PERCEPTIONS OF AND RESPONSE TO
LIFE EXPECTANCIES

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Abstract

Hammermesh recently reported the results of a survey which provided the basis of his conclusion that households are well informed and prescient about their life expectancies. This underlies his claim that households can be expected to make difficult inter-temporal or lifecycle decisions in an informed and rational manner. In this paper we summarize the results of a survey of households which provides contrary evidence. Household decision makers appear to have only a vague awareness of relevant current life expectancies and do not appear to be cognizant of secular improvements in life expectancies. These misperceptions appear to be one of several factors that explain questionable responses to the particular retirement choice that we examined in our survey.
I. INTRODUCTION

Perceptions of life expectancy have become increasingly relevant for the economic analysis of household behavior, particularly in the study of savings and bequests. Hammermesh's recent article provided empirical evidence that subjective perceptions of life expectancy are consistent with objective, up to date indicators of life expectancy. Moreover, he argued that individuals correctly anticipate future improvements in mortality experience. This finding led him to imply that economic decisions depending on life expectancy estimates will therefore be correct. Some recent related empirical work reported here provides qualifying and contradictory evidence about both aspects: 1) the link between ultimate actual and expected life expectancies may not be as close as claimed by Hammermesh and, 2) even given a relatively close link, households do not act in as informed manner with regard to intertemporal choices as Hammermesh implies. Remaining errors and biases in making inherently difficult intertemporal choices in the context of market imperfections and uncertainty often precludes reasonable choices even if eventual lifespans or planning horizons are known.

The empirical work reported here involves a study of household behavior in a choice situation where perceptions of life expectancies and the ability to interpret and apply such life span information were very important. Employees of state-local governments in Hawaii were given a "once in a lifetime" opportunity to opt out of the contributory portion of the pension plan available to them before
1985. In effect, these workers were permitted to trade off higher current take home pay for the higher lifetime annuities that would otherwise have become available to them once they retired. Any comparison or determination of the values of one option relative to the other would obviously be greatly influenced by perceptions of life expectancy. If they underestimated their correct life expectancy the value of remaining in the contributory portion of the government employee retirement plan would be erroneously undervalued.

The survey instrument we used to elicit household-specific data for this choice situation permits us to compare worker-specific subjective life expectancies with objective life expectancies, given the respondent’s age and sex. On the basis of this empirical insight we are able to conclude that only subjective and current objective life expectancies are generally consistent for males while pronounced anomalies exist for female respondents. Of greater quantitative significance, neither females nor males extrapolated likely future improvements in age-specific mortality experience in a manner claimed by Hammermesh.

Section II of this paper reports on the degree of conformity between subjective and objective life expectancies of the respondents to our survey. The pronounced disparity between perceived and relevant eventual life expectancies in the case of females is documented. Moreover, even in the case of the male respondents there was no evidence of the extrapolations indicated in Hammermesh’s analysis.

The implications of these faulty life expectancy perceptions for rational household choice making is considered in Section III. Even
if households made intertemporal choices on the basis of correct perceptions of life expectancy, there are still indications that such choices would be distorted. Whatever rational behavior exists, it is bounded. We conclude in Section IV that it is premature to accept that difficult intertemporal household choices are as informed or rational as Hammermesh concludes.

II. ON THE ACCURACY OF SUBJECTIVE LIFE EXPECTANCIES

The Hammermesh Conclusions

Hammermesh finds that individuals have rational and far seeing perceptions of life expectancies as viewed in several dimensions. First he concludes that persons' perceptions are "demographically consistent" in that they accurately estimate that with each year they survive, their ultimate life expectancy increases. Moreover, these age-specific extensions of life expectancy are consistent with the improved mortality experience for their age group reflected in a current life table. Second, Hammermesh maintains that individuals extrapolate past trends in life expectancy gains and accurately apply those to themselves. This he terms "consistency of expectations." In sum, individuals are aware of improvements in life expectancy for persons in similar demographic positions and are able to anticipate further improvements that will likely to influence their own ultimate life spans.¹

The conclusions of Hammermesh can be illustrated in a stylized manner in the context of the expectation of life function indicated in Figure 1. Curve AB of Figure 1 shows the relationship between age and
Figure One
Illustrative Expectancy of Life Functions

Yrs Remaining

Age

0 10 20 30 40 50 60 70 80 90

A H M B
an objective measure of the expected life remaining as measured by the latest available life table. Hammermesh's demographic consistency exists if surveys of subjective life expectancies result in observations that lie along the expectation of life function, i.e. curve AB. The expectation of life function shifts to the right over time as mortality experience improves.

