The triumph of hope over regret: A note on the utility value of good health expectations

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Abstract
In this paper we compare three theories of utility formation: prospect theory, regret theory, and a combination which additionally allows for direct utility flows from positive expectations. We then test which of these theories best explains actual connections between health and welfare over time, using a rich Australian data set on health expectations, economic behavior, and well-being. We find evidence supporting a much stronger utility impact of health expectations than of regret regarding health. Our results support the idea than unless individuals are able to alter their future health outcomes by changing their behavior, a benevolent health care provider should only provide good information about the future.

Keywords: health economics, behavioral economics, optimism, micro-econometrics

JEL classification: D40, L10
1 Introduction

In the last few years, ‘savoring’ has emerged in several behavioral disciplines as a novel concept relevant to understanding utility. A broader concept than pleasure from present consumption, savoring is the present enjoyment of events that are happening now, are being remembered, or are being anticipated.\(^1\) This extends the classic economic viewpoint, wherein current utility can be indirectly affected by one’s beliefs about future events since these beliefs change the future possibilities frontier and thus motivate different consumption and savings choices today. The broader conceptualization of the sources of pleasure offered by the ‘savoring’ framework holds clear interest for economists and welfarists more generally. If expectations of future outcomes affect utility directly, rather than merely indirectly via choices made on the basis of those expectations, then there may be implications for optimal information provision. In particular, if savoring of the future is a sufficiently strong direct input to utility today, then it may be optimal for a utilitarian actively to withhold information about the future from other individuals, or even deliberately to let them have false beliefs, in order to

\(^1\)See Bryant & Veroff (2007) for a conceptual overview of savoring and suggestions about how to measure it. The basic concept that chronological time is relevant to utility formulations has a long intellectual tradition. Decades ago, Frisch (1964) suggested the concept of ‘perspective’ utility functions in which an individual at one period can ‘visualize’ the utility function in a future period. The essential difference between the Frisch concept and ‘savoring’ is that the latter includes a direct, present-day utility impact of anticipated future events, quite apart from any changes in behavior that arise from expected future events.
make them feel good.  

This new line of thought extends and challenges a previous family of theoretical frameworks—most prominently, disappointment theory, regret theory and prospect theory—where the utility power of disappointment, fueled by relative comparisons, is at the fore. In this paper, we directly compare and test the empirical implications of a utility formulation consistent with a very particular versions of disappointment, regret, and prospect theory, against an expanded formulation which also includes savoring. Our empirical application is in the area of health and well-being, which are well known to be strongly positively related (Okun, Stock, Haring & Witter 1984, Michalos, Zumbo & Hubley 2000, Cho, Martin, MacDonald, Margrett, Johnson & Poon 2008). We find not only that expectations about future health increase present utility, but that any potential for disappointment is fully dominated by the direct utility contributions of prior expectations. Thus, both from a forward-looking perspective and from a backward-looking perspective, expectations and outcome levels are directly utility-enhancing. We conclude that relative comparisons performed today are far less important than expectations and memories in influencing utility.

In the next section we briefly review the theories mentioned above and

\footnote{Importantly, as noted by Caplin & Leahy (2004), revealed-preference experiments are of limited value in pinning down information provision rules that are optimal on average. This is why in this paper we use non-experimental data on a large sample.}

\footnote{Though the line of thought is new in behavioral economics, its seeds go back at least to Bentham and Jevons in the 18th and 19th century. For an informative discussion, see Loewenstein (1987).}
derive empirical implications from each. Section 3 presents the empirical
tests of our two competing utility formulations, and Section 4 concludes.

2 Literature

2.1 Disappointment, prospect theory and regret theory

A substantial economic literature has arisen proposing that individuals eval-
uate their circumstances relative to their previous circumstances and relative
to the circumstances of others. The idea that people hold a moving refer-
ence point against which they evaluate their outcomes rationalizes the many
instances of habituation and status races that we observe. The utility func-
tion then, in contrast to that implied by traditional expected utility theory
(Bernoulli 1954), is informed by the outcomes observed and/or actions taken
in previous periods as these may contribute to forming the reference point
(see Clark, Frijters & Shields (2008), Koszegi & Rabin (2006), and Koszegi
& Rabin (2009) for reviews).

