation 5. Here we see that age was positively and significantly related to dietary behavior. To test the mediation effect of motivation, we next include motivation and knowledge in equation 6. Here again we begin to see a partial mediation, as the magnitude of the coefficient reduces from 0.051 to 0.032 as well as the magnitude of the t-stat (from 9.03 to 8.35). To confirm that this effect is caused by motivation and not knowledge, equations 7 and 8 isolate these two variables and we can see that motivation has a larger effect on the age variable. Finally, equation 9 regressed motivation on the socio-demographic variables, and we see that although the coefficient (0.033) and t-stat (4.10) were reduced, they still indicate that a partial mediation effect is observed.

Hypothesis 9 predicted that the effects of education level, income, and gender on dietary behaviors would all be mediated by motivation. Interestingly, the results of equations 6 through 9 indicate that only gender is mediated by motivation. As we can see from equation 6, the coefficient is significantly reduced from equation 5 (from -0.871 to -0.091) and the t-stat is reduced to an insignificant level (from -5.57 to -0.86). To confirm that this is a mediation effect of the motivation variable, we first look at equations 7 and 8. These show that when knowledge is removed and motivation remains as an independent variable, the results from equation 6 are maintained. Finally, equation 9 shows that gender is significant in explaining motivation, with a coefficient of -1.25 and the t-stat of -5.64.

Regarding education level, the results of equations 5 through 9 indicate that its effects are partially mediated by motivation. First, we see in equation 6 that the coefficient is reduced from equation 5 (from 0.29 to 0.11), as is the significance level (t-stat went from 7.34 to 4.03). Because education level is still significant in equation 6, we begin to suspect partial mediation. Equations 7 and 8 help solidify this suspicion, for we can see that the coefficient and t-stat of equation 8 (in which motivation is still an independent variable) more closely resemble those of equation 6. To finalize this notion of partial mediation we examine the results of equation 9. Here the coefficient of 0.257 and t-stat of 4.42 do in fact confirm the partial mediation of motivation on education level.

Finally, rather than a mediation effect of motivation on income, we see that income affects dietary behavior independently. To start, we see there was minimal change between the coefficient and t-stat of equation 5 (0.05 and 4.61 respectively) and those of equation 6 (0.03 and 4.79). Continuing on with equations 7 and 8, we see that again motivation has very little effect on the coefficient and significance level of the income variable. And finally equation 9 validates the independence of income, as we see a reduced coefficient (0.01) and t-stat (0.62) when motivation is regressed on income.

6. Conclusion and Implication

The most important implication of this thesis is that efforts made in the future by government agencies, educators, and private industry, with the goal of affecting the dietary patterns of people, will need to give adequate consideration to the motivations driving these choices. Because motivation acts as a mediator to nutritional knowledge, as well as several key socio-demographic variables, it must be treated as an essential component to any model that maps dietary health behavior. As this thesis and other referenced studies have shown, educating the public on healthy eating practices is not enough to inspire beneficial changes to eating patterns. Similarly, higher incomes alone cannot help people to engage in healthier dietary behaviors, even though the regressions in this thesis show that income is not mediated by motivation. The national data sources show that people in the U.S. are spending considerably smaller portions of their income on food than on health care costs, and yet obesity rates continue to rise. Therefore, confusion seems to exist about peoples' understanding of how consumption of a healthy diet will drastically mitigate healthcare costs.

Furthermore, future research of this nature must be conducted with a consideration for the multidisciplinary nature of the subject. Because humans often interact in complex social environments, sciences like psychology, sociology and geography provide valuable information to economists trying to understand consumers' decision making processes. Alvensleben (1997) argues that past studies in microeconomic theory limit researchers to studying effects of price changes. However he believes that in the future, shifts in food demand will be caused more by preference changes than income or price shifts. This poses a problem to economists because "consumer preference" is a difficult variable to measure and quantify. In an effort to move towards this goal, Alvensleben provides a theoretical framework consisting of eight categories of food demand motives, three phases of food demand, distinct consumer typology groups, and measures of consumers' perception of products. The implication of this outline is that classical economic demand analysis is no longer a sufficient tool for analyzing shifts in consumer demand.