Hammermesh's expectational consistency dimension of subjective life expectancies can also be illustrated through use of Figure 1. If individuals do extrapolate past increases in life expectancy, any survey of subjective of life expectancies should yield data points or observations that lie somewhere to the right of the expectation of life of function AB based on current life tables. For the sake of discussion we draw a line through these hypothetical points and label it HM for the "Hammermesh" function. Since neither Hammermesh nor his sources provides a means for determining the precise location of any HM function, it is difficult to make a judgement about its correct position. It is even difficult to empirically estimate the correct position of the HM function on the basis of trend growth of the expectancy of life function. While the AB function has moved to the right over time, the movement has been erratic, with both the overall rate of change and the slope of the function changing over time (see Table 1). Regardless of the difficulty in estimating the HM function it is clear that Hammermesh expects observations of subjective life expectancy to lie somewhere to the right of the objectively derived expectation of life function reflected in current life tables.

As Hammermesh points out, his optimism about the accurate and
The present nature of subjective life expectancies has important implications for the economic behavior of households. Any household choice involving life cycle or intertemporal planning will be more likely to be correct than if erroneous planning horizons were being used. If Hammermesh is correct, there will not be any biases leading to consistent underestimation of the relevant life expectancies.

<table>
<thead>
<tr>
<th>By Ten Year Interval</th>
<th>At Birth Male</th>
<th>At Birth Female</th>
<th>At Age 20 Male</th>
<th>At Age 20 Female</th>
<th>At Age 40 Male</th>
<th>At Age 40 Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960 - 1970</td>
<td>.089</td>
<td>.200</td>
<td>-.020</td>
<td>.159</td>
<td>.063</td>
<td>.266</td>
</tr>
<tr>
<td>1940 - 1950</td>
<td>.685</td>
<td>.807</td>
<td>.349</td>
<td>.604</td>
<td>.392</td>
<td>.668</td>
</tr>
<tr>
<td>1930 - 1940</td>
<td>.394</td>
<td>.477</td>
<td>.383</td>
<td>.581</td>
<td>.270</td>
<td>.556</td>
</tr>
<tr>
<td>1920 - 1930</td>
<td>.930</td>
<td>1.339</td>
<td>.087</td>
<td>.421</td>
<td>-.237</td>
<td>.192</td>
</tr>
<tr>
<td>1910 - 1920</td>
<td>1.127</td>
<td>.669</td>
<td>.657</td>
<td>.350</td>
<td>.874</td>
<td>.532</td>
</tr>
<tr>
<td>1900 - 1910</td>
<td>.420</td>
<td>.656</td>
<td>.118</td>
<td>.248</td>
<td>-.109</td>
<td>.034</td>
</tr>
</tbody>
</table>

Our Findings

Overall, our findings provide little support for Hammermesh's conclusion of demographic consistency and no support for expectational consistency. In the case of male respondents our data at best only weakly confirms the Hammermesh expectation of demographic consistency. In the case of female respondents, only one aspect of demographic consistency is manifested: females did report greater ultimate expectations of life the older the respondent, but the average female respondent significantly underestimated her ultimate life expectancy regardless of age. The survey results for both sexes failed to provide any support whatever for Hammermesh's claim concerning expectational consistency.

Our survey results are reported in Table 2 and in Figures 2 and 3. As indicated, males in 1985 tend to report greater expectations of life compared to objective 1983 U.S. national actuarial tables. This finding is superficially in agreement with Hammermesh's expectational consistency. However, life expectancies in Hawaii are known to be longer than national averages. When 1980 Hawaii life tables are used, the male subjective estimates are somewhat below the comparable objective values. Thus, there is only marginal conformity between the subjective life expectations for males and the relevant objective expectancy of life function. The absence of any observations to the right of the relevant expectation of life function provides a less ambiguous basis for rejecting Hammermesh's expectational consistency conclusion even for males.

