

## Obesity and the update of survival expectations

### Abstract

#### Introduction

Between 1995 and 2005 obesity measured by body mass index (BMI<sup>1</sup>) showed an increasing prevalence among the US adult population at both national and state levels. The Behavioral Risk Factor Surveillance System (BRFSS) showed that, in the US, 23.9% of the people over 18 years were obese (BMI $\geq$ 30) (CDC, 2006) and the National Health and Nutritional Examination Survey (NHANES) showed that for people over 20 years, the obesity prevalence was of 20.2% for men and of 25.4% for women for the wave 1988-1994, while the for the wave 1999-2000 it showed a prevalence of 27.5% for men and 33.4% for women (Flegal et al, 2002). The NHANES 2003-2004, for the same age range, showed that among men the prevalence of obesity increased to 31.1%, while for women it remained almost unchanged from its level at 1999-2000 (Ogden et al., 2006).

It has been shown that obesity increases the risk of heart disease, hypertension, and osteoarthritis (in the knees) by two to three times, and the risk of cancer by two times, that it increases the risk of type 2 diabetes by three times, compared to people with normal body weight ( $18.5 \leq \text{BMI} < 25$ ), (WHO, 1999) and that obesity is associated with increased mortality and decreased life expectancy relative to people in the normal weight category (Adams et al., 2006; Flegal et al., 2005; Olshansky et al., 2005; Peeters et al., 2003). Despite the considerable amount of research investigating health-related outcomes that have obesity as one of the most important risk factors it calls our attention the insufficient amount of research investigating the awareness that individuals may have on this topic.

There is almost no evidence on whether individuals acknowledge the possible deleterious effects that excess body weight may have on their health and on their survival perspectives. Perceiving the threat that excess body weight posits on survival may motivate behavioral changes (Baranowski et al., 2003) conducive to both weight gain prevention and weight loss encouragement when necessary. The motivations to engage in health protecting behaviors vanish when the likelihood, or the severity, of any given condition are perceived as low (Weinstein, 2000) which adds to the importance of studying individuals' survival perceptions in relation to excess body weight.

The present study intends to investigate which are the factors associated with survival expectation formation that may be related to excess body weight. To the best of our knowledge there is no research done in this area as well as on whether serious obesity-related problems (obesity related health shocks) may influence changes in these expectations. We are, therefore, interested in answering the following questions: are there differences in the determinants of the subjective survival expectations between individuals with excess body weight and those that are considered as normal weight individuals? Do the differentials in the determinants of subjective survival expectations change with time? Do these groups of individuals update their survival expectations differently in the presence of obesity-related health shocks that may occur at a given point in time?

#### Data

For the present study we are going to use data from the Health and Retirement Study (HRS). The HRS is a longitudinal survey that was designed to gather information on persons from pre-

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<sup>1</sup> BMI= (weight in kilograms / (height in meters)<sup>2</sup>)

retirement into retirement in the US. The first's wave (1992) target population includes individuals aged 51-61 living in households. A total of 15497 individuals, including spouses or partners regardless of their age, were eligible for interviews in 1992 from whom 12654 respondents were finally interviewed. The survey consists of a total of eight waves with interviews conducted every two years. The subsample for this study, obtained from the RAND HRS Data File Version "H", comprises all the individuals, targets and spouses, aged 50 to 60 at baseline (1992): a total of 4369 males and 5116 females. Among these individuals a total of 1624 were reported as dead by 2006.

Besides a battery of self-reported health-related questions and self-reported height and weight the other two relevant questions for this study that the HRS provides are:

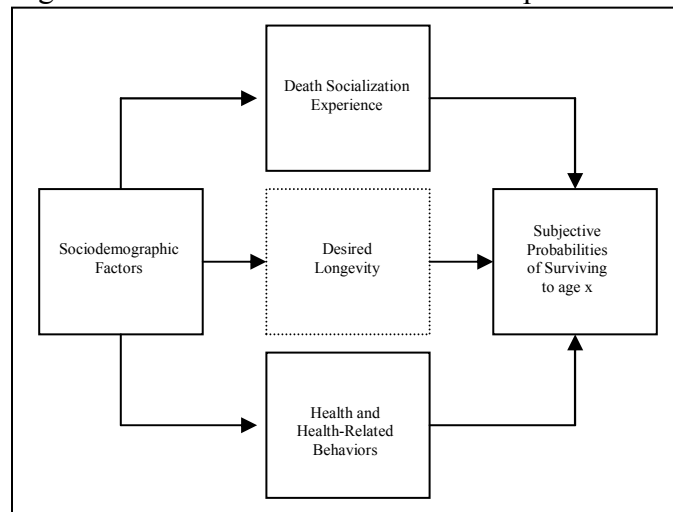
- “What do you think are the chances that you will live to be 75 or more?”
- “And how about the chances that you will live to be 85 or more?”

In 1992 there were ten possible answers ranging from 0 to 10 for each of these questions, with 0 representing “Absolutely no chance” and 10 “Absolutely certain”. From 1994 on the question changed its wording: instead of asking for chances between 0 and 10, now the question asked for percent chance to live to be 75 or more (85 or more) with the same number of possibilities (11) but from 0 to 100. Besides this change the 1994 wave was the first one restricting the age for asking the first of the mentioned questions (survival to age 75) to individuals with less than 66 years of age and the second one to individuals with less than 75 years of age.