A recommendation for future studies of this nature is to more thoroughly distinguish between socio-demographic groups and include a variable for open-ended survey questions that allows respondents to state perceived barriers to, and proponents of, eating healthy (similar to the studies mentioned in section 2.4). This will provide a more complete picture of the psychology behind dietary behaviors.

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Table 1. Descriptive statistics of variables used in regression analysis

Descriptive statistics of variables used in regression analysis							
Variable	Items	Range	Min	Max	Mean	SD	Cronbach Alpha
Health Behavior	5	20	5	25	15.102	4.456	0.867
Health Motivation	8	32	8	40	22.932	6.512	0.798
Health Knowledge	11	11	0	11	6.085	3.142	-
Health Status	7	6	1	7	1.554	0.973	-
Income	25	24	1	25	12.104	6.429	-
Age	82	72	1	73	32.722	13.754	-
Gender	2	1	0	1	0.478	0.500	-
Education	11	9	1	10	5.018	13.754	-

Table 2. Correlation matrix for independent variables

Correlation Matrix for Independent Variables							
	Motivation	*Status*	*Knowledge*	*Income*	*Age*	*Educ*	*Gender*
Motivation	1						
Health Status	0.1930	1					
Knowledge	0.2054	0.0399	1				
Income	0.0655	-0.0837	0.2195	1			
Age	0.1327	0.3173	0.0751	0.0419	1		
Education Level	0.0957	-0.0290	0.2265	0.3426	0.0375	1	
Gender	-0.0750	0.0614	-0.0920	-0.0237	0.0905	0.2457	1

Table 3. Parameter Coefficient Estimates for Regression Equations 1-4

Parameter Coefficient Estimates for Regression Equations 1-4				
	Dependent Variable			
Equation Number	1	2	3	4
Indep. Variable	Behavior	Behavior	Behavior	Motivation
Intercept	3.3576	13.6435	3.2709	20.3426
(t-stat)	[18.2368]	[83.7675]	[16.8300]	[86.0768]
Motivation	0.5121	-	0.5098	-
(t-stat)	[66.3127]	-	[64.6224]	-
Knowledge	-	0.2397	0.0227	0.4256
(t-stat)	-	[10.0805]	[0.0163]	[12.3335]
R-squared	0.560	0.029	0.056	0.042

Table 4. Parameter Coefficient Estimates for Regression Equations 5-9

Parameter Coefficient Estimates for Regression Equations 5-9					
	Dependent Variable				
Equation Number	5	6	7	8	9
Indep. Variable	Behavior	Behavior	Behavior	Behavior	Motivation
Intercept	11.162	1.9732	10.6493	1.9371	17.1455
(t-value)	[39.9454]	[8.2550]	[36.7626]	[8.1812]	[40.7408]
Motivation	-	0.506	-	0.5046	-
(t-value)	-	[63.6796]	-	[64.3368]	-
Knowledge	-	-0.0184	0.153	-	0.3388
(t-value)	-	[-1.0997]	[6.2726]	-	[9.5599]
Health Status	0.3541	-0.2568	0.3301	-0.2581	1.16
(t-value)	[4.4413]	[-4.7042]	[4.1583]	[-4.7268]	[10.0580]
Income	0.0565	0.04	0.0457	0.0387	0.0112
(t-value)	[4.6132]	[4.7960]	[3.7138]	[4.6896]	[0.6284]
Age	0.0509	0.0319	0.0488	0.0317	0.0335
(t-value)	[9.0296]	[8..3591]	[8.6958]	[8.3167]	[4.1005]
Education Level	0.2903	0.1098	0.2402	0.1043	0.2578
(t-value)	[7.3439]	[4.0263]	[5.9899]	[3.8904]	[4.4241]
Gender	-0.8711	-0.0905	-0.7274	-0.0755	-1.2586
(t-value)	[-5.5702]	[-0.8657]	[-4.7354]	[-0.7279]	[-5.6393]
R-Squared	0.071	0.577	0.093	0.577	0.092

