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Obesity and the Updating of Survival Expectations

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CDE Working Paper No. 2011-07

OBESITY

AND THE UPDATING OF SURVIVAL EXPECTATIONS

INTRODUCTION

The causes and consequences of the increasing trend in obesity prevalence observed worldwide (Popkin and Doak 1998) have been a subject of interest of researchers, health agencies, and policy makers (Kersh and Morone 2002, Visscher and Seidell 2001). The general public is also increasingly concerned about the health-related effects of adult obesity, as shown by several polls (HSPH 2005, Hilbert et al. 2007). Not only is adult obesity progressively perceived as health threat, but concern about childhood obesity is also growing (Evans et al. 2006a), as its prevalence has rapidly increased (Anderson and Butcher 2006). However, the ways in which individuals perceive and evaluate the effects their excessive body weight may have on their health, and ultimately on their survival, has rarely been analyzed. In this study I investigate whether personal health shocks related to excess body weight influence individuals' risk perceptions. Further, I study whether these perceptions have changed after a decade of increasing scientific interest and media attention on the health problems related to obesity (Evans et al. 2006b; Hilbert and Ried 2009).

Previous Research on Health Risk Perceptions and the Revision of Perceptions

Research has shown that survival expectations respond to new personal health information in the expected manner. For example, Hurd and McGarry (2002) analyzing the first two Health and Retirement (HRS) waves (individuals aged 51-61 in 1992) found that subjective survival probabilities decreased from the first wave to the second one in response to only one type of new health outcome: cancer. Liu et al. (2007), using data from three surveys conducted at a hospital in Taipei, Taiwan, found that after undergoing a physical examination those individuals with more abnormal test outcomes, and those receiving more extensive advice on health behaviors from their physicians significantly lowered their previously assessed subjective probabilities of living to ages 75 and 85. A diagnosis of heart disease or other health shocks, such as hepatitis or thyroid disease, also decreased their subjective probabilities of survival.

Regarding health risks related to excess body weight, Finkelstein and his colleagues (2008) found that overweight and obese adults recognize that their weight puts them at greater risk of developing obesity-related diseases. The greatest impact was found on the reported risk of diabetes, compared to cancer, stroke, and heart disease. In the survey conducted by the authors, respondents were asked to assess their personal risk of contracting a given disease as high, moderate, low, or no risk at all. However, as Schoembaum (1997) noted, answers of this type are imprecise. They cannot be compared with epidemiological evidence, and therefore cannot be used to assess whether respondents are correctly estimating the health risks posed by a given exposure.

Schoembaum addressed the problem of whether smokers understand the mortality risks of smoking. His results suggest that smokers understand that smoking reduces their chances of reaching age 75. However, they significantly underestimated the magnitude of the effect of smoking on their survival probabilities compared with actuarial estimates. Following Schoembaum's approach but addressing the effect of higher levels of Body Mass Index[1] (BMI) on subjective survival expectations, Falba and Busch (2005) found that individuals significantly underestimate the mortality risk associated with obesity. Intriguingly enough, this false optimism was more pronounced among obese smokers.

[1] Body Mass Index is obtained by dividing body weight (in kilograms) by the square of the height (in meters).

While research focused on assessing subjective risk beliefs regarding obesity is scarce, research on the revision of subjective beliefs after experiencing an obesity-related health shock is virtually nonexistent. However, literature regarding subjective estimations related to smoking is more abundant. For example, Smith et al. (2001) found that upon experiencing smoking-related health shocks, smokers update their survival expectations more dramatically than former smokers or persons who never smoked. However, general health shocks—health shocks that are not considered to be smoking-related—do not have such strong effects on the updating of survival expectations. From these results, the authors concluded that specific information about smoking-related health events is most likely to cause smokers to negatively update their survival beliefs.

Research Objectives

This study pursues two main objectives: The first objective is to investigate the processes by which normal weight, overweight, and obese[2] individuals from two different cohorts (50-59 years in 1996 and 50-59 years in 2006) evaluate their subjective survival expectations. This objective in itself has two aspects: to study differences among body-weight subgroups within the previously mentioned cohorts and to analyze differences between the two cohorts. The second objective is to analyze the importance of both prior subjective survival assessments and the risk associated with intervening events for updating subjective survival expectations. There are two extreme procedures individuals may follow when reevaluating their future survival. These procedures depend on the importance assigned to previous survival assessments and to the risk associated with intervening events. In one procedure, the reappraisal of future survival is based only on individuals' preconceived ideas, and new experiences that may jeopardize it are ignored

[2] Underweight: BMI<18.5; Normal Weight: 18.5≤BMI<25; Overweight: 25≤BMI<30; Obese: BMI≥30 (WHO 1995).

when adjusting previous survival assessments. In the other procedure, individuals base their new survival estimations completely on intervening experiences, completely forgetting their previous assessments.

DATA, MEASURES, and METHODS

Data

The data used in this study are drawn from the 1994, 1996, 2004, and 2006 waves of the HRS study obtained from the RAND HRS Data File Version "H".[3] The HRS is a longitudinal survey that was designed to gather information on persons from pre-retirement into retirement in the US.[4] The first wave's (1992) target population includes individuals aged 51-61 (born between 1931 and 1941) living in households. Including spouses or partners regardless of their age, 12,654 respondents were interviewed. Hispanics, Blacks, and Florida residents were over-sampled. In 1998 the study incorporated the War Baby cohort which consists of individuals born between 1942 and 1947. In 2004 the Early Baby Boomer cohort was included in the study. Individuals in this cohort were born between 1948 and 1953. Individuals of all cohorts are reinterviewed every two years. There are 6,916 individuals in the age range 50-59 in 1994 and 5,024 in 2004 (14 individuals present in both 1994 and 2004 were excluded from the 2004 sample, therefore these two samples do not have individuals in common).

Measures

Subjective Survival Expectations: Self-Reported Probability of Surviving to Age 75

Since 1992 the HRS includes a number of questions that allow the direct measurement of respondents' subjective expectations, or more precisely subjective probability distributions of

[3] Available at: http://hrsonline.isr.umich.edu/modules/meta/rand/index.html

[4] For a detailed description of the HRS refer to: Juster and Suzman (1995).

future events. In 1992, the questions on subjective survival probabilities were as follows: “Using any number from 0 to 10, where 0 equals absolutely no chance and 10 equals absolutely certain, What do you think are the chances that you will live to be 75 or more?” From 1994 on, the question wording changed to: “Please answer the questions in terms of percent chance. Percent chance must be a number from 0 to 100, where "0" means there is absolutely no chance, and "100" means that it is absolutely certain.” Besides this change, the 1994 wave was the first one restricting the age for asking the survival to age 75 question to individuals under 66 years of age.

An important characteristic of self-reported probabilities of any kind is the high frequency of what Hurd and McGarry (1995) called “focal-point responses.” A focal-point response is found when the answer given to the question regarding the respondents’ beliefs on the probability of occurrence of any given future event corresponds to a probability of zero, one half, or one. Heaping around focal values as Hurd and McGarry pointed out may be due to different reasons. For example, they can be a consequence of the coarseness of the scale where very optimistic respondents decide that a subjective probability greater than 0.9 should be 1.0, while pessimistic respondents may decide that a less than 0.1 probability could be adequately reflected by 0.0. Rounding can also be very gross, having zero percent as an expression of any small chance that the given event occurs, fifty percent for any moderate chance, and one hundred percent for any relatively large chance of occurrence (Manski and Molinari 2008).

One of the problems with the fifty percent chance responses is the difficulty, or impossibility, of distinguishing if they express a real belief (Gärdenfors and Sahlin 1982) or the inability to state this belief in a probabilistic manner (Fischhoff and Bruine de Bruin 1999). A fifty percent response may also allow uncertain respondents to answer a question numerically instead of giving a “don’t know” answer (Bruine de Bruin et al. 2000). Perry (2005), agreeing with Lillard and Willis (2001), states that in some cases focal answers may reveal the respondents' high degree of uncertainty and concludes that the zero and one hundred answers to the self-perceived risk of death question are more likely to show poor understanding of the question that was asked than optimism or pessimism.

