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The Interaction of Public and Private Insurance: Medicaid and the Long-Term Care Insurance Market

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Abstract: Long-term care represents one of the largest uninsured financial risks facing the elderly in the United States. This paper examines the importance of Medicaid, relative to potential private market failures, in limiting private insurance coverage. We develop an analytical framework to compute a risk averse consumer's willingness to pay for a long-term care insurance policy and calibrate the model using state-of-the-art actuarial data on long-term care utilization probabilities, comprehensive market data on insurance policy characteristics and premiums, and common state Medicaid rules. We find that, given the existence of the public Medicaid program as a payer-of-last resort, individuals throughout most of the wealth distribution would not be willing to pay for either the currently available limited insurance contracts or for comprehensive coverage, *even if prices were actuarially fair*. By contrast, we find that making Medicaid less generous substantially increases the proportion of individuals who are willing to pay for either the currently available, limited policies or for more comprehensive policies, *even at existing prices*. Our findings thus highlight the fundamental role played by Medicaid in limiting demand for private long-term care insurance.

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1. Introduction

Long-term care represents one of the largest uninsured financial risks facing the elderly in the United States today, and yet very little is privately insured. 40 percent of the $100 billion annual expenditures on long-term care are paid for out of pocket. Private insurance reimburses only 5 percent of long-term care expenditures, compared to 35 percent of total health care expenditures (US Congress 2000, National Center for Health Statistics, 2002).

Interestingly, the share of health expenditures for the elderly reimbursed by public insurance programs is quite similar for long-term care expenditures and acute health expenditures, at approximately 50 percent. However, the *structure* of the public health insurance programs is quite different. The public Medicare program provides universal coverage for acute medical expenditures for the elderly, and permits private supplementary insurance policies to fill in for what the public insurance does not cover. By contrast, the public Medicaid program, which is the primary source of public funds for long-term care expenditures, is a payer-of-last resort; it will cover long-term care expenditures only once the individual meets stringent asset and income tests. Moreover, if at that point the individual has private insurance, the private insurance must continue to pay, with Medicaid acting only as a supplement for what is not covered by the private insurance (rather than the other way around).

This paper investigates the relation between the public coverage for long-term care expenditures and the extremely limited size of the private long-term care insurance market. As an imperfect but publicly funded substitute for private long-term care insurance, Medicaid has been suggested as a potential explanation for the limited demand for private insurance (Pauly, 1990). However, other theoretical analysis has suggested that the fundamental cause of the limited private market lies instead in imperfections in the private market itself. Imperfect competition, asymmetric information (both adverse selection and moral hazard), and the difficult-to-insure aggregate risk of medical cost increases have all been proposed as private market failures that may be responsible for the lack of private long-term care insurance coverage (see Norton, 2000 for an extensive review of this literature). Consistent with such private market problems, recent empirical evidence has documented the presence of asymmetric

information in this market (Finkelstein and McGarry, 2003) and shown that existing policies come with substantial pricing loads and offer very limited coverage (Brown and Finkelstein, 2003).

Yet there exists very little evidence with which to distinguish the relative role of the public Medicaid program compared to potential private market failures in contributing to the limited size of the private insurance market. Distinguishing between these two types of explanations has important implications for the structure of the long-term care insurance market and for the efficacy of public policy interventions in this market. For example, were private market problems to be the primary factor behind the limited size of the private market, this might suggest the need for new public policies to address the specific market failures. By contrast, if the public Medicaid program is the primary factor, this might suggest the desirability of alternative designs of the existing public insurance program. Of course we recognize that a variety of other factors – including myopia or the possibility that one could rely on one's children for support – could also play a role in further limiting market demand. The focus of this paper, however, is to determine whether – even absent these factors – correcting potential market failures could stimulate substantial increases in private insurance coverage, or whether the existence of Medicaid as a payer of last resort presents a fundamental impediment to such coverage.

To investigate this, we develop an analytical framework for estimating a 65-year-old risk averse individual's willingness to pay for a long-term care insurance contract. We calculate the dollar-denominated utility gain from following an optimal intertemporal consumption path with private long-term care insurance relative to not having private insurance. The willingness to pay is calculated taking into account the presence of a Medicaid program that provides care only after one meets stringent asset and income qualifications. We parameterize the model using current market loads, actuarial data on the distribution of long-term care expenditure risk, and common state Medicaid rules. The model produces results that are broadly consistent with the empirical patterns in survey data in terms of the limited fraction of the elderly who buy insurance, and the patterns of coverage by gender and by wealth.