The life expectancies indicated by the female respondents were
### Table 2: Relationship Between Present Age and Expected Age of Death

#### Male Respondents:

<table>
<thead>
<tr>
<th>Present Age</th>
<th>Number</th>
<th>Expected Age of Death</th>
<th>Actuarial Life Expectancies</th>
<th>Hypothetical H-M Life Expectancies*</th>
<th>Underestimation of H-M Function**</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-29</td>
<td>19</td>
<td>75.9</td>
<td>73.2</td>
<td>80.3</td>
<td>-4.4</td>
</tr>
<tr>
<td>30-34</td>
<td>58</td>
<td>78.5</td>
<td>73.6</td>
<td>80.0</td>
<td>-1.5</td>
</tr>
<tr>
<td>35-39</td>
<td>86</td>
<td>76.2</td>
<td>73.9</td>
<td>79.6</td>
<td>-3.3</td>
</tr>
<tr>
<td>40-44</td>
<td>87</td>
<td>77.0</td>
<td>74.3</td>
<td>79.3</td>
<td>-2.3</td>
</tr>
<tr>
<td>45-49</td>
<td>70</td>
<td>77.0</td>
<td>75.0</td>
<td>79.3</td>
<td>-2.3</td>
</tr>
<tr>
<td>50-54</td>
<td>80</td>
<td>77.4</td>
<td>75.8</td>
<td>79.5</td>
<td>-2.1</td>
</tr>
<tr>
<td>55-59</td>
<td>38</td>
<td>80.2</td>
<td>76.8</td>
<td>79.9</td>
<td>0.3</td>
</tr>
<tr>
<td>60-64</td>
<td>28</td>
<td>79.6</td>
<td>78.1</td>
<td>80.7</td>
<td>-1.0</td>
</tr>
<tr>
<td>65 OR OLDER</td>
<td>5</td>
<td>83.8</td>
<td>80.1</td>
<td>82.2</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>482</td>
<td><strong>77.9</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Female Respondents:

<table>
<thead>
<tr>
<th>Present Age</th>
<th>Number</th>
<th>Expected Age of Death</th>
<th>Actuarial Life Expectancies</th>
<th>Hypothetical H-M Life Expectancies*</th>
<th>Underestimation of H-M Function**</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-29</td>
<td>38</td>
<td>76.6</td>
<td>79.6</td>
<td>88.4</td>
<td>-11.9</td>
</tr>
<tr>
<td>30-34</td>
<td>86</td>
<td>78.8</td>
<td>79.7</td>
<td>87.7</td>
<td>-8.9</td>
</tr>
<tr>
<td>35-39</td>
<td>131</td>
<td>78.1</td>
<td>79.9</td>
<td>87.1</td>
<td>-9.0</td>
</tr>
<tr>
<td>40-44</td>
<td>127</td>
<td>78.8</td>
<td>80.2</td>
<td>86.6</td>
<td>-7.8</td>
</tr>
<tr>
<td>45-49</td>
<td>116</td>
<td>78.4</td>
<td>80.5</td>
<td>86.1</td>
<td>-7.7</td>
</tr>
<tr>
<td>50-54</td>
<td>81</td>
<td>79.7</td>
<td>81.1</td>
<td>86.0</td>
<td>-6.2</td>
</tr>
<tr>
<td>55-59</td>
<td>47</td>
<td>81.5</td>
<td>81.8</td>
<td>86.0</td>
<td>-4.4</td>
</tr>
<tr>
<td>60-64</td>
<td>19</td>
<td>82.4</td>
<td>82.6</td>
<td>86.1</td>
<td>-3.7</td>
</tr>
<tr>
<td>65 OR OLDER</td>
<td>2</td>
<td>83.5</td>
<td>83.5</td>
<td>86.3</td>
<td>-2.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>662</td>
<td><strong>78.9</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: * Assumes a .2% annual improvement in life expectancy between present age and actuarial life expectancy. (See text footnote 3.)

** Difference between the expected age of death and the hypothetical HM value.
FIGURE 3
Expectations of Life Remaining, Females

Years Remaining

65 60 55 50 45 40 35 30 25 20 15

UNDER 25 25-29 30-34 35-39 40-44 45-49 50-54 55-59 60-64 65 OR OLDER
consistent with the Hammermesh expectations only with regard to one aspect of demographic consistency: life expectancies rose as a function of age. However, all age-specific life expectancies were underestimated even in terms of the relevant current life tables. There was certainly no evidence of any anticipation or extrapolation of improved mortality experience likely to occur in the future if the past trend continue. In terms of the expectation of life function in Figure 1, the reported ultimate life expectancies were to the left of the AB function instead of to the right as would have been predicted by Hammermesh.²

Our survey was conducted in the context of a larger survey regarding a choice about staying in a government contributory pension plan scheme. In view of this, our respondents should have been particularly sensitive about forming their life expectancies since that parameter was crucial to making the correct opting out choice. Yet, contrary to the prediction based on the Hammermesh paradigm, these government workers significantly underestimated the relevant lifespan or planning horizon. The average male respondent in the 25-29 age group reported an average life expectancy to 75.9 years while current life tables for Hawaii indicate a life expectancy to age 77.0 (Table 2). Assuming a .2% annual increase in life expectancy, the ultimate expectation of life for this group would be approximately age 85.³ Table 3 provides a matrix of possible underestimation of life expectancies resulting from different combinations of age and trends in mortality improvement.