Elder (2007) rejected the assumption that focal responses do not provide any real information. Analyzing the first seven HRS waves (1992-2004), he found that survival rates were lower among those individuals who answered zero than among individuals who gave any other answer to the survival to age 75 question. He also found that survival rates for the respondents who answered that they have fifty percent chance of surviving to age 75 were lower than for those respondents who answered with any value between fifty and one hundred. Even though responses of one hundred percent chance of surviving to age 75 were associated with higher mortality rates than for any other response above fifty, he also found that the mortality rate of respondents who answered that their chance of surviving was one hundred percent was lower than the mean death rate in the sample. For Hurd and colleagues (1999) the higher mortality found among those answering with a probability higher than 0.91 to the subjective survival question indicates observation errors probably related to cognitive malfunctioning or misunderstanding. Instead, Delavande and Rohwedder (2008) conclude that even so the one hundred percent chance answers contain information because they still exhibit lower mortality than those who were fifty percent confident.

Even though different approaches have been developed to correct for possible biases introduced by focal responses (Bloom et al. 2006, Gan et al. 2005), as a general practice however, numerical responses to probabilistic questions are taken at face value (Manski and

Molinari 2008). All focal point responses are included in the present analysis without any type of correction.

Measuring Body Fat

BMI as a measure of body fat and the standard WHO BMI cut-off points to determine overweight levels are widely used, despite their limitations (Burkhauser and Cawley 2008; Hubbard 2000; López-Alvarenga et al. 2003; Snijder et al. 2006; Villareal et al. 2005). Two major advantages of using them are: first, it is relatively easy to obtain information about weight and height in studies involving a large number of individuals, especially if they are self-reported, and second, because the cut-off points are fixed, they allow for comparisons between different populations. The only anthropometric measures provided by the HRS that allow the estimation of body fat are those required for the evaluation of BMI, weight and height, and both are self-reported.

Health Shocks

Health shocks are defined as unexpected declines in health brought about by accidents or diseases (Riphahn 1998). In the present study, health shocks are conditions diagnosed for the first time or surgeries that took place between two consecutive waves of the survey. Health shocks also include a worsening of a given pre-existing condition occurring between one wave and the next—between 1994 and 1996 or 2004 and 2006 in the present case. Three different groups of health shocks are considered. The first two groups include health shocks that are more likely to occur among the obese than among those with normal body weight and that may be linked to diet-related chronic conditions. One of them includes health shocks such as diabetes or heart disease. For simplicity, we refer to these as Major Health Shocks. The other group is composed of health shocks such as hypertension that in general are well controlled by medication and therefore not perceived as life threatening, at least not to the degree of those included in the previous group. Also for the sake of simplicity, we refer to these as Minor Health Shocks. And finally the third group, which is composed of health shocks that, in general, are not linked to diet-related chronic conditions, such as cancer or lung disease. We refer to them as Not Diet-Related Health Shocks. See Table 1 for a detailed description of the different groups of health shocks.

Other Health Measures and Health-Related Behaviors Measures

In addition to the above-mentioned health shocks, two more health measures are considered. One takes into account the worsening of functional limitations. The other is a measure of mental health (depression). The only heath-related behavior measure considered is smoking status. See Table 1 for a detailed description of these measures.

Sociodemographic Measures

The analysis controls for a set of sociodemographic characteristics: age, gender, race, marital status, and educational attainment. Marital status indicates whether an individual is married (or partnered). Race differentiates between white and nonwhite individuals, and education categorizes individuals into those with less than high school education, those with high school diploma (or General Equivalent Diploma, GED), and those with at least some college education.

Death Experience

Longevity of parents has been shown to have an important influence on individuals' survival expectations; the longevity of the same-sex parent having a higher effect than that of the opposite-sex parent (Liu et al. 2007; Hurd and McGarry 1995; Ross and Mirowsky 2002). It has also been shown that a parental death affects the revision of the individual's subjective survival.

The measure considered here is whether at the time of the interview, the respondent's same-sex parent was still alive.

Methods

Updating Subjective Survival Expectations

The updating of survival expectations is addressed using the risk-updating framework proposed by Viscusi and O'Connor in 1984. Viscusi and O'Connor investigated whether workers in high-risk jobs form subjective risk assessments that generate compensating differentials for hazardous occupations and industries, and whether learning more about risks on the job led them to revise their risk perception. The authors conducted a survey of 335 employees in the chemical industry. Their sample included a broad range of lines of work with different exposures to chemicals. They found that when workers begin working in jobs for which they have imperfect job-related risk knowledge, upon acquiring risk information most update their probabilistic beliefs in a manner completely consistent with Bayesian learning. In the Bayesian learning model, individuals hold particular beliefs about the world and act according to these beliefs. Observing the outcomes of their actions, they then modify their beliefs (Breen 1999). This framework has been used in different applications in which stated beliefs and/or safety decisions involved a risk assessment process (Smith et al. 2001). For example, following this model, Smith and Desvousges (1988) analyzed how households' stated risk perceptions are updated in response to information about radon in their homes. The sample used in that study involved a panel of 2,300 homeowners in the state of New York who participated in a state-sponsored study to measure radon. Findings clearly indicated that risk perceptions were updated in response to the content and format of radon risk-related information.

Within this framework, survival expectations at time t, P_t, are hypothesized to be a weighted function of the individuals' own survival expectations stated at time $t-1$, P_{t-1}, and an unobserved risk equivalent, r_t, a product of new information the individual acquires regarding a new risk that appeared between times $t-1$ and t. In this model, P_t can be expressed by the following equation (Sloan et al. 2003, p. 103):

$$P_t = \frac{\theta}{\theta+\gamma} P_{t-1} + \frac{\gamma}{\theta+\gamma} r_t \qquad (1)$$

In equation (1), θ represents the precision, the degree of confidence, added by the respondent to his or her prior assessment, and γ represents the degree of confidence assigned by the respondent to the beliefs implied by the new information r_t.

The following is the regression equation counterpart of equation (1):

$$P_t = \alpha + \beta P_{t-1} + u \qquad (1.1)$$

where u is a random error. The estimated values of the parameters of equation (1.1) could be written as:

$$\hat{\alpha} = \frac{\hat{\gamma} r_t}{\hat{\theta}+\hat{\gamma}} \quad \text{and} \quad \hat{\beta} = \frac{\hat{\theta}}{\hat{\theta}+\hat{\gamma}}$$

Viscusi and O'Connor (1984) stated that coefficients $\hat{\alpha}$ and $\hat{\beta}$ express the essential characteristics of the learning process. If individuals only value their previous survival assessment (P_{t-1}), then $\hat{\alpha}$ is zero and $\hat{\beta}$ is one. By contrast, if individuals only value the new information then $\hat{\beta}$ is zero and $\hat{\alpha}$ positive. Using the estimated $\hat{\alpha}$ and $\hat{\beta}$, two measures can be calculated, r_t and Ψ, the risk level implied by the new health experiences and the informational content of the new experiences relative to the prior.

$$r_t = \frac{\hat{\alpha}}{1-\hat{\beta}} \quad \text{and} \quad \Psi = \frac{\widehat{\gamma}}{\widehat{\theta}} = \frac{1}{\hat{\beta}} - 1$$

Here, r_t is a function of new health-related events, worsening of preexisting conditions, and worsening of previously existing activity restrictions, all of which may or may not be associated with excess body weight but could motivate a revision of the previous survival assessment. In addition, r_t is a function of a set of socio-demographic factors (such as age, sex, and education), which may affect the way the new information is processed.[5] If, for the sake of notational simplicity, the variables that represent health shocks (associated with excess body weight or not), the worsening of preexisting conditions, the worsening of activity restrictions, and the mentioned sociodemographic factors are combined under the same vector X, then, as Smith and colleagues (2001) showed, P_t can be estimated by the following equation:

$$P_t = \left(\frac{\theta}{\theta+\gamma}\right) P_{t-1} + \left(\alpha_0 + \sum_j \alpha_j x_j\right) + u \qquad (2)$$

[5] Then, from equation (1),

$$P_t = \frac{\theta}{\theta+\gamma} P_{t-1} + \frac{\gamma}{\theta+\gamma} r_t = \frac{\theta}{\theta+\gamma} P_{t-1} + \frac{\gamma}{\theta+\gamma} f(S, WC, WA, z_1, ..., z_k)$$

where S stands for different types of health shocks, WC for worsening of pre-existing conditions, WA for worsening of activity limitations, and $z_1 \ldots z_2$ for the aforementioned sociodemographic factors.