There are many different formulations of the basic idea that individuals
evaluate an outcome relative to some reference point. The one that we will
test most directly is disappointment theory (Bell 1985, Gul 1991, Gollier &
Muermann 2010). Utility in this framework can be written as follows:

\[ U_{it} = y_{it} + f(y_{it} - E_{t-1}\{y_{it}\}) \] (1)
where $U_{it}$ is the instantaneous utility experienced by individual $i$ in period $t$, $y_{it}$ is an outcome of interest (such as health state) in period $t$, and $[y_{it} - E_{t-1}\{y_{it}\}]$ is the amount of outcome observed this period that is incremental to what was expected—i.e., the degree to which the expectations held last period about the outcome this period are lower than the realizations. The generic assumption is that $f(0) = 0$ and $f'(\cdot) > 0$. In our empirical analysis, we will assume $f(\cdot)$ is linear.

We can expand the interpretative framework of the analysis by considering particular parameterizations of other prominent theories of decision making under uncertainty. Under regret theory, developed originally by Loomes & Sugden (1982), the linearized after-the-fact utility function can be written as

$$U_{it} = y_{it} + g(y_{it} - \{y_{it}^*\}_{t-1})$$

where $\{y_{it}^*\}_{t-1}$ is the outcome at time $t$ that could have been achieved by taking a superior action, such as the best possible action that was available in hindsight. Loomes & Sugden (1982) call this equation the regret-rejoice function in the linearized case, and we interpret it here as the realized level of utility after choices and realizations have occurred. Since our empirical measures are linked to expectations ($E_{t-1}\{y_{it}\}$) and not to alternative outcomes under particular alternative choices, we can only directly test the power of regret theory if we are willing to assume that $\{y_{it}^*\}_{t-1} = E_{t-1}\{y_{it}\} + \varepsilon_{it}$, where
\( \varepsilon_{it} \) is a term statistically uncorrelated with actual future outcomes. Such an assumption would hold, for example, if the actual outcome were a linear combination of an action and uncontrollable events, because then a rational individual would take the optimal action and combine it with expectations about the uncontrollable events to arrive at an expectation.

Another prominent paradigm in the literature on relative comparisons is prospect theory (Kahneman & Tversky 1979), where individuals making a decision are presumed to evaluate the incremental utility they expect to derive from alternative courses of action, relative to a reference point. There are many different versions of prospect theory, and prospect theory itself encompasses many different phenomena relevant to decision making. For the purposes of our exercise, we are exclusively interested in those aspects of the theory relevant to the reference-dependence of utility, and particularly in the case that the reference point is the same as the expected outcome. In that case, the instantaneous utility function is the same as in 1. If in addition agents experience loss aversion, then \( f(.) \) would have a kink at zero because marginal losses are believed to count more than marginal gains, in utility terms.

Under any of the three prominent theories discussed above, a benevolent dictator would lead individuals to adopt low expectations. Benevolent policymakers would be advised to paint as negative a picture about the future as is politically sustainable in order to manage default expectations downward. In order to avoid disappointment, regret, and outcomes below any prior ref-
erence point, individuals should be shielded from information that would tell them either that they should expect good outcomes, or that they could have achieved better outcomes if only they had acted differently.\textsuperscript{4} Applying this conclusion to health, the core policy implication flowing from these theories is that doctors should exaggerate the risk of bad health outcomes in the future, and should emphasize that patients could not have prevented bad current outcomes.

2.2 Savoring the imagined future

The idea that individuals care about their expectations \textit{per se} is well-established in other behavioral disciplines. In psychology, the idea that individuals care about expectations is implicit in the pervasive finding that individuals dislike fear—a reflection of negative expectations—even if the feared outcome does not materialize (Janis & Feshbach 1953, Ohman & Mineka 2001, Kemeny 2003). The ‘fight-or-flight’ response discussed in neuroscience relies on expectations forming an important link in the chain from observation to action: only because one believes that something important is about to happen does one either fight or flee. The stress caused by the prospect of a bad future outcome occurs in advance of the outcome rather than only in

\textsuperscript{4}This implication is contingent upon the idea that expectations can be manipulated externally and internally—not an impossible task, according to the literature on framing effects (Tversky & Kahneman 1981) as well as medical research grounded in prospect theory (Verhoef, Haan & Daal 1994, van Osch, van den Hout & Stiggelbout 2006) where reference-point differences across people, even after being manipulated by the researcher, are shown to be systematically related to stated attitudes towards risk-taking.
response to it, and is exacerbated if individuals feel they cannot do anything to avert the impending disaster that is anticipated (Cannon 1914, Dickerson & Kemeny 2004, Debiec & LeDoux 2004). Research in these areas is not written in the economic tradition of utility functions and optimization, but a clear basic tenet is that individuals derive disutility from the belief that bad things are going to happen to them in the future. The perception of future threat automatically induces a negative response. Confirming this pattern with regard to positive emotions, there is evidence that individuals derive joy and excitement from optimistic expectations, even if they are unrealistic (Wulfert, Roland & Hartley 2005).