We then use the model to answer counterfactual questions about the effect of eliminating potential market failures that might be responsible for high prices and the offering of policies with only limited

coverage, and the effect of altering the public Medicaid program. We examine the effects of such changes on both the proportion of the elderly willing to pay for private policies and the amount of benefit coverage purchased by those who do purchase policies.

We have two primary, and complementary findings. First, we find that even if policies are available *at actuarially fair prices*, individuals throughout most of the wealth distribution prefer either no insurance or policies with extremely limited coverage to fully comprehensive policies. For example, at actuarially fair prices neither the median 65-year old male nor the median 65-year old female is willing to pay for a comprehensive private insurance policy. The median 65-year old male prefers a policy that reimburses less than one-third of his expected present discounted value expenditures, while the median 65-year old female prefers no policy at all. These findings indicate that the existence of Medicaid as a payer of last resort is central to explaining the extremely limited size of the long-term care insurance market and suggest that fixing supply-side market failures is unlikely to be sufficient to substantially alter the role played by private insurance in covering long-term care expenditure risk. For even when we "correct" all the potential private market failures and offer comprehensive policies at actuarially fair prices, most individuals are not willing to buy them in a model with Medicaid.

Our second primary finding is that, by contrast, reducing the generosity of Medicaid can both generate positive willingness to pay for many of the current non-purchasers *and* induce them to demand policies of considerably higher comprehensiveness than existing policies, even at existing prices. The basic intuition for why Medicaid limits demand for more comprehensive insurance relative to more limited policies is that Medicaid provides coverage against financially catastrophic care episodes. Therefore, while a limited private insurance policy may offer benefits that, in the absence of this policy, would be paid for out of pocket, more comprehensive policies offer benefits that are more likely to be duplicative of the coverage offered by Medicaid.

The rest of the paper is structured as follows. Section two provides some brief background on public and private insurance for long-term care expenditures. Section three provides new, detailed data of the distribution of long-term care expenditure risk. These data illustrate the underlying nature of the risk that

might be potentially insured, and are the key input in our subsequent analysis. Section four develops the analytical framework of the paper and discusses our base case parameterization of the model. Section five shows that this model and parameterization yields results that are broadly consistent with the empirical patterns of long-term care insurance coverage in survey data.

Sections six and seven present our principal findings. Section six presents evidence of the willingness to pay for different amounts of private insurance coverage when available at actuarially fair prices. Section seven considers the effect of changing Medicaid on willingness to pay for policies of different comprehensiveness. Section eight shows that these findings are robust to a number of alternative modeling assumptions. The last section concludes.

2. Background: private and public insurance for long-term care expenditures

At $100 billion annually, long-term care expenditures represent 7.5% of total health expenditures *for all* ages and about 1% of GDP (US Congress, 2000). Real long-term care expenditures are projected to *triple* over the next 35 years, as the baby boomers age and medical costs rise (Congressional Budget Office, 1999). Moreover there is considerably variation among the elderly in their long-term care expenditures. For example, we estimate below that although only 40 percent of current 65 year old women will ever enter a nursing home, of those who do, one-in-eight will spend more than 5 years there. This variation suggests a potentially large welfare improvement from insurance coverage.

Yet most of this substantial expenditure risk is uninsured. As a result, 40 percent of long-term care expenditures are paid for out of pocket; this is more than double the proportion of expenditures in the health sector as a whole that are paid for out of pocket (US Congress 2000, National Center for Health Statistics, 2002). This difference stems primarily from a difference in the coverage provided by private insurance. As discussed above, public insurance pays for about half of long-term care and all health expenditures, although the structure of the public insurance is quite different. Because the focus of this paper is the interaction of public insurance with the private long-term care insurance market, this section provides some brief background on the private and public coverage for long-term care insurance.

2.1 The private market for long-term care insurance

The private long-term care insurance market is extremely limited along two different dimensions.[1] First, only 10 percent of the elderly have any private long-term care insurance. Second, those who do have private long-term care insurance have policies that cover only a very limited proportion of expected long-term care expenditures. A policy is purchased for a pre-specified annual nominal premium that will continue throughout the individual's lifetime. The typical policy purchased by a 65-year old (which is roughly the average age of purchase), tends to cover only one-third of the expected present discounted value of long-term care expenditures. This suggests that understanding the reason for the limited coverage offered by existing policies is critical to understanding the limited amount of privately insured expenditure risk. For even if all 65-year olds were to be covered by existing policies, these estimates suggest that only one-third of long-term care expenditure risk would be privately insured.