The two above-mentioned key measures can be calculated from the estimated parameters of equation (2). These measures are the risk equivalent value of the new health information, r_t, that can be calculated by means of equation (2.1), and the relative informational value of the new information, Ψ, that can be obtained through equation (2.2) (Liu et al. 2007; Smith and Michaels 1987; Viscusi and O'Connor 1984).

$$r_t = \frac{\hat{\alpha}_0 + \sum_j \hat{\alpha}_j x_j}{1-(\hat{\theta}/(\hat{\theta}+\hat{\gamma}))} \quad (2.1) \qquad \Psi = \frac{\hat{\gamma}}{\hat{\theta}} = \left(\frac{1}{(\hat{\theta}/(\hat{\theta}+\hat{\gamma}))}\right) - 1 \quad (2.2)$$

As implied by equations (1) and (2.2), the greater the value of Ψ, that is to say the lower the value of $(\hat{\theta}/(\hat{\theta}+\hat{\gamma}))$, the greater the value the individual attributes to the information acquired between times *t*-1 and *t* (Viscusi and O'Connor 1984). Whether the new information affects the assessment of the subjective probability at time *t* depends on the difference between the risk equivalent, r_t, and the probability assessment at time *t*-1, and the extent of the informational content γ (Viscusi and O'Connor 1984).

The coefficients in equation (2) are estimated after stratifying individuals by body weight categories (as reported at time *t*, 1994 and 2004). These categories are normal weight, overweight, and obese. Underweight individuals are not included because the main interest of this study is on subjective survival expectations among individuals with excess body weight (BMI≥25).

RESULTS

Descriptive Analysis

The 1996 analytical sample is composed of 4,918 individuals, 71.11% of the original sample of individuals aged 50-59 in 1994. 24.75% of respondents were excluded from the analytical sample due to lack of information on BMI or subjective survival estimations. The 2006 analytical sample is composed of 3,738 individuals, 74.40% of the original sample of individuals aged 50-59 in 2004. As with the 1996 analytical sample, the great majority of losses from this sample, 23.61%, are due to missing information regarding BMI or subjective survival. [6] In 1996, 77.34% of the total amount of respondents in the age range and 78.30% in 2006 provided information regarding their expectations of surviving to age 75.[7] Subjective survival questions were not asked of proxies; 34.64% in 1996 and 28.08% in 2006 of the missing survival information is due to proxy interviews. Among individuals for whom BMI information could not be obtained, 86.99% and 81.68% in 1996 and 2006 respectively also failed to provide subjective survival estimates. No statistical differences were found in 1996 and in 2006 between the proportions of individuals in the analytical and excluded samples for the normal weight and obese subgroups.

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[6] Individuals with missing BMI information are more likely to be females in both samples. In the 1996 sample, the likelihood of lacking BMI information is higher among individuals in the age group 50-55, Caucasians, and those whose self-assessed health status was very good, good or fair, as compared to excellent. Among those that provided BMI information, only 1.84% in the 1996 sample and 1.40% in the 2006 sample correspond to individuals classified as underweight.

[7] Women and individuals who reported themselves other than White, as well as individuals with at least a high school diploma, are less likely to have missing subjective survival expectations in both 1996 and 2006. Individuals who reported good and fair health status are more likely to have missing subjective survival estimations compared to those that reported excellent health status in 1996; but in 2006 self-assessed health status does not show any influence on the likelihood of estimating future survival. Reporting memory problems and showing symptoms of moderate depression increased the odds of not reporting future survivals estimates (at a 0.1 level) only among individuals in the 1996 sample.

Tables 2, 3.1 and 3.2 contain a full description of both analytical samples by BMI categories. The last two tables show the percentage of each health shock that occurred between HRS waves 1994 and 1996 and 2004 and 2006, respectively. The highest proportion of males is always found among individuals in the overweight category and the smallest among individuals in the normal weight group. With only two exceptions (stroke in 1996 and heart-related surgeries in 2006) the proportion of Major Health Shocks is, in general, statistically significantly higher among obese individuals than among normal weight respondents. Hypertension and the worsening of a pre-existing hypertension are also more prevalent among obese individuals than among normal weight ones in both periods.

In general, there are not statistically significant differences between 1996 and 2006 in the percentage of health shocks occurring among individuals in each body weight category. However, the higher proportion of individuals reporting having been diagnosed with hypertension observed in all body weight subgroups in 2006 compared with 1996 probably reflects the greater awareness, treatment, and control of the condition that occurred in the US between 1999 and 2008 (Egan et al. 2010). Similarly, increased diabetes detection (Gregg et al. 2004) due to changes in the classification as well as changes in the diagnostic methods and cut-off points used to define diabetes recommended in 1997 by the American Diabetes Association (Wareham and O'Rahilly 1998) may be one reason for the larger proportion of newly diagnosed diabetics among individuals in the normal weight and overweight subgroups observed in the second time period compared to 1996. The higher percentage of joint replacements due to arthritis found in 2006 among obese individuals, compared to 1996, is in accordance with the increasing trend in these surgeries observed since the 1990's in the US as well as in other developed countries (Dixon et al. 2004; Memtsoudis et al. 2009). Some researchers suggest that one factor that may be contributing to this trend is the increasing number of obese patients observed during the last decades (Kurtz et al. 2005; Mehrotra et al. 2005).

Updating Survival Expectations

Tables 4.1 and 5.1 show the results of the OLS[8] regressions used to explore the influence of different health shocks occurring between two consecutive waves on the subjective probability of surviving to age 75 for each body weight subgroup among individuals in the 1996 and 2006 samples, respectively. In addition, the models include an index of the number of functional limitations reported as having worsened between two successive waves and a depression indicator. The models also include a set of sociodemographic variables, a variable that controls for smoking status, and an indicator of the survival status of the same-sex parent.

The tables show that the coefficients of the variables associated with subjective survival assessments in the previous wave (1994 and 2004 respectively) are positive and statistically significant in all subsamples, showing the strong influence of previous beliefs on the new survival assessment (1996 and 2006 respectively). The coefficients associated with health shocks, in general, are negative and statistically significant. In other words, in general, respondents decrease their subjective longevity expectations in response to health shocks experienced between consecutive waves. However, in neither subsample was the coefficient associated with Minor Health Shocks statistically significant.[9] In contrast, the coefficient associated with Major Health Shocks is statistically significant in both subsamples for all body weight categories.

For the 1996 sample, the coefficient associated with health shocks that are not diet-related is statistically significant only among normal weight individuals. In addition, this

[8] Results do not change when the analysis is done using a two-limit tobit regression due to the limited nature of the dependent variable.
[9] Results do not change when considering arthritis as separate health shock.

coefficient is significantly higher, in absolute value, than the one associated with the Major health shocks. Among overweight and obese individuals in the 1996 sample, the hypothesis of equality between the coefficient associated with Major Health Shocks and the coefficient associated with health shocks that are not diet-related could not be rejected. A comparison of health shock coefficients across subsamples did not result in any significant difference in the 1996 sample, except between the normal weight and obese subsamples for the coefficient associated with health shocks that are not diet-related. However, this coefficient in the obese subsample is not statistically significant (and is positive).