In economic theories about choice-making, the possibility of direct utility effects of anticipation has arisen in theoretical treatises (Koszegi & Rabin 2008), in the context of optimal savings (Brunnermeier & Parker 2005), and when analyzing the time-consistency of choices (Caplin & Leahy 2001). In behavioral economics, utility effects of anticipation have emerged as a leading explanation for the finding that individuals care greatly about economic growth yet do not seem to become happier as GDP increases over time (Senik 2008, Clark et al. 2008, Frijters, Liu & Meng 2008). The explanation given in that literature is that individuals derive great pleasure from the idea that their income and the economy as a whole is ‘improving’ rather than deriving utility from income per se. A simple and intuitive example of how future savoring can impact on present consumption decisions is provided by the wine connoisseur who keeps a couple of bottles of his favorite wine
in reserve, preferring to savor the anticipation of future consumption rather than the pleasure of current consumption (Loewenstein 1987).

The health economics literature is rife with empirical evidence consistent with the presence of direct utility impacts from positive expectations about future health. Studies abound that have found patients with more optimistic outlooks about their life and/or their health survive longer, experience fewer side effects, and report less pain (see, for example, Davidge, Bell, Ferguson, Turcotte, Wunder & Davis 2009, Hochhausen, Altmaier, McQuellon, Davies, Papadopolous, Carter & Henslee-Downey 2007, Engel, Hamilton, Potter & Zautra 2004, Chunta 2009). Given this strong association between belief in a good future and patient welfare, the ethical implications for care providers are not clear. For example, the American Medical Association’s most recently adopted Principles of Medical Ethics (2001) reflect both the goal of compassion and the goal of honesty in all interactions with patients, goals which conflict if compassion is interpreted to include pandering to the false optimistic beliefs of patients (which themselves may well create a positive, if placebo, effect). Studies about communication in health care provision (particularly in oncology; see, e.g., Hagerty, Butow, Ellis, Lobb, Pendlebury, Leighl, Goldstein, Lo & Tattersall 2004, Charlton 1992, Kaplowitz, Campo

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5See http://www.ama-assn.org/ama/pub/physician-resources/medical-ethics/code-medical-ethics/principles-medical-ethics.shtml. The interpretation of compassion presented in the text is historically justified by the 1903 version of this Code, which placed little to no emphasis upon honesty, and much more emphasis on providing hope, cheerfulness, and comfort to patients and avoiding, when possible, ‘gloomy prognostications’.
Chui 2002) have considered this implicit conflict between honesty—found in most surveys to be stated-preferred by patients—and the possibility that such honesty may have directly harmful effects on patients. Recent work in health economics has explored the implications of this problem when patients have the option of avoiding information: Koszegi (2003) use a statistical game-theoretic approach to show that patients who suffer anxiety about their future health are unlikely to go to an information-providing doctor, particularly when the risk of hearing bad news is high.

2.3 The expanded model

The expanded utility function we propose, allowing for direct effects of expectations but also including the possibility of disappointment, is of the form

$$U_{it} = y_{it} + f_1(y_{it} - E_{t-1}\{y_{it}\}) + f_2(y_{it} - y_{it-1}) + f_3(E_t\{y_{it+1}\})$$

(3)

where, in our application, $y_{it}$ is health in period $t$; $U_{it}$ is the instantaneous utility experienced by individual $i$ in period $t$; $[y_{it} - E_{t-1}\{y_{it}\}]$ is the measure of disappointment, i.e., the degree to which the expectation held last period about health this period is higher or lower than the realization of health this period; $[y_{it} - y_{it-1}]$ is a measure of the actual change in health since the last period, and thus allows for the possibility that the reference point used by potential regrettors is simply health in the previous period; and $E_t\{y_{it+1}\}$ is a measure of having optimistic expectations about next period’s health.
We may note that Equation 3 differs from any other model of expectations and utility we know in existing published work, yet links together the several diverse strands of literature that we briefly review above into one framework. Health expectations affect utility in two distinct direct ways: one is via disappointment, and the other is via the warm glow of positive outlooks.

In the case that all the functions \( f_1(.) \), \( f_2(.) \), and \( f_3(.) \) are linear, we can write this model equivalently as

\[
U_{it} = Ay_{it} + B_1[E_{t-1}\{y_{it}\} - y_{it-1}] + B_2y_{it-1} + C[E_{t}\{y_{it+1}\} - y_{it}] 
\]

where we anticipate a positive value for \( \hat{C} \), a positive value for \( \hat{A} \), and (if disappointment is salient) a negative value for \( \hat{B}_1 \), in estimation. A positive value for \( \hat{B}_1 \) would imply that the memories of prior periods’ expectations about today’s health directly influence utility. We have written Equation 4 in terms of anticipated changes because in our data, expectations are measured only in anticipated changes.