The primary factor limiting the comprehensiveness of private long-term care insurance policies is that they specify a fixed and binding daily benefit cap that is the maximum amount of incurred expenditures that will be reimbursed per day in covered care. The average maximum daily benefit on long-term care insurance policies sold in 2000 was about $100 per day; maximum daily benefits are typically constant in nominal terms, and thus declining in real terms over time. These daily benefit caps make long-term care insurance policies unique among private health insurance contracts; other contracts specify services that they will cover, sometimes with an overall cap on reimbursements, but not a cap on the amount that will be spent on any given episode or visit. Long-term care insurance policies with caps specified in terms of services or days in care, but not on expenditures per day, are not available in the market.

A variety of private market problems may prevent the *supply* of more comprehensive contracts. For example, it is well known that asymmetric information may result in insurance rationing. This rationing may well take the form of binding maximum payout caps (see e.g. Young and Browne, 1997). In addition, Cutler (1996) has argued that insurance companies' inability to diversify the substantial inter-

[1] This section draws heavily on the evidence presented in Brown and Finkelstein (2003). Substantially more detail on the nature of the private insurance market can be found there.

temporal aggregate risk of dramatically increased long-term care costs (which cannot be diversified through the traditional insurance approach of pooling idiosyncratic risks) results in the specification of binding dollar daily benefit caps which do not expose the insurance companies to this aggregate risk.

In addition, high loads – which may result from imperfect competition, large administrative costs, or asymmetric information – could limit *demand* for more comprehensive contracts. Brown and Finkelstein (2003) estimate loads as high as 70 cents on the dollar for men and 40 cents on the dollar for women.[2] It is also possible that the structure of public insurance limits demand for more comprehensive contracts.

2.2 Public coverage of long-term care expenditures

Medicaid is the primary source of public funds for long-term care expenditures, paying for 44 percent of long-term institutional care expenditures for the elderly (US Congress 2000). Medicaid serves as a payer-of-last resort, imposing stringent income and asset tests that must be met before an individual can receive Medicaid reimbursement. It thus covers an individual's long-term care expenditures only after he has exhausted a substantial portion of his financial resources (AARP, 2000). Moreover, Medicaid is a *secondary payer* relative to any private insurance policy; if the individual has private long-term care insurance, the private policy pays whatever benefits it owes before Medicaid makes any payments.[3]

Medicaid is an imperfect substitute for private long-term care insurance. Medicaid's income and asset eligibility tests impose severe restrictions on an individual's ability to engage in optimal consumption smoothing across care states and over time. In particular, while an individual is receiving care paid for by Medicaid, there are very tight restrictions on the resources that are available for non-care consumption. Moreover, the income and asset spend-down requirements substantially reduce the wealth out of which the individual can consume if he recovers and exits from care, or that he can bequeath upon death.

[2] Loads are substantially higher for men than women because long-term care insurance polices are priced on a unisex basis, but women have substantially higher expected utilization. This unisex pricing pattern is not due to any regulatory restrictions. Indeed, pricing is largely unregulated in this market. Nonetheless, companies price based on very little information – typically age and a few broad health categories – and do not experience rate their policies.

[3] Medi*care* (the public health insurance program for the elderly) covers an extremely limited amount of long-term care expenditures. In those limited cases, Medicare is a *primary payer* for such expenditures, meaning that any care that is eligible for Medicare is not reimbursed by private insurance. Medicare does not cover the type of long-term nursing home stays covered by private long-term care insurance. While it does cover 30% of home health care costs, these Medicare expenditures constitute only about 7 percent of total long-term care expenditures (US Congress, 2000). This coverage is taken into account in our analysis, as described in more detail in Section 4.2.

Even so, an imperfect but publicly funded substitute has the potential to substantially reduce demand for private insurance coverage. Indeed, Pauly (1989, 1990) has shown in a highly stylized model that the existence of Medicaid as an imperfect but publicly funded substitute for private long-term care insurance has the potential to substantially reduce demand for private insurance. Whether Medicaid is, *in practice*, an important factor limiting private insurance coverage is an open question for at least two reasons.

First, evidence from related insurance markets of the effect of public insurance on private insurance demand is mixed. On the one hand, there is evidence that Medicaid has a substantial crowd-out affect on demand for private insurance for acute medical care among working-age individuals (Cutler and Gruber, 1996). On the other hand, there is little evidence that public insurance crowds out demand for private insurance for the elderly. For example, Mitchell et al. (1999) find that the presence of publicly provided annuities through Social Security is not sufficient to explain the absence of private annuities, and Finkelstein (forthcoming) finds that public Medicare coverage for acute medical expenditures for the elderly does not crowd-out private insurance coverage to supplement the gaps in Medicare coverage.