For the 2006 sample, the coefficient associated with health shocks that are not diet-related is statistically significant among individuals in all body weight categories. In addition, among normal weight and overweight individuals this coefficient is significantly higher in absolute value than the coefficient associated with Major Health Shocks (in the case of the overweight subsample at a 0.1 level). Among individuals in the obese subgroup, the hypothesis of equality between the coefficient associated with Major Health Shocks and the one associated with health shocks that are not diet-related could not be rejected. The hypothesis of equality of coefficients across body weight subsamples was rejected (at a 0.1 level) in only one case—for the coefficient associated with Major Health Shocks when comparing the obese and overweight categories. For the coefficient associated with health shocks that are not diet-related the hypothesis of equality of coefficients across body weight subgroups could not be rejected. The coefficients associated with the rest of the variables in the model were, in general, as expected: currently smoking, reporting depression symptoms, and experiencing more functional limitations significantly decrease survival expectations and having the same-sex parent alive increase them.

In summary, for both periods previous beliefs have a strong influence on new survival assessments. In addition, both Major Health Shocks usually linked to diet-related chronic conditions and health shocks usually not linked to diet-related chronic conditions decrease survival expectations among all body weight subgroups. However, also for both periods, when estimating their future survival, individuals in the obese subgroup do not seem to assign greater importance to health shocks that are in general more prevalent among them than to the other health shocks.

Risk Assigned to Intervening Events and the Updating of Survival Expectations

As previously stated, the second research objective is to analyze the role that prior subjective survival assessments and the risk associated with intervening events play in updating survival expectations. According to the risk updating framework described in the Methods section, survival expectations at time t, P_t, are a weighted function of individuals' previous survival expectations, P_{t-1}, and an unobserved risk equivalent, r_t, assigned to intervening events.

The lower part of Table 4.1 shows, for each body weight subgroup, the mean of prior self-reported probabilities of surviving to age 75 (P_{t-1}, stated in 1994), the mean of predicted posterior self-reported probabilities of surviving to age 75 (P_t, stated in 1996), the risk equivalent assigned to the intervening events (r_t) for the periods 1994-1996, and the informational content of the new experiences relative to prior experiences (Ψ). The lower part of Table 5.1 shows the same information for the 2004-2006 period.

As was already mentioned, the effect of new information on a subsequent assessment of the subjective survival probability depends on the difference between the risk equivalent r_t and the previous probability assessment, and on the extent of the beliefs implied by r_t. For the 1996 sample, the risk equivalent r_t is slightly higher than the prior assessment of the probability of surviving to age 75 among normal weight and overweight individuals; among obese respondents, this difference is not statistically significant.[10]

At the same time, Ψ (calculated at the sample mean) is near one for all body weight categories, indicating that individuals did not view the new information as more instructive than the information they previously had. As mentioned earlier, the greater the value of Ψ, the greater the value attributed to the information acquired between consecutive waves (γ). The hypothesis of equality of means between the predicted survival probabilities (posterior probabilities) and the prior survival probabilities of surviving to age 75 was rejected at a 0.1 level only among individuals in the overweight subgroup.

This last result, together with Ψ near one and r_t higher than the prior assessment, indicates that among overweight individuals, contrary to what was expected, the risk assigned to the intervening events decreases mortality expectations by a significant amount. The hypothesis of equality between the predicted survival probabilities (posterior probabilities) and the prior survival probabilities of surviving to age 75 could not be rejected among individuals in the normal weight and obese subgroups. Results also show that the new information did not eliminate the role of prior survival probabilities, which remained highly significant in all cases (coefficient associated with the probability of surviving to age 75, Table 4.1).

Taken together, these results suggest that new adverse information did not affect current survival expectations more than previous survival beliefs did, and if anything it increased

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[10] In 1996, the risk equivalent r_t (r_{1996}) is 3.44% higher than P_{t-1} (P_{1994}) among individuals in the normal weight category, 3.88% higher among individuals in the overweight category, and 1.32% higher among those in the obese subsample. The difference between r_t and P_{t-1} is not statistically significant among individuals in the obese category.

survival expectations among individuals in the overweight subgroup. However, the mean of prior survival assessments decreases as body weight status increases. The three means are statistically significantly different. The risk equivalent r_t obtained for 1996 also decreases as body weight status increases. This last result may suggest that individuals at higher levels of body weight status assign a greater mortality risk to new adverse health information than individuals with normal body weight. Therefore, it is interesting to investigate whether this more negative expectation among individuals in the obese subgroup is based on actual health experiences or is a characteristic of the subgroup that is independent of these adverse experiences.

In order to separate the weights assigned to new information from health-related experiences underwent by each body weight subgroup, I followed the approach taken by Smith and colleagues (2001): first, the coefficients of the updating model obtained for each body weight subgroup (upper portion of Table 4.1) were applied to the observed experience of the two other body weight subgroups. Second, these results were used to estimate a new risk equivalent r_t for each of the two other subgroups. The risk equivalents obtained by this procedure are the ones that would be implied by individuals in each subgroup should they have had the characteristics and health experiences of any of the other body weight subgroups. The information in Table 4.2[11] was obtained following this approach for the 1996 subsample. The first row of Table 4.2 shows the risk equivalents calculated using the coefficients of the OLS regression obtained for the normal weight subgroup that were applied to the information of the three body weight categories. Note that for the normal weight subgroup the risk equivalent obtained by this method is the same shown in Table 4.1 (lower portion) for this subgroup. The second row of Table 4.2 was constructed using the coefficients of the OLS regression obtained

[11] Standard errors obtained using the bootstrapping technique with 500 replications.

for the overweight subgroup and applying them to the normal weight and obese subsamples. The same procedure using the equation estimates obtained for the obese subsample was used for constructing the third row of the table. Therefore, the first column of Table 4.2 shows the risk equivalents obtained after applying the coefficients of the updating model of each of the three subgroups to the health experience (and other characteristics) of the individuals in the normal weight category. The same procedure was used for the second and third columns for the health experiences of individuals in the overweight and obese body weight categories respectively.

The results suggest that had obese individuals undergone the health experiences of normal weight individuals, on average, they still would have perceived their new health information as expressing a statistically significantly[12] lower risk of surviving to age 75 (r_t = 0.642) than normal weight individuals would have (r_t = 0.691). Similarly, had obese individuals undergone the expediencies of overweight ones, their perceived risk of surviving (r_t = 0.641) would still have been, on average, statistically significantly lower than the perceived by overweight individuals (r_t = 0.669). Comparing overweight and normal weight individuals does not yield such clear results. In summary, results suggest that the more negative survival expectations found among individuals in the obese subgroup seem to be independent of their adverse health experiences.

The same analysis was done for the 2004-2006 period. In the first place, the lower part of Table 5.1 shows that Ψ (the informational content of the new experiences relative to prior subjective survival estimates) are near one for all body weight subgroups, meaning that individuals did not view the new information as more instructive than the information they

[12] The statistical tests were done calculating z-scores from the standard errors obtained by the bootstrapping technique.

previously had. Among individuals in the normal weight subgroup there is almost no difference between the risk equivalent (r_t) and the previous probability assessment. In addition, as among individuals in the 1996 normal weight subgroup, the mean of prior subjective survival probabilities is not significantly different from the mean of posterior survival probabilities. Among individuals in the overweight subgroup, the risk level assigned to new information is 95% of the prior subjective probabilities and the mean of the posterior is significantly lower (at a 0.1 level) than the mean of the priors. The lack of impact of the new information among individuals in the normal weight subgroup and the small impact among individuals in the overweight subgroup are, as mentioned earlier, caused by two factors: the relative precision of the informational content of the health shocks that is roughly the same as the precision assigned by respondents to prior beliefs, or lower, and by the close similarity between the risk equivalent and the previous subjective survival probability assessment, especially among individuals in the normal weight subgroup.