In the next section, we investigate which of the two main formulations of utility outlined above best fits the empirical relationships between health and well-being. To this end, we estimate Equation 4 on a data set that uniquely has all the information it requires. Our focus will be on the estimated signs of \( B_1 \) (whose predicted sign is negative under disappointment theory) and \( C \) (which should be positive if anticipatory savoring directly impacts utility).

An important limitation of our empirical approach is that we do not ac-
tually have a direct measure of $E_{t-1}\{y_{it}\}$ or $E_t\{y_{it+1}\}$, i.e., the expected outcomes themselves. Rather, we measure both $[E_{t-1}\{y_{it}\}-y_{it-1}]$ and $[E_t\{y_{it+1}\}-y_{it}]$ up to an unknown proportional positive factor. That is, we measure whether someone expects the outcome to improve or reduce on an ordinal scale of increases and decreases, but not a cardinal scale. Because we are not able to observe or infer *ex ante* what $E_{t-1}\{y_{it}\}$ actually is, we can only identify whether $B_1$ and $C$ are positive or negative. This limitation precludes directly running the regression implied by (3), and means we have to rely on the linearity assumption.

Another crucial point to make with respect to the interpretation of our empirical results is that we are explicitly modeling the agent’s instantaneous present utility, rather than the discounted utility stream of the agent as calculated today. In most standard utility functions, future consumption levels (analogous to $y_{it+1}$ in our application) are directly included in the discounted sum, as in Equation 12 of Frisch (1964), while future consumption *per se* rarely appears in the instantaneous utility function. Our precise interpretation of the coefficient $C$ in our model as capturing the importance of ‘savoring expectations’ hinges on the assumption that we are modeling instantaneous utility only.

The policy implications that can flow from this model depend on the magnitudes of $B_1$ and $C$ and the ability of policy makers to influence $E_t\{y_{it+1}\}$ and $E_{t-1}\{y_{it}\}$. If, as we expect, $C$ is positive and $B_1$ is negative, then the optimal policy (whenever feasible) is to exaggerate positive expectations of
the future and, retrospectively, to downplay any previously-held high expectations for the recent past. To adopt positive expectations of events before they happen and instantaneously switch to negative expectations of those same events once they have happened implies of course a bold-faced inconsistency. However, this type of story is not without some external validity in terms of the actual behavior of those powerful enough to manipulate people’s expectations. The most striking example of this in the real world is in regard to religious predictions, such as the prediction of the ‘second coming of Christ’. Dozens of times in the past millennium, religious leaders have predicted a specific date for the coming of the Christian god to Earth, yet never has this event actually taken place. Once the target date has come and gone with no evidence of the predicted event having come to pass, the typical tack taken by religious leadership has been to provide a palliative or distraction from any potential disappointment, often including a reason why the second coming had in fact been unlikely to happen as predicted, but simultaneously to affirm that the hoped-for event will still take place soon.\footnote{As an extreme example, Robbins (1999) suggests that “hope” completely replace any disappointment about the second coming not having come. He writes, “Is there any way to retain the anticipation of eschatology without the disappointments of catastrophism? There is a way and it is found in the Christian virtue of hope...Expectancy grows ever more nervous and begins to despair that it ever will come. Certain that it will come at some future time, hope fills the present moment with steadfast faith...Confident of God’s promises, we do not need to keep a record of performance.”} Likewise in secular politics, both incumbents and candidates for political office routinely use speeches and media appearances to downplay comparisons of previous promises to current outcomes, re-set expectations ex post to match reality,
and encourage forward-thinking optimism.\textsuperscript{7}

In the case that one demands time-consistency of information policy, the optimal policy recommendation turns on the sign of \((B_1 + C)\). If the sign is positive, it would be beneficial to adopt positive expectations; otherwise, it would be beneficial to adopt negative expectations. In our empirical application we can directly test this sign.

\section{Data and Analyses}

\subsection{Data}

To test the implications of the two main theoretical frameworks presented above, we require data on a large set of individuals representative of a whole population, and information on their stated utility, expectations of health, and (ideally) behaviors that are directly related to health. Data from the Household Income and Labour Dynamics in Australia (HILDA) survey satisfies all of our requirements. HILDA is a household-based longitudinal study.