Second, even if Medicaid has a substantial effect on private insurance demand, it is unclear whether substantially reducing Medicaid would be sufficient to stimulate substantial private insurance coverage or whether a host of other factors may also substantially restrict insurance demand. For example, recent research has shown that pricing loads in the private market are quite high, especially for men (Brown and Finkelstein, 2003), a fact that could limit demand even if Medicaid were made less generous.

3. The distribution of long-term care utilization risk

3.1 Data

In order to compute a risk averse consumer's willingness to pay for a long-term care insurance contract, it is necessary to have extremely rich and detailed data on long-term care utilization. While there exist excellent published studies estimating nursing home utilization (see e.g. Dick et al. 1994, Kemper and Murtaugh, 1991, Murtaugh et al. 1997, and Society of Actuaries 1992), they do not characterize the full distribution of nursing home utilization. Moreover, we know of no existing studies

that characterize the full set of transition probabilities across different types of care. Most long-term care insurance policies cover not only nursing homes, but also assisted living facilities and home health care (HIAA 2000a). We therefore require detailed information on the full distribution of transitions across all of these care states, as well as the states of "no care" and of death.

In this study, we make use of a "state of the art" model of transitions across states of care that was developed and provided to us by Jim Robinson, a former member of the Society of Actuaries' long-term care insurance valuation methods task force (Society of Actuaries, 1996).[4] This model uses data from the 1985 National Nursing Home Survey, and the 1982 through 1994 waves of the National Long Term Care Survey to produce estimates of age- and gender-specific Markov transition probabilities across five care states (no care, home care, assisted living, nursing home, or death). The model also produces estimates of the number of hours of skilled home care and unskilled home care provided during a home care episode. These estimates are designed to be representative of the entire population.[5]

The model has a very strong pedigree. Versions of the model have been used by insurance regulators, private insurance companies, state agencies administering public long-term care benefit programs, and the Society of Actuaries LTC Valuation Methods Task Force (Robinson, 2002). We spoke with numerous actuaries in consulting firms, insurance companies, and the Society of Actuaries who confirmed that the model is widely used to price long-term care insurance policies and that it is very highly regarded. We also independently verified the quality of the model by confirming that it produces estimates that are consistent with published estimated, where comparable (see Brown and Finkelstein, 2003 for details).

3.2 Descriptive statistics on the distribution of long-term care utilization

Table 1 presents some summary statistics on care utilization in the Robinson model for 65-year old men and women. To make the statistics relevant for someone's long-term care insurance policy, the

[4] Readers interested in a more detailed description of the model are encouraged to consult Brown and Finkelstein (2003) and especially Robinson (1996).

[5] The estimates do not incorporate any projected changes in morbidity or care utilization; this is standard practice for the industry (see e.g. Tillinghast-Towers Perrin, 2002) and for academic research (see e.g. Wiener et al. 1994). It reflects the substantial disagreement in the literature over the *sign* of projected changes in morbidity (compare e.g. Manton et al. 1997 and Manton and Gu 2001 to Lakdawalla et al., 2001) or in care utilization conditional on morbidity (compare e.g. Lakdawalla and Philipson, 2002 to CBO 1999).

statistics are all based on a version of the model that assumes that the individual is medically eligible for private long-term care insurance at 65; this requires that they have no limitations to activities of daily living and not be cognitively impaired (over 98 percent of 65 year olds meet this requirement). It also counts care utilization only if the individual meets the health-related benefit triggers for the long-term care expenditures to be reimbursable by private insurance.[6]

Table 1 indicates that a 65-year old man has a 27% chance of ever using nursing home care, a 12% chance of ever using an assisted living facility, and a 29% chance of ever using home care. The probability of using any type of care is substantially higher for women (44%, 20%, and 35% respectively). Women who use care also tend to spend longer there than men who use care; for example, men who enter a nursing home spend on average 1.3 years there, while women spend on average 2 years.[7]

There is a non-trivial right tail of the time-in-care distribution, particularly for women. Men who enter a nursing home have only a 5 percent chance of spending more than 5 years in a nursing home, while women have a 12 percent chance. These statistics indicate that there are potentially large welfare gains from insurance that reduces the considerable variance in long-term care expenditure risk.

There is also substantial churning across types of care and, relatedly, exit from care for reasons other than death. For example, a man who uses a nursing home has a 55% chance of also using home health care (results not shown). In addition, almost two-thirds of individuals who use a nursing home will at some point leave the nursing home alive; this is consistent with other studies (e.g. Dick et al. 1994) that indicate a substantial amount of recovery from nursing home care.