In the case of the obese subgroup, even though the new health information is no more instructive than the information respondents already had, the risk level of the new information played a different role than for the other two body weight subgroups. The risk level assigned to the intervening events is 88% of the previous survival assessment, leading to a mean of predicted posteriors significantly lower than the mean of prior survival probabilities (at a 0.001 level). This result suggests that although individuals in the obese subgroup do not value the new information more than they did the information they previously had, nevertheless from their experiences they are implying a greater mortality risk.

As for the 1996 subsample the survival risk equivalent obtained for each body weight category decreases as body weight status increases. To investigate whether this result is based on the health experience of individuals, particularly those in the obese subgroup, or is a characteristic of the subgroups we apply to the 2006 subsample the same method used with the 1996 subsample. Table 5.2 shows the results of this procedure. As for the 1996 subsample, Table 5.2 shows that had obese individuals had the same health experiences of normal weight or overweight individuals, they would have interpreted the information as implying a statistically significantly greater mortality risk than normal weight and overweight individuals would have. In addition, similar to the results obtained for the 1996 subsample, there were not significant differences between the risk equivalents obtained for the normal weight and overweight subgroups had individuals in each of these groups experienced the health shocks experienced by individuals in the other group.

Tables 4.1 and 5.1 also show that the survival risk equivalents obtained for all three body weight subgroups for 1996 are statistically significantly higher than those obtained for 2006 for the same body weight subgroups. Here again we would like to know whether this higher pessimism among individuals in the younger cohort is a feature of the cohort or whether it is related to their characteristics and experiences, particularly the health experiences. Proceeding as before, I applied the coefficients of the 2006 updating model (upper part of Table 5.1) to the data of each 1996 body weight subgroup. Table 6 shows the results obtained by this procedure. For all three body weight subgroups, had individuals in the 2006 subsample had the characteristics and health experiences of individuals in the 1996 subsample, they would have assigned a statistically significant smaller risk equivalent than that assigned by individuals in the 1996.[13] That is to say that under the same circumstances, individuals in the younger cohort would have had a more negative perception than individuals in the older cohort.

[13] The risk equivalents in Table 6 are not statistically different from the risk equivalents in Table 5.1 for normal weight, overweight, and obese individuals, respectively.

DISCUSSION

The first objective of this study was to analyze, by body weight groups, the processes by which normal weight, overweight, and obese individuals from two different cohorts (1996 and 2006) reevaluate their subjective survival expectations in light of health shocks. For all body weight subgroups in both periods, results show that previous beliefs have a strong influence on survival assessments. They also show that from the health shocks that include conditions which are usually diet-related, only the group we called Major Health Shocks decreases survival expectations, while the one we called Minor Health Shocks does not seem to have any influence on survival expectations. Regarding the health shocks that may be considered not-diet related, while in 1996 only among individuals in the normal weight subgroup were they negatively related to survival expectations, in 2006 this type of health shock decreased survival expectations among individuals in all body weight subgroups. However, for both periods results show that when estimating future survival, individuals in the obese subgroup do not seem to assign greater importance to major health shocks that usually are diet-related than to health shocks that are not diet-related. In contrast, for both periods, individuals in the normal weight category decrease their survival expectations more in the presence of health shocks that are not diet-related than in the presence the other type of health shocks.

The second objective was to analyze the role played by previous subjective survival assessments and the risk equivalent assigned to intervening events in the updating of survival expectations. Results show that for all body weight subgroups in both periods individuals do not attribute greater informational content to new health information acquired between waves than to their previous survival assessments. However, among obese individuals in both periods the mortality risk assigned to intervening events is higher than the mortality risk assigned to intervening events among individuals in the other two body weight groups, independent of the actual health experiences that obese individuals undergo, more so among obese individuals in the 2006 subsample.

One factor that may explain this last result is the significantly higher proportion of individuals classified as obese Class II (BMI≥35) in 2006 (14.37%) compared with the proportion in 1996 (8.05%).[14] Individuals at this high obesity level may have a more negative view of their future survival than individuals at lower obesity levels. The evidence of negative attitudes on clinical judgment, diagnosis, and care for obese individuals (Kaminsky and Gadaleta 2002; Puhl and Brownell 2001; Schwartz et al. 2003) may contribute to a lower sense of personal control over health treatments and outcomes. Sense of control has been found to have a positive and significant correlation with subjective life expectancy (Mirowsky 1997). Another factor that may explain the difference between the survival risk assessment among obese individuals in 1996 and obese individuals in 2006 is the higher levels of media exposure of obesity-related issues experienced by 2006 respondents compared to 1996 individuals. For example, in the brief period between spring and fall 2004, Evans and his colleagues (2006b) found a significant drop (8%) in the percentage of individuals answering "never" to the question: "In the past 30 days, how often have you seen or read any news stories about obesity-related issues?"[15]

One of the limitations of this study is related to the high amount of missing data, mainly due to lack of information on subjective survival expectations. However, analysis using multiple

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[14] This increase is consistent with the increases found for the US between 2000 and 2005 with data from the Behavioral Risk Factor Surveillance System (Sturm 2007).

[15] The other possible answers to this question were Every Day; 2 or 3 Times a Week; Once a Week; and Less than Once a Week. Evans and colleagues conducted a survey designed to study opinions and attitudes about childhood overweight and obesity (Evans et al. 2006b).

imputations for missing data, in general, yields the same results.[16] As previously mentioned, the presence of focal answers may constitute a source of bias. As expected, there are high percentages of focal point answers, particularly for the fifty percent chance of survival.[17] Some studies have shown that nonfocal answers may, in fact, be used at face value or with very little adjustment (Bassett and Lumsdaine 2001; Hurd et al. 1998). We compared the results obtained using focal answers, acknowledging their informational content, against results obtained excluding extreme answers of zero and one hundred percent certainty as well as with results obtained completely excluding all focal answers to the question on subjective survival to age 75. In any case results do not change substantially from the results presented here.

As mentioned earlier, Smith et al. (2001) found that upon experiencing smoking-related health shocks, smokers update their survival expectations in a more drastic manner than former smokers or persons who never smoked. However, health shocks not considered smoking-related do not have such a strong effect on the updating of survival expectations. In addition, the authors found that smokers assign a greater risk equivalent to smoking-related health shocks than former smokers or never smokers. Based on these results, the authors inferred that particular information about smoking-related health events have a greater likelihood of causing smokers to update their survival beliefs compared to any other type of health events. The current results differ from those obtained by Smith and colleagues in an important manner. Even though obese individuals decrease their survival expectations more dramatically than individuals in the other two

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[16] The multiple imputations were done by means of the STATA 11 ICE (imputation by chained equations) module performing a set of five imputations for each cohort.

[17] In 1994-1996 waves and 2004-2006 waves percentages range from 3.56% to 8.41%, from 20.17% to 30.03%, and from 14.58% to 21.79% for focal point answers 0%, 50%, and 100%, respectively. More than 32% of those answering with a focal point response estimated in both 1994 and 1996 they have 0% chance of surviving to age 75, while more than 44% answered in both cases they have a 50% chance of surviving, and more than 41% reported 100% chance in both waves. In the case of the 2004-2006 waves, percentages are 28%, 42%, and 50%, respectively (Figure 1 shows detailed distribution of focal point answers by body weight category).

subgroups do, when evaluating their survival expectations obese individuals do not seem to react differently to health shocks that usually are not linked to diet-related chronic conditions than to health shocks that usually are linked to these type of conditions and that show a greater prevalence among them than among individuals in other body weight subgroups. Differential responses to smoking-related health shocks between current smokers and the other two groups suggested to Sloan and colleagues that "personalized messages, relevant to their circumstances, are necessary to get their attention and induce changes in their beliefs" (Sloan et al. 2003, p. 124). This policy implication highlights a major difference between the results from the present study and those from both Smith and colleagues and Sloan and colleagues regarding smoking behavior.