The average female respondent below the age of 40 was
underestimating her relevant life span by 10 to 15 years. This higher underestimation results from the failure to be aware of current life expectancies of females in Hawaii, as well as the failure to anticipate further improvements in life expectancy during the remainder of her life. As we shall see in the next section, this underestimation of relevant planning horizons along with other misperceptions contributed to questionable responses to the opting out choice.

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**TABLE 3**

Under Estimation of Life Expectancy as a Result of Failing to Recognize Improvements in Mortality Experience (In Years)

<table>
<thead>
<tr>
<th>Expected Rates of Improvement in Life Expectancy</th>
<th>Approximate Years to Time of Death*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>.1 % per year</td>
<td>0.7</td>
</tr>
<tr>
<td>.2 % per year</td>
<td>1.4</td>
</tr>
<tr>
<td>.25% per year</td>
<td>1.8</td>
</tr>
<tr>
<td>.5 % per year</td>
<td>3.5</td>
</tr>
</tbody>
</table>

*Assumes 70 years is the life expectancy prior to any subsequent improvement, regardless of the rate of improvement or period.
Hammermesh did not provide a systematic explanation as to why persons should be informed, rational, and far seeing when they are forming their ultimate life expectancies. The mortality experience of close relatives is obviously relevant. But this insight is also obviously discounted or extrapolated differentially because of many other informational inputs. These would include media accounts of new life tables, impressions about the likely effects of good or bad exercise or diet habits, etc. Since Hammermesh did not indicate how such factors and information inputs interacted in explaining his conclusions, it is not useful to conjecture how they might have interacted differently to explain the contrary pattern of life expectancy formation we found in our survey.

III. IMPLICATIONS FOR THE QUALITY OF INTERTEMPORAL CHOICES

Hammermesh did not explicitly cast his article in terms of an inquiry into the rationality of consumer choices, or even the "bounded rationality" of household behavior. However, he does so implicitly when, during his discussion of the research implications of his findings, he states:

"Empirical studies of life-cycle saving, investment in human capital, and labor supply ignore changing life expectancy and its effects on subjective horizons and survival probabilities at the expense of realism, and with the possible price of incorrect behavioral implications. Theoretical studies that treat actuarial data as directly motivating behavior may miss much of the potential richness of their models if they ignore how those data are transformed into the subjective probabilities that are the proximate determinants of the phenomena under study."

In effect, he is criticizing studies of economic behavior that ignore
the prescience of household choice makers, or, in other terms, studies that overstate the bounds on rational behavior or choice making. This assertion does give rise to several questions concerning bounded rationality, i.e., the quality of household decision making in the context of limited information, inaccurate perceptions, and faulty analytic insight. (Simon, 1987)

As we have already shown in the previous sections of this note, it is premature to attribute too much prescience about ultimate life expectancy to households. This in itself raises a bounded rationality problem: in spite of Hamermesh's findings to the contrary, the average household may still be making life cycle decisions based on underestimated ultimate life expectancy. However, there is a broader concern about the quality of such intertemporal choices even if estimates of life expectancy are expectationally consistent as claimed by Hamermesh. A variety of other insights and analytic skills is required to make accurate complex intertemporal choices, the most important of which is the discount rate and the related discounting process. (Johnson, Kotlikoff, and Samuelson, 1987) These additional data and information processing problems involve cognitive limitations that are recognized in the bounded rationality literature. Even in the face of correct anticipation of ultimate life expectancy, these additional empirical and analytic requirements probably contributed to an optiing out rate that may have been in excess of what was optimal on the basis of maximizing life-time consumption. These include:

1. Real Rate of Return on Own Savings: Respondents, on average, indicated a rather high expectation as to the real rate of return they
could achieve on their own retirement saving (4.23%). This may not have been an excessive expectation for 1984, when the opting out choice was made, if a large percentage of assets were held in stocks. However, only 38.3% of our sample directly owned stock or mutual funds and then such holdings averaged a small proportion of their total financial assets. Extrapolation of relatively high real returns may be reflective of cognitive limitations. Historically, returns vary by asset class, but the long term (1926-84) inflation-adjusted yield on government and corporate bonds was less than 1% while that on common stocks was only 6.3%. (Source: Ibbotson and Sinquefield, 1982) The respondent's misperception of long-term yields would have led to excessive opting out rates even if the subjective estimates of life expectancy had been correct, which they were not.