\textsuperscript{7}Instances of politicians encouraging forward-thinking optimism are plentiful; the ‘Yes We Can’ Obama presidential slogan is one exceptionally concise example. The ‘weapons of mass destruction’ debacle under the prior U.S. presidential administration offers a perfect stage for the display of the time-inconsistency we sketch. Ex ante, Defense Policy Board member Kenneth Adelman sets high expectations for finding WMD in Iraq (which would thereby provide moral justification for the U.S. invasion of Iraq): ‘I have no doubt we’re going to find big stores of weapons of mass destruction.’ (quoted in The Washington Post, Page A27, March 23, 2003). Ex post (two months later, after the U.S invasion), Condoleezza Rice pulls down prior expectations of how easy it would be to find weapons of mass destruction in Iraq: ‘U.S. officials never expected that “we were going to open garages and find” weapons of mass destruction.’ (quoted in an interview by Reuters, May 12, 2003).
that is nationally representative, with the exception of under-sampling individuals living in more remote areas of Australia. It began in 2001 with the survey of 13,969 persons in 7,682 households, and each year since then interviews have been conducted with all willing members of each household who are at least 15 years old at the time of the interview. In these interviews, information is collected on labor force dynamics, education, income, family formation, health and other specialized topics.\(^8\)

The crucial variables we use are a measure of stated utility and direct measures of both health outcomes and expectations of health changes. Stated utility is measured with the question, “All things considered, how satisfied are you with your life?”, with respondents told to, “Pick a number between 0 and 10 to indicate how satisfied you are” and that “the more satisfied you are, the higher the number you should pick”. The median and modal response to this question is 8, and the distribution of responses is negatively skewed, with over three quarters of respondents choosing 7 or above.

Expectations of health changes are measured using respondents’ evaluation of the statement, “I expect my health to get worse”, to which they can answer: definitely true (coded as 1), mostly true (2), don’t know (3), mostly false (4), or definitely false (5). The mean and standard deviation of this expected change-in-health measure are 3.6 and 1.1, respectively, with higher numbers indicating a more positive anticipated trajectory for health. Current general health is measured with the standard question, “In general,

\(^8\)HILDA is described in more detail in Watson & Wooden (2004).
would you say your health is: poor, fair, good, very good, excellent”. We code an answer of ‘poor’ as 1, ‘fair’ as 2, ‘good’ as 3, ‘very good’ as 4, and ‘excellent’ as 5. The mean and standard deviation of general health are respectively 3.4 and 0.96. In some expanded empirical specifications we also include additional measures of current health from the Short-Form General Health Survey (SF-36), which are discussed in more detail in the following subsection.

Figure 1 displays mean life satisfaction for each value of expected health improvement, general health, and lagged expected health improvement. Consistent with prior literature, the relationship between current general health and life satisfaction is clearly the strongest: increasing general health from 1 (poor) to 5 (excellent) increases life satisfaction by almost one and a half times its standard deviation of 1.5. The relationships between life satisfaction and expected health improvements, and life satisfaction and lagged expected health improvements, are far less significant but very similar to one another. All three relationships are close to linear.

[Figure 1 here]

In addition to current health and expected health improvements, we include in our empirical models the following time-varying control variables representing personal circumstances: age, age squared, marital status (married/cohabiting versus divorced/separated), number of children, log of income, employment status (employed full-time, employed part-time, or unemployed), and highest educational attainment (university degree, diploma,
vocational certificate, or high school graduate). We also include variables repre-
senting health-related behaviors: whether respondents report being rushed for time, and to what degree they are physically active, drink, and smoke. The precise definitions of these variables and their sample means and standard deviations are presented in Table 1.

[Table 1 here]

We exclude from our estimation sample any observations that have missing information on life satisfaction, health expectations, current health or the covariates listed in Table 1. These exclusions leave us with an unbalanced panel of 13,479 individuals from a maximum of six survey years, and a total of 53,476 individual-year observations. Importantly, for some empir- ical models this sample size is further reduced by excluding all individuals without variation in life satisfaction across years, leaving a total sample of 45,638. This restriction is a requirement for the model and is discussed in more detail below.

3.2 Methodology and Results

Our empirical approach is to estimate Equation 4 for current-period life sat- isfaction including and excluding various controls. Our baseline estimation strategy is to fit ordered logit models via maximum likelihood to accommo-
date the ordinal nature of reported utility. We then estimate fixed-effects ordered logit models as developed in Ferrer-i-Carbonel & Frijters (2004). The inclusion of individual-level fixed effects allows us to correct for correla-
tion between time-invariant individual heterogeneity and the regressors. For example, it is likely that people with optimistic personalities expect better health outcomes and are generally happier, thereby creating a spurious association between expected health improvements and utility. By estimating a fixed-effects model we estimate the relationship between deviations in life satisfaction and deviations in health, expected health improvement and lagged expected health improvement, and so unobserved traits, such as personality, are differenced out.