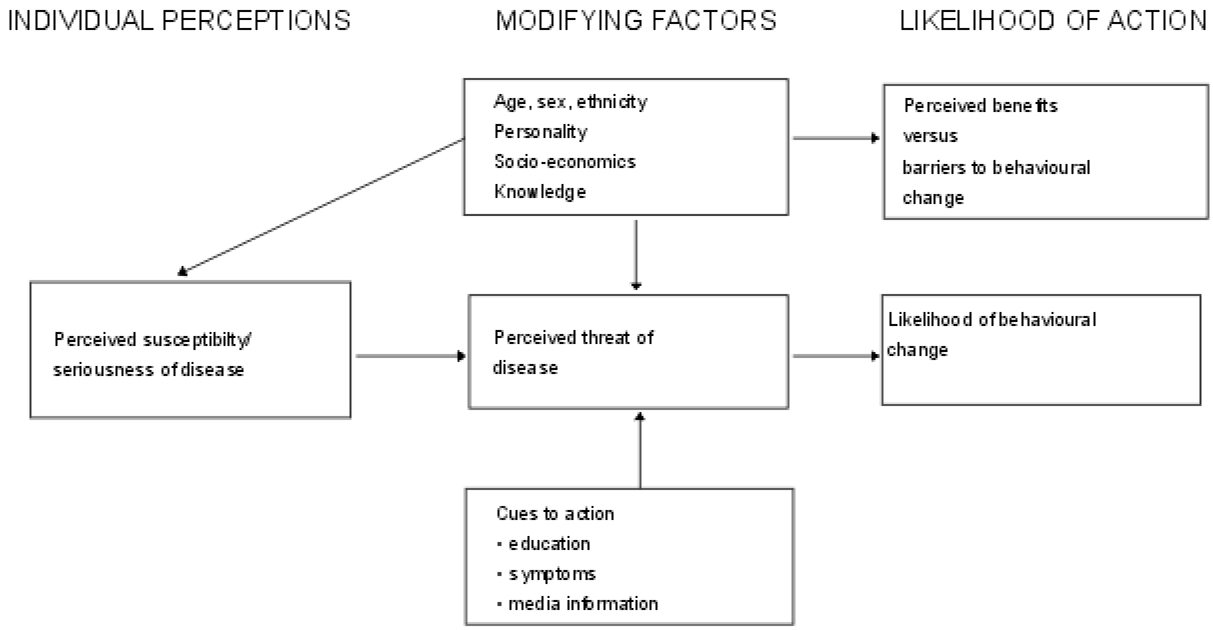

Figure 1 – Becker Health Belief Model

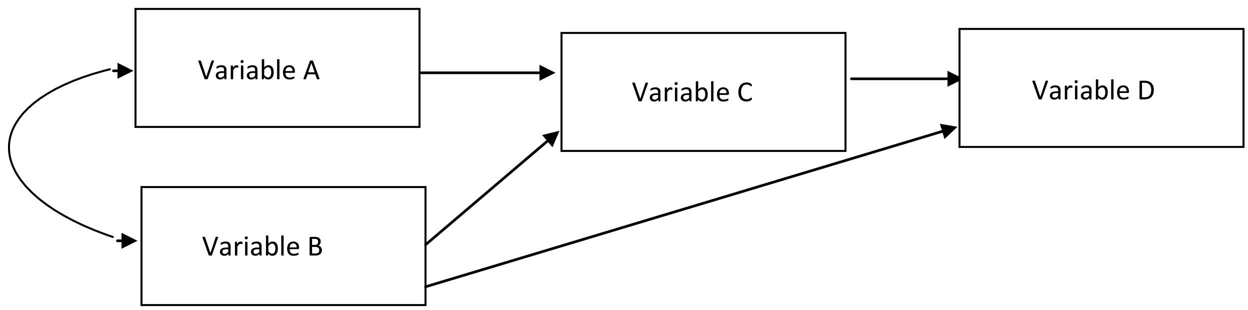

Figure 2: Wright's Path Analysis