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Table 1 Description of Health and Health-Related Behaviors Variables

Major Health Shocks usually Linked to Diet-Related Chronic Conditions	Range: 0-8. Counts the number of major diet-related health events. These health shocks are: Heart Disease (Includes heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems); Heart-related Hospitalization (Hospitalization due to congestive heart failure occurred between waves with or without previous history of a heart condition); Heart-related Surgery (Heart surgery occurred between waves with or without previous history of a heart condition); Stroke (Stroke or transient ischemic attack with no previous history of any of them); Diabetes (Diabetes or high blood sugar with no previous history); Kidney Disease due to Diabetes (Kidney disease with no previous history); Worsening of a pre-existing Diabetes; Surgery or any Joint Replacement due to Arthritis.
Minor Health Shocks usually Linked to Diet-Related Chronic Conditions	Range: 0-3. Counts the number of minor diet-related health events. The health shocks included in this index are: High Blood Pressure (High blood pressure, or hypertension with no previous history); Worsening of a pre-existing High Blood Pressure; Arthritis (Arthritis or rheumatism with no previous history).
Health Shocks usually not Linked to Diet-Related Chronic Conditions	Range: 0-3. Counts the number of these types of health events. The health shocks included in this index are: Cancer (Cancer or a malignant tumor of any kind except skin cancer with no previous history of the condition); Worsening of a pre-existing Cancer; Lung Disease (Chronic lung disease except asthma such as chronic bronchitis or emphysema).
Worsening in Functional Limitations	Worsening in Functional Limitations=1 if respondent reports that he or she experiences an increased difficulty (compared with a previous assessment) in any of the following activities: walking across a room, getting in and out of bed, dressing, bathing, and eating, walking one block, or climbing a flight of stairs; and 0 otherwise.
Depression	Range: 0-2. Depression is measured using the eight-item short form of the Center for Epidemiologic Studies Depression Scale (CES-D). Depression=0 if CES-D=0, no depression symptoms (reference category). Depression=1 if the CES-D scale is between 1 and 4 (mild depression). Depression=2 if the CES-D scale is between 5 and 8 (more severe depression).
Current Smoker	Current Smoker=1 if the respondent reports to be currently smoking cigarettes, and 0 otherwise

Table 2 **Sample Composition in 1996 and 2006 by Body Weight Status in 1994 and 2004 – Respondents Aged 50 to 59 in 1994 and 2004**

	Normal	Over-weight	Obese	Normal vs. Over-weight [a]	Normal vs. Obese [a]	Over-weight vs. Obese [a]
1996						
N	1579 (32.11%)	2007 (40.82%)	1332 (27.07%)	--------	--------	--------
Age (Mean, SD)	55.16 (2.57)	55.33 (2.47)	55.11 (2.49)	†	§	*
Males (%)	30.25	48.93	40.00	***	***	***
Whites (%)	88.14	82.64	76.17	***	***	***
Education (%)						
Less than HS	15.98	20.00	24.74	***	***	**
HS / GED	39.38	39.50	38.57	*	§	§
At Least Some College	44.64	40.50	36.69	§	***	*
Married (%)	76.54	79.30	74.96	*	§	**
No Mobility Difficulties (%)	89.73	88.48	76.77	§	***	***
Depression (CES-D = 0) (%)	55.49	54.86	47.67	§	***	***
Mild (CES-D: 1-4)	37.22	37.41	40.68	§	†	†
Severe (CES-D: 5-8)	7.29	7.73	11.65	§	***	***
Current Smoker (%)	31.20	20.90	17.59	***	***	*
Same Sex Parent Alive (%)	32.78	27.18	27.14	***	***	§
2006						
N	944 (25.25%)	1402 (37.51%)	1392 (37.24%)	--------	--------	--------
Age (Mean, SD)	54.22 (2.73)	54.41 (2.67)	54.52 (2.68)	†	*	§
Males (%)	30.01	49.25	37.63	***	***	***
Whites (%)	81.87	80.06	72.66	§	***	***
Education (%)						
Less than HS	8.70	9.86	12.52	§	**	*
HS / GED	27.78	29.44	35.18	§	***	**
At Least Some College	63.52	60.68	52.30	§	***	***
Married (%)	71.90	76.13	70.58	*		***
No Mobility Difficulties (%)	91.41	90.28	78.85	§	***	***
Depression (CES-D=0) (%)	50.48	47.96	40.22	§	***	***
Mild (CES-D: 1-4)	37.75	41.82	44.32	*	**	§
Severe (CES-D: 5-8)	11.77	10.22	15.47	§	*	***
Current Smoker (%)	25.77	21.52	14.10	*	***	***
Same Sex Parent Alive (%)	39.77	34.60	31.65	*	***	†

[a] Student's *t* test for equality of means and *z* statistic for equality of proportions
†: p-value<0.1; *: p-value<0.05; **: p-value<0.01; ***: p-value<0.001; §: p-value≥0.1

Table 3.1 Percentage Health Shocks Occurred between HRS Waves 1994 and 1996 by Body Weight Status in 1994

	Normal Weight	Over-weight	Obese	Normal vs. Over-weight [a]	Normal vs. Obese [a]	Over-weight vs. Obese [a]
N	1579	2007	1332	--------	--------	--------
Major Health Shocks (%)						
Heart Disease	1.39	1.99	2.56	§	*	§
Heart-related Hospitalization	0.38	0.65	1.35	§	**	*
Heart Surgery	0.57	1.74	1.95	**	***	§
Stroke	2.98	2.69	3.08	§	§	§
Diabetes	0.44	1.25	3.76	*	***	***
Kidney Disease due to Diabetes	0.64	1.01	2.83	§	***	***
Worsening of pre-existing Diabetes	0.51	0.85	2.04	§	***	**
Surgery or any Joint Replacement due to Arthritis	0.89	1.65	2.71	*	***	*
Minor Health Shocks (%)						
Hypertension	2.09	3.29	3.53	*	*	§
Worsening of pre-existing Hypertension	0.95	1.55	3.09	§	***	**
Arthritis	5.07	4.79	5.94	§	§	§
Health Shocks usually not Diet-Related (%)						
Cancer	1.01	1.20	0.98	§	§	§
Worsening of pre-existing Cancer	0.51	0.15	0.08	†	*	§
Lung Disease	0.70	0.70	0.68	§	§	§
Functional Limitations (%)						
Worsening of pre-existing Functional Limitations	10.27	11.52	23.23	§	***	***

[a] Student's *t* test for equality of means and *z* statistic for equality of proportions
†: p-value<0.1; *: p-value<0.05; **: p-value<0.01; ***: p-value<0.001; §: p-value≥0.1

Table 3.2 Percentage Health Shocks Occurred between HRS Waves 2004 and 2006 by Body Weight Status in 2004