2. Insight Into Return on OASI and C-ERS: As a group, the respondents underestimated the eventual payoff of their contributions to both OASI and C-ERS. In spite of the fact that after-tax retirement income from ERS and OASI together should be close to 100% of pre-retirement after-tax wage income, overall, only 40% of the respondents did not anticipate that the combined OASI and ERS pension benefits would be adequate to meet basic shelter, food, utilities and clothing expenses. Among those who opted out, 47% were not confident that combined benefits from OASI and ERS would meet such needs while 33% of those who stayed in felt this way. Again, this points to a cognitive limitation constraint on rational choice.
IV. CONCLUSION

Our conclusions and their relations to those of Hammermesh can be summarized as follows:

1. The subjective life expectancies of responding males were characterized by demographic consistency, as predicted by Hammermesh. The older the responding male, the greater his ultimate life expectancy. Moreover, the ultimate life expectancies of the responding males in all age categories were below those attributed to that age group in the most recently available life tables.

2. The responding females reported subjective life expectancies that were congruous with Hammermesh's demographic consistency in only one dimension: the ultimate life expectancy of these females increase as their age increased. However, their subjective ultimate life expectancies underestimated by significant margins the objective life expectancies indicated in contemporaneous life tables.

3. Of greater quantitative significance, the subjective ultimate life expectancies of both male and female respondents failed to evidence the expectational consistency predicted by Hammermesh. This is most obvious in the case of females since their life expectancies did not even match current objective life expectancies which are far short of the eventual objective life expectancies that will prevail if secular improvements in mortality experience continue as they have in the past. While consistent with current objective life expectancies, the subjective life expectancies of males did not evidence any anticipation of future improvements in mortality experience. The
underestimation of eventual life spans even by males frequently represents a 30 to 50% shortfall in the estimate of the relevant retirement period.

4. The opting out choices of the majority of respondents to the survey were at best questionable in terms of rationality criteria. This was attributable to the underestimation of eventual life spans, to the overestimation of the discount rate relevant for valuing of costs and benefits over long future time periods, and to misperceptions of the adequacy of public pensions. Even if the responding households had been as informed of the relevant eventual objective life expectancy as predicted by Hammermesh, they would have still made questionable or faulty intertemporal choices in their opting out choice.

5. All of these observations indicate that economists should be restrained in attributing too much information and sophistication to average households in their handling of difficult intertemporal choices. In many ways the discrete opting out choice forced on state-local government employees in Hawaii in 1984 was more tractable than more complex life cycle savings decisions. In any case, the behavior of the these employees in making their opting out choice suggests that the bounds on rationality are more intrusive than Hammermesh may hope for.

FOOTNOTES

1. Hammermesh also finds that while overall life expectancy estimates are accurate, people tend to underestimate the probability of surviving near years and overestimate the probability of surviving later years; i.e. the subjective survival function life flattens
relative to the actuarial survival function. Because of the nature of our survey, we are unable to test this dimension.

2. Since actuarial life tables report no difference in the life expectancies between women active in the labor force and those who are not, the fact that our survey relies exclusively on working women does not explain the below-actuarial life expectancies they report. [See, for example, U.S. Bureau of Labor Statistics, Worklife Estimates: Effect of Race and Education, Bulletin 2254, February 1986.]

3. As noted, erratic behavior in rates of improvement in mortality experience indicated in Table 1 makes it difficult for individuals to extrapolate previous improvements. This same phenomenon makes it difficult for us to specify a point estimate of the rate of improvement that would be plausible. In spite of the secular decline in this rate of improvement, recent rates have been relatively high. The average 1950-1980 annual rates for various age groups ranged from .190 to .397. The rates of improvement for the 1970 to 1980 period ranged from .377 to .512 for the adult age categories considered in Table 3, the most relevant for our purposes. In view of this variance we somewhat arbitrarily select a .2% annual rate of improvement as a plausible lower bound. Recognition of any amount above this rate would obviously strengthen our argument.

4. Respondents were asked to provide an estimate of the nominal rate of return they would expect on an investment and the rate of inflation they expected in the long run. The difference yields their own perceived real return.

REFERENCES