The fixed-effects ordered logit model can be expressed as:

\[ LS_{it}^* = \beta X_{it} + \delta_t + f_i + \varepsilon_{it} \]  \quad (5)

\[ LS_{it} = k \Leftrightarrow LS_{it}^* \in [\lambda_k, \lambda_{k+1}] \]

where \( LS_{it}^* \) is latent life satisfaction; \( LS_{it} \) is observed life satisfaction; \( X_{it} \) are time-varying characteristics including health and expected health improvement; \( \delta_t \) is a time fixed-effect; \( f_i \) is an individual fixed-effect; \( \lambda_k \) is the cut-off point for the \( k_{th} \) life-satisfaction response; and \( \varepsilon_{it} \) is a time-varying logistically-distributed error term that is orthogonal to all characteristics. Importantly, the conditional likelihood function for this model incorporates only those individuals with changes in reported life satisfaction over time, and so individuals with time-invariant life satisfaction are omitted from the sample, leaving us with 45,638 person-by-year observations.

Columns 1 and 4 of Table 2 present our baseline estimates from a stan-
dard ordered logit model. The specification presented in Column 1 is a prospect/regret theory specification, which includes current general health, past expectations of health improvements and a large set of controls for actual health choices and personal circumstances. Surprisingly, the effect of prior-period expected health improvement on current life satisfaction is positive and significant: a one point increase in past expected health improvement increases latent life satisfaction by 0.157 points. The positive effect suggests that disappointment is not important, at least not when it concerns the valuation of health. The specification presented in Column 4 also includes our main term of interest, current expectations about future health changes. The results suggest that disappointment continues to be unimportant, as past expectations have a positive effect, though the effect size is much smaller than in Column 1. Current expectations are highly significant and positive: a one-point increase in expectations increases latent life satisfaction by 0.127 points on the 11-point scale. This is not as important as current health itself, but is still highly significant both economically and statistically.

[Table 2 here]

A first concern with these baseline ordered logit results is that they may be biased due to fixed unobserved heterogeneity that influences both life satisfaction and health. Thus, we add to the standard disappointment theory specification and our augmented specification individual-level fixed effects. Results are displayed in Columns 2 and 5. In both cases we see that the effect of expectations, both past and present, remains positive. In particular,
the effect of current expectations of future health changes remains strongly significant with the inclusion of fixed effects, with the point estimate reduced by only 25 percent (from 0.127 to 0.097), though these coefficients are not strictly comparable. Yet the ratio of the coefficient on current expectations to the coefficient on general health is almost the same across the specifications with and without fixed effects, as shown in Columns 4 and 5 (0.21 versus 0.22), indicating that the relative contributions of expected improvements and actual outcomes in creating utility is estimated to be largely invariant across people.

A second concern is whether we have sufficiently controlled for current health. It is possible that our expectations variables are partially correlated with elements of current health not captured by our general health variable. If this is the case, then the coefficients on expected health changes would be biased. A related concern is reverse causality, in the sense that higher life satisfaction causes higher health levels. We handle these concerns by including in specifications shown in Columns 3 and 6 of Table 2 a number of additional current health measures. Specifically, we include seven health summary indices from the Short-Form General Health Survey (SF-36). The SF-36 is a widely used 36-item questionnaire from which health indices can be constructed relating to physical functioning, role limitations due to physical health problems, social functioning, bodily pain, general mental health, role limitations due to emotional problems, and vitality. Many prior researchers have used the SF-36 to capture objective health state (e.g., Boden
& Galizzi 2003, Cai & Kalb 2006) and its reliability and validity are documented in the SF-36 user’s manual (Ware, Snow, Kosinski & Gandek 1993). As suspected, including more comprehensive health control variables diminishes the estimated effects of the expectations variables. However, the expectation of future health changes remains significant at the .01 level.