	Normal Weight	Over-weight	Obese	Normal vs. Over-weight [a]	Normal vs. Obese [a]	Over-weight vs. Obese [a]
N	944	1402	1392	--------	--------	--------
Major Health Shocks (%)						
Heart Disease	1.70	2.50	3.45	§	*	§
Heart-related Hospitalization	0.53	0.64	1.37	§	*	†
Heart-related Surgery	0.53	1.28	1.08	†	§	§
Stroke	2.76	3.64	5.10	§	**	†
Diabetes	1.27	2.71	4.82	*	***	**
Kidney Disease due to Diabetes	0.53	1.37	3.71	†	***	***
Worsening of pre-existing Diabetes	0.42	0.86	4.25	§	***	***
Surgery or any Joint Replacement due to Arthritis	0.74	1.93	4.60	*	***	***
Minor Health Shocks (%)						
Hypertension	3.82	5.58	6.98	†	**	§
Worsening of pre-existing Hypertension	1.38	1.15	3.32	§	**	***
Arthritis	4.78	6.07	6.26	§	§	§
Health Shocks usually not Diet-Related (%)						
Cancer	1.06	1.36	1.94	§	†	§
Worsening of pre-existing Cancer	0.64	0.29	0.36	§	§	§
Lung Disease	1.38	1.29	1.65	§	§	§
Functional Limitations (%)						
Worsening of pre-existing Functional Limitations	8.59	9.71	21.14	§	***	***

[a] Student's *t* test for equality of means and *z* statistic for equality of proportions
†: p-value<0.1; *: p-value<0.05; **: p-value<0.01; ***: p-value<0.001; §: p-value≥0.1

Table 4.1 Risk Updating – OLS Dependent Variable Subjective Probability to Live to Age 75 in 1996 by Body Weight Status

Variable	Normal Weight		Overweight		Obese	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
P75 in 1994	0.49***	0.03	0.50***	0.02	0.49***	0.03
Age	-0.44†	0.23	0.20	0.23	0.06	0.31
Male (1=Male; 0=Female)	0.18	1.31	-2.78*	1.20	-2.26	1.58
Non-White (1=African American or other; 0=White)	0.63	2.29	-0.96	1.70	0.45	1.99
Not-Married (1=Not Married or Cohabiting; 0:Married or Cohabiting)	-0.41	1.53	-0.30	1.49	-2.43	1.86
Education (vs. Less than HS)						
HS (1=Yes; 0=No)	2.95	2.15	3.97*	1.76	1.28	2.18
Some College &Above (1=Yes; 0=No)	4.01†	2.11	6.15***	1.75	4.11†	2.19
Current Smoker (1=Yes; 0=No)	-3.01*	1.34	-4.31**	1.51	-8.07***	2.16
Depression (vs. No Symptoms)						
Mild (1=Yes; 0=No)	-3.93**	1.25	-2.37†	1.22	-2.82†	1.58
Severe (1=Yes; 0=No)	-14.94***	3.04	-8.43**	2.75	-9.39**	2.94
Worsening of Functional Limitations (1=Yes; 0=No)	-8.32**	2.61	-5.59*	2.16	-5.55**	1.98
Same-Sex Parent Alive (1=Yes; 0=No)	2.13†	1.27	3.02*	1.23	2.28	1.72
<u>Health Shocks</u>						
Major	-4.00†	2.18	-4.47*	1.80	-4.08*	1.72
Minor	-0.94	2.24	-1.52	2.00	0.79	2.21
Not Diet-Related	-17.71***	4.80	-6.90	4.66	4.97	6.86
_cons	61.18***	13.12	23.18†	12.93	32.33†	17.03
N	1579		2007		1332	
R-Squared	0.3573		0.3106		0.3069	
Ψ (SE) [a] [95% CI]	1.049 (0.110) [0.839; 1.275]		1.019 (0.097) [0.842; 1.226]		1.023 (0.113) [0.805; 1.265]	
r (SE) [a] [95% CI]	0.691 (0.004) [0.684; 0.698]		0.669 (0.003) [0.663; 0.674]		0.616 (0.004) [0.609; 0.624]	
P75 **1994** Mean (SE) [95% CI]	0.668 (0.007) [0.654; 0.681]		0.644 (0.006) [0.632; 0.656]		0.608 (0.008) [0.592; 0.624]	
Predicted P75 **1996** (SE) [95% CI]	0.679 (0.004) [0.671; 0.688]		0.657 (0.004) [0.649; 0.664]		0.612 (0.005) [0.603; 0.622]	

†: p-value<0.1; *: p-value<0.05; **: p-value<0.01; ***: p-value<0.001

[a] The standard errors obtained using the bootstrapping technique with 500 replications.

Note: Weight status reported in 1996

Table 4.2 HRS 1996 - Average Risk Equivalent by Body Weight Subgroup according to Characteristics of Each Subgroup and Characteristics of the Other Subgroups

	Normal Weight		Overweight		Obese	
	r	SE [a] [95% CI]	r	SE [a] [95% CI]	r	SE [a] [95% CI]
Normal Weight	0.691	0.004 [0.684; 0.698]	0.685	0.003 [0.679; 0.692]	0.647	0.005 [0.637; 0.656]
Overweight	0.685	0.003 [0.679; 0.691]	0.669	0.003 [0.663; 0.674]	0.641	0.004 [0.633; 0.648]
Obese	0.642	0.003 [0.634; 0.648]	0.641	0.003 [0.636; 0.646]	0.616	0.004 [0.609; 0.624]

[a] The standard errors obtained using the bootstrapping technique with 500 replications.
Note: Weight status reported in 1996

Table 5.1 Risk Updating – OLS Dependent Variable Subjective Probability to Live to Age 75 in 2006 by Body Weight Status

Variable	Normal Weight		Overweight		Obese	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
P75 in 1994	0.52^{***}	0.04	0.50^{***}	0.03	0.52^{***}	0.03
Age	-0.31	0.27	0.56^{**}	0.23	0.25	0.24
Male (1=Male; 0=Female)	-6.11^{***}	1.70	0.04	1.31	-4.52^{**}	1.44
Non-White (1=African American or other; 0=White)	1.15	2.28	1.28	1.76	-0.71	1.64
Not-Married (1=Not Married or Cohabiting; 0:Married or Cohabiting)	-1.24	1.67	-0.61	1.60	-1.47	1.59
Education (vs. Less than HS)						
HS (1=Yes; 0=No)	-1.00	3.93	2.04	2.71	6.63^{**}	2.46
Some College &Above (1=Yes; 0=No)	2.66	3.82	$4.51^{\dagger}$	2.59	5.79^{*}	2.45
Current Smoker (1=Yes; 0=No)	$-3.28^{\dagger}$	1.90	$-2.71^{\dagger}$	1.62	$-3.91^{\dagger}$	2.15
Depression (vs. No Symptoms)						
Mild (1=Yes; 0=No)	-3.34^{*}	1.51	$-2.36^{\dagger}$	1.30	$-2.79^{\dagger}$	1.45
Severe (1=Yes; 0=No)	-10.95^{***}	2.97	$-5.37^{\dagger}$	2.81	-5.55^{*}	2.37
Worsening of Functional Limitations (1=Yes; 0=No)	-7.09^{*}	3.49	-2.22	2.73	-5.18^{**}	1.90
Same-Sex Parent Alive (1=Yes; 0=No)	1.94	1.55	2.89^{*}	1.31	4.22^{**}	1.45
Health Shocks						
Major	$-4.67^{\dagger}$	2.82	-4.51^{**}	1.71	-5.38^{***}	1.23
Minor	-2.73	2.38	2.54	1.77	-1.37	1.83
Not Diet-Related	-9.18^{*}	4.64	-12.51^{**}	4.16	-8.07^{**}	3.82
_cons	52.87^{*}	15.96	-0.55	13.10	14.62	13.60
N	944		1402		1392	
R-Squared	0.4229		0.3257		0.3711	
ψ (SE) [a] [95% CI]	0.909 (0.137) [0.686; 1.248]		1.013 (0.112) [0.816; 1.249]		0.931 (0.097) [0.758; 1.156]	
r (SE) [a] [95% CI]	0.664 (0.005) [0.655; 0.674]		0.627 (0.003) [0.621; 0.632]		0.556 (0.004) [0.547; 0.563]	
P75 **2004** Mean (SE) [95% CI]	0.661 (0.009) [0.643; 0.679]		0.659 (0.007) [0.645; 0.674]		0.629 (0.008) [0. 613; 0.644]	
Predicted P75 **2006** (SE) [95% CI]	0.663 (0.006) [0.650; 0.675]		0.643 (0.004) [0.635; 0.651]		0.593 (0.005) [0.584; 0.603]	

†: p-value<0.1; *: p-value<0.05; **: p-value<0.01; ***: p-value<0.001

[a] The standard errors obtained using the bootstrapping technique with 500 replications.