**Models and Methods**

In order to study the determinants of subjective probabilities of surviving to a given age I modified the model that Nelson and Honnold (1980) proposed for the determinants of subjective life expectancy incorporating the health dimension to it. The health dimension has shown to have a strong influence on subjective survival expectations of older individuals; Nelson and Honnold studied the determinants of mortality expectations in young adults (18-29 years of age). The authors hypothesized that “subjective life expectancy would vary with exposure to early death among near relatives, family size, and desired longevity.” Figure 1 shows the modified model.

Figure 1. Determinants of Survival Expectations



Among the sociodemographic factors influencing subjective probabilities of surviving to age  $x$  we will consider the individual's age, sex, ethnicity, and SES (Mirowsky, 1999; Mirowsky and Ross, 2000; Popham and Mitchell, 2007). The health and health related factors will include self-rated health, and smoking behavior (Hurd and McGarry, 1995 and 2002). The death socialization experience set of factors make reference to the aforementioned aspects described by Tolor and Murphy (1967). Among them there are going to be consider age at death of parents, spouses, siblings. The HRS provides all this information, what it is not provide by HRS is information regarding "desired longevity."

In order to examine differences in the determinants of the subjective probabilities of surviving to a given age for people at different levels of body weight the analysis will be done stratifying by weight status. We will center our analysis in the subjective probability of surviving to age 75 because the HRS maintained the format of this particular question throughout all the waves for the age range that we are considering (50-60 years old). We will use the ordered probit model having as dependent variable the self-reported probability of surviving to age 75. We are also interested in study whether the determinants of the subjective probabilities of surviving to age 75 change with time (throughout the different waves of the HRS) at different levels of body weight since from the time when the first HRS wave was obtained (1992) it has been an increased awareness of the necessity of preventing and controlling the upsurge of obesity prevalence as it is clear from the media coverage that the topic receives (Saguy and Almeling, 2008) and the amount of recommendations made by different health organizations (NIH, 1998; WHO, 1999; Surgeon General, 2001; U.S. Preventive Service Task Force, 2003) .

In order to address the question of whether individuals change their own survival perceptions as a result of the appearance of obesity-related health conditions that were not previously present, or the worsening of preexistent ones during the period under consideration, we will use the risk-updating framework and model proposed by Smith and colleagues (Smith et al., 2001b). Under 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,  $r_t$ , that is implied by any new information the individual acquires regarding a new fatality risk that may have appeared between times  $t$  and  $t-1$  that could induce a revision of the previous assessment. Therefore  $P_t$  responds to equation (1):

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

Where  $\theta$  represents the precision added by the respondent to its first assessment and  $\gamma$  represents the extent of the beliefs implied by  $r_t$  .

As here we consider  $r_t$  as a function of health-related events that are associated with excess body weight that might motivate revision of the previous survival assessment, general health-related events that are not associated with excess body weight but which might also motivate a revision of the previous survival assessment, worsening of preexisting conditions, worsening of activity restrictions that were already present, and a set of sociodemographic factors, like age, sex, and education, that can affect the way in which the new information is processed we can express  $r_t$  as in equation (2) if for the sake of notational simplicity we combine under the same vector  $X$  the variables that represent the two types of health shocks, the ones that

are associated with excess body weight and the ones that are not, the worsening of preexisting conditions, the worsening of activity restrictions, and the mentioned sociodemographic factors. Then, as Smith and colleagues (2001b) stated,  $P_t$  can be estimated by means of equation (2):

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

The coefficients in equation (2) are going to be estimated using a two-limit Tobit model stratifying individuals by body weight categories. We are going to compare the effect of the health shocks among categories in order to investigate whether individuals at higher levels of body weight have a different perception of the effect that the given health shocks would have on their survival perspectives. There are two key measures that can be constructed from the estimated parameters of equation (2) and are going to be used to get more insight on the risk perception: 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,  $\Psi$ , that can be obtained through equation (2.2) (Liu et al, 2007; Smith and Michaels, 1987; Viscusi and O'Connor, 1984).

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

The mortality expectations and risk perception of people with excess body weight has not been studied to the extent that it deserves even though it has been shown that obesity is associated with at least as much morbidity as are poverty, smoking, and alcoholism (Sturm and Wells, 2001), that there is general consensus on the fact that obesity is strongly associated with several serious health risk factors (Mokdad et al 2003), and that in the US there is an excess in mortality due to obesity (Allison et al., 1999; Flegal et al., 2005; Fontaine et al, 2003; Mokdad et al., 2004; Olshansky et al, 2005). Only a reduced number of studies have paid a closer attention to the relationship between individuals' knowledge of the health risk associated with obesity (Hamermesh and Hamermesh, 1983; Kan and Tsai, 2004; Liu et al., 2007; Ross and Mirowsky, 2002) and only one of them, the Falba and Busch (2005) study, addresses directly the question of differential survival expectations of people at higher levels of body weight compared with those that are considered as being in the normal weight range. To the best of our knowledge, there is no systematic research on the possible differentials in the determinants of subjective survival by levels of body weight. The present study attempts to gain insight into what factors shape individuals' survival perceptions because these perceptions are likely to influence individual's behavioral changes and knowing how individuals respond to new health information may help to address the growing problem that obesity poses.