A final concern is whether individuals relate their health to their prior expectations, or instead relate it to their actual health in the past. People have been argued to habituate not only to pleasurable things (Carroll, Overland & Weil 2000, Heyink 1993) but also to pain and other health-related sensory inputs (Ernst, Lee, Dworkin & Zaretsky 1986, Leppaluoto, Korhonen & Hassi 2001). If people get used to what they experience, as suggested in Groot (2000) and as is accommodated directly in our Equation 4, then it is the past health state, not past expectations, that form the reference against which today’s state is compared. Therefore, we include in the specification shown in Column 7 of Table 2 the lag of general health. As a further test, in the specification shown in Column 8 we also include the lead of general health. While both the lag and the lead exert important positive impacts on life satisfaction, the estimated impact of expected health improvements remains largely unaffected. The fact that the lag of health has a positive effect today means that even if the true reference point is the past state rather than expectations held in the past,\(^9\) disappointment does not play an impor-

\(^9\)Several recent empirical applications of prospect theory use prior-period outcomes as proxies for expectations, including List (2004) and Dhami & al Nowaihi (2007).
tant role in utility today. An explanation for this finding is that individuals consume positive memories associated with good health in the past. The positive effect of actual future health strengthens our findings on the utility impact today of expected health, since actual future health is another, possibly more accurate, measure of health expectations.\textsuperscript{10}

Finally, we look at how our favored specification (shown in Column 7 of Table 2) differs by sub-group. Results are shown in Table 3. We find that current expected health improvements are more important in determining women’s than men’s life satisfaction (the relevant estimated effects are 0.051 versus 0.027 points) and running the model separately by sex, we again find that disappointment plays no significant role. If we disaggregate by age group, we find current expectations unimportant for younger (18-35) people, but significant and positive for older age groups.

[Table 3 here]

\textsuperscript{10}It is possible that changes in an individual’s life satisfaction may change the way in which an individual perceives their current and future health, even if their objectively measured health has remained constant. To control for this potential reverse causality requires an instrumental variables approach. Unfortunately, instrumental variables for current health levels and anticipated health levels are unavailable – in fact, we are unaware of any study that instruments for health status in a life satisfaction regression model. We are however reassured by our results from specification (8) in Table 2, which show that health in \( t+1 \) (i.e. recorded health in the next wave) is a highly significant predictor of life satisfaction in period \( t \). It is unlikely that all of this strong future health effect is driven by shocks to current life satisfaction.
4 Conclusion

In this paper, we have directly tested the empirical implications of two standard utility models against the implications of a new model where both expectations \textit{and} disappointment regarding health may influence happiness. We find strong evidence in favor of a utility model that accommodates positive effects on current life satisfaction from individuals’ expectations about their future health. We also find some evidence for the consumption value of past health outcomes and, for older individuals particularly, of past expectations.

An important implication of our findings is in regard to optimal information provision. The fact that positive health expectations appear to affect utility so strongly compared to disappointment implies that there is a strong case to be made for deliberately allowing people to be overly optimistic about their future health, i.e., to engage in ‘sweet talk’ about the future. This goes counter to the standard economic advice of full information provision. A question for future research is to ascertain the extent to which deliberate sweet talk is still optimal if health care providers have private information to withhold, if there are reputational factors that the information provider must consider, and/or if people make decisions based on their expectations that may change their actual future health outcomes.
References


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<th>Std Dev</th>
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<td>Married or cohabiting (dv)</td>
<td>0.681</td>
<td>0.466</td>
</tr>
<tr>
<td>Divorced or separated (dv)</td>
<td>0.031</td>
<td>0.174</td>
</tr>
<tr>
<td>Number of children aged 0 to 14 years old</td>
<td>0.623</td>
<td>1.023</td>
</tr>
<tr>
<td>Real log household disposable income</td>
<td>10.70</td>
<td>0.721</td>
</tr>
<tr>
<td>Employed in a full-time job (dv)</td>
<td>0.452</td>
<td>0.498</td>
</tr>
<tr>
<td>Employed in a part-time job (dv)</td>
<td>0.206</td>
<td>0.404</td>
</tr>
<tr>
<td>Unemployed (dv)</td>
<td>0.025</td>
<td>0.156</td>
</tr>
<tr>
<td>Highest educational attainment university degree (dv)</td>
<td>0.222</td>
<td>0.415</td>
</tr>
<tr>
<td>Highest educational attainment diploma (dv)</td>
<td>0.093</td>
<td>0.290</td>
</tr>
<tr>
<td>Highest educational attainment vocational certificate (dv)</td>
<td>0.216</td>
<td>0.412</td>
</tr>
<tr>
<td>Highest educational attainment high school (dv)</td>
<td>0.149</td>
<td>0.356</td>
</tr>
<tr>
<td><strong>Health-Relevant Behaviors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Often feel rushed/pressed for time (5-point scale)</td>
<td>3.251</td>
<td>0.931</td>
</tr>
<tr>
<td>Frequency of physical activity (6-point scale)</td>
<td>3.432</td>
<td>1.538</td>
</tr>
<tr>
<td>Standard drinks usually have per day</td>
<td>2.623</td>
<td>2.463</td>
</tr>
<tr>
<td>Currently smokes (dv)</td>
<td>0.219</td>
<td>0.413</td>
</tr>
<tr>
<td><strong>Health Measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-36 physical functioning index</td>
<td>83.24</td>
<td>22.57</td>
</tr>
<tr>
<td>SF-36 role-physical index</td>
<td>78.43</td>
<td>36.32</td>
</tr>
<tr>
<td>SF-36 bodily pain index</td>
<td>73.30</td>
<td>24.23</td>
</tr>
<tr>
<td>SF-36 vitality index</td>
<td>60.22</td>
<td>19.66</td>
</tr>
<tr>
<td>SF-36 social functioning index</td>
<td>82.83</td>
<td>23.17</td>
</tr>
<tr>
<td>SF-36 role-emotional index</td>
<td>83.53</td>
<td>32.31</td>
</tr>
<tr>
<td>SF-36 mental health index</td>
<td>74.71</td>
<td>16.84</td>
</tr>
</tbody>
</table>