Note: Weight status reported in 1996

Table 5.2 HRS 2006 - Average Risk Equivalent by Body Weight Subgroup according to Characteristics of Each Subgroup and Characteristics of the Other Subgroups

	Normal Weight		Overweight		Obese	
	r	SE [a] [95% CI]	r	SE [a] [95% CI]	r	SE [a] [95% CI]
Normal Weight	0.664	0.005 [0.655; 0.674]	0.631	0.004 [0.623; 0.639]	0.597	0.005 [0.589; 0.607]
Overweight	0.630	0.003 [0.623; 0.636]	0.627	0.003 [0.621; 0.632]	0.603	0.003 [0.597; 0.610]
Obese	0.609	0.004 [0.601; 0.617]	0.582	0.004 [0.575; 0.589]	0.556	0.004 [0.547 0.563]

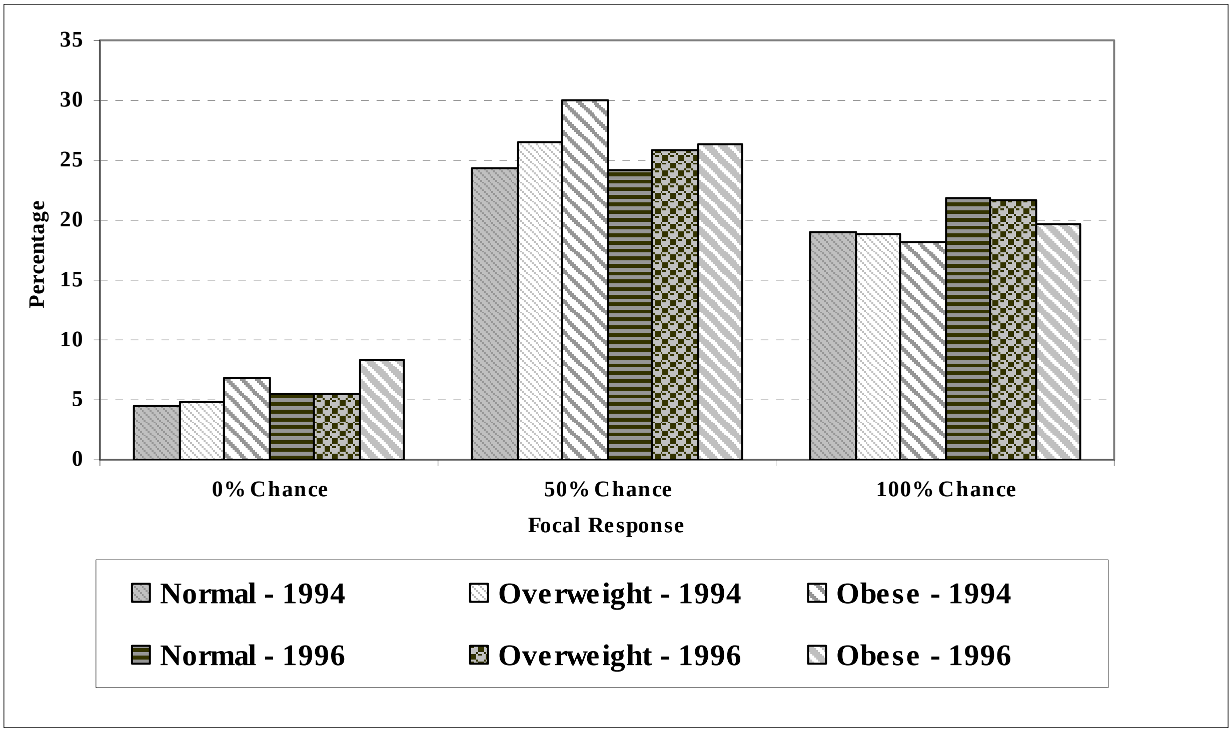
[a] The standard errors obtained using the bootstrapping technique with 500 replications.
Note: Weight status reported in 2006

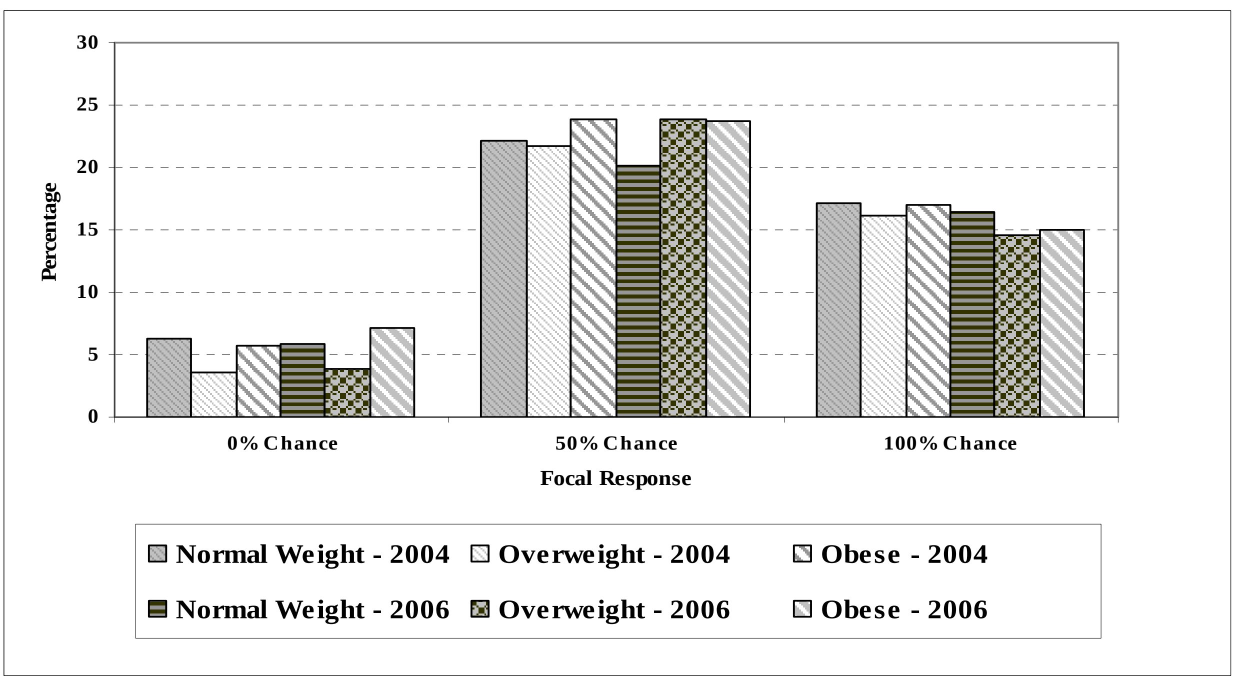
Table 6 HRS 2006 - Average Risk Equivalent by Body Weight Subgroup according to Characteristics of Each Subgroup in 1996

	Normal Weight		**Overweight**		**Obese**	
	r	SE	r	SE	r	SE
Normal Weight	0.650	0.004 [0.642;0.657]	---	---	---	---
Overweight	---	---	0.626	0.002 [0.622;0.630]	---	---
Obese	---	---	---	---	0.554	0.004 [0.546;0.562]

[a] The standard errors obtained using the bootstrapping technique with 500 replications.
Note: Weight status reported in 1996

Figure 1 **Percentage of Focal Responses Relative to Total Amount of Responses to the Survival Question for 1994, 1996, 2004 and 2006, by Body Weight Category.**





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