Note: ‘dv’ denotes that the variable is a dummy variable. Sample size is 53,476.
Table 2: Ordered Logit Models of Life Satisfaction

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current health</td>
<td>0.642**</td>
<td>0.468**</td>
<td>0.309**</td>
<td>0.609**</td>
<td>0.447**</td>
<td>0.302**</td>
<td>0.314**</td>
<td>0.328**</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.020)</td>
<td>(0.022)</td>
<td>(0.016)</td>
<td>(0.020)</td>
<td>(0.022)</td>
<td>(0.022)</td>
<td>(0.027)</td>
</tr>
<tr>
<td>Lagged expected health change</td>
<td>0.157**</td>
<td>0.022</td>
<td>0.021</td>
<td>0.096**</td>
<td>0.033*</td>
<td>0.026+</td>
<td>0.018</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.014)</td>
<td>(0.014)</td>
<td>(0.009)</td>
<td>(0.014)</td>
<td>(0.014)</td>
<td>(0.015)</td>
<td>(0.018)</td>
</tr>
<tr>
<td>Expected health change</td>
<td>0.127**</td>
<td>0.097**</td>
<td>0.043**</td>
<td>0.040**</td>
<td>0.055**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.015)</td>
<td>(0.015)</td>
<td>(0.015)</td>
<td>(0.019)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lagged health</td>
<td>0.077**</td>
<td>0.106**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.024)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future health</td>
<td>0.081**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Figures are coefficient estimates. Standard errors in parentheses. + p less than 0.10; * p less than 0.05; ** p less than 0.01. All models include controls for age, marital status, children, income, employment status, education, life-style and year effects. Expanded covariates included in columns 3, 6, 7 and 8 include seven SF-36 health indices. See Table 1 for variable definitions.

Sample size

<table>
<thead>
<tr>
<th></th>
<th>30624</th>
<th>4669</th>
<th>46868</th>
<th>46638</th>
<th>46638</th>
<th>46638</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>λ</td>
<td>λ</td>
<td>λ</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>λ</td>
<td>N</td>
</tr>
</tbody>
</table>

Note: Figures are coefficient estimates. Standard errors in parentheses. + p less than 0.10; * p less than 0.05; ** p less than 0.01. All models include controls for age, marital status, children, income, employment status, education, life-style and year effects. Expanded covariates included in columns 3, 6, 7 and 8 include seven SF-36 health indices. See Table 1 for variable definitions.
Table 3: Fixed-Effect Ordered Logit Models of Life Satisfaction by Groups

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Current health $y_t$</td>
<td>0.308**</td>
<td>0.320**</td>
</tr>
<tr>
<td></td>
<td>(0.030)</td>
<td>(0.033)</td>
</tr>
<tr>
<td>Lagged expected health change $E_{t-1}{y_{it}} - y_{it-1}$</td>
<td>0.025</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.021)</td>
</tr>
<tr>
<td>Expected health change $E_t{y_{it+1}} - y_{it}$</td>
<td>0.051*</td>
<td>0.027</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.022)</td>
</tr>
<tr>
<td>Lagged health $y_{t-1}$</td>
<td>0.080**</td>
<td>0.075*</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.029)</td>
</tr>
<tr>
<td>Sample size</td>
<td>23991</td>
<td>20608</td>
</tr>
</tbody>
</table>

Note: Figures are coefficient estimates. Standard errors in parentheses. + p less than 0.10; * p less than 0.05; ** p less than 0.01. All models includes same covariates as model (7) from Table 1.