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[6] Presumably to reduce moral hazard, long-term care insurance policies specify health conditions (known as "benefit triggers") that must be satisfied in order for the individual to be eligible to receive benefits for care covered by the policy. The most common benefit triggers require that the individual must either need substantial assistance in performing at least 2 of 6 activities of daily living (ADLs) and assistance must be expected to last at least 90 days, or the individual must require substantial supervision due to severe cognitive impairment See Brown and Finkelstein (2003) for further details. We estimate in the Robinson data that most care used meets these health requirements. For example, the probability of ever using nursing home care for a 65 year old man is 27% for benefit-eligible care compared to 30% for any care. For women, these numbers are 44% and 47% respectively.

[7] In results not shown, we find that the difference in care utilization for men and women is partly – but not entirely – explained by women's longer longevity. The probability of care use increases substantially with age; for example, a 65-year old man who survives until age 90 sees his lifetime probability of nursing home use rise from 27 percent to 46 percent. However, we also find that among individuals who survive until age 80, women are over 40 percent more likely to have used care prior to age 80 than men.

These findings underscore the importance of having a rich source of transition and utilization data. The fact that there is a substantial amount of exit from care also underscores the potential cost to the individual of Medicaid's spend-down rules. If an individual relies on Medicaid to pay for care, then upon exit, she will have very little in the way of financial wealth to supplement her income used to pay for post-care consumption. These considerations, combined with the large degree of uncertainty about future long-term care utilization facing a current 65-year-old, are critical determinants of an individual's willingness to pay for private insurance.

4. An analytical framework for assessing the willingness to pay for long-term care contracts

This section describes the analytical framework we develop to estimate how much a risk-averse life-cycle consumer would be willing to pay, over and above the required premiums, for a long-term care insurance contract that offers a specific set of benefits with a particular load. To do this, we consider an individual at age 65 who chooses a consumption path to maximize remaining expected lifetime utility subject to a budget constraint. We first calculate the maximum expected lifetime utility that can be achieved when the individual purchases a particular long-term care insurance contract. We then "take away" this insurance contract and find the increment to financial wealth such that, when the individual follows their new optimal consumption path, the individual achieves the same level of expected lifetime utility that they had when they were insured.[8]

This approach allows us to put a dollar value on the utility gains from insuring against long term care expenditure risk. We refer to this as an individual's "willingness to pay" for the insurance above and beyond the required premium payments. It is roughly analogous to an equivalent variation measure in applied welfare analysis, although our measure captures discrete changes in insurance status rather than a marginal price change. A positive value suggests that the ability to purchase the long-term care insurance

[8] While our base case models a unitary decision maker, one of our many sensitivity checks in Section 8 and appendix A also considers the case of a household utility function that models the joint consumption decisions of a husband and wife and calculates the utility gains from having each spouse purchase insurance relative to not purchasing insurance. We find that within-household risk sharing and more generous Medicaid rules for married couples lead to an even lower valuation of private long-term care insurance than in our base case.

contract is welfare enhancing, while a negative value indicates that the purchase of the insurance contract would reduce utility. There is a large literature that calculates similar measures of the willingness to pay for annuities (e.g., Kotlikoff & Spivak 1981, Mitchell et al 1999, Davidoff et al., 2003). This present study represents, to our knowledge, the first such analysis of the market for long-term care insurance.

4.1 The basic model

At the core of the model is a 65 year old with a stock of financial wealth and a predetermined stream of annuity payments (e.g., from Social Security) who maximizes expected lifetime utility by choosing an optimal consumption path. This individual faces two sources of future uncertainty: long-term care expenditures and mortality. In particular, in each period the individual may be in one of five possible states of care (s): at home receiving no care, at home receiving paid home health care (denoted "hhc"), in residence at an assisted living facility ("alf"), in residence in a nursing home ("nh"), or death.

When alive, the individual derives utility from real consumption $C_{s,t}$. Following Pauly (1989, 1990), we also allow for the possibility that the individual derives some consumption value from long-term care, such as from the provision of food or shelter that would otherwise need to be funded out of an individual's income or wealth. We denote the consumption portion of long-term care expenditures by $F_{s,t}$. While Pauly (1989, 1990) was primary concerned with institutional care, our model also allows for the possibility that some portion of the expenditures spent on home health care (e.g., help with shopping and cooking) also provides direct consumption value.

Our framework also allows us to capture the fact that – for a variety of possible reasons – individuals may get less utility from care paid for by Medicaid than care paid for by private payers, and that this should increase their willingness to pay for private long-term care insurance.[9] We denote the consumption value of care financed from public payers *relative* to the consumption value of care financed by private players by α_s. Thus $\alpha_s = 1$ when care is paid from private resources and $0 \le \alpha_s \le 1$ when care is paid by Medicaid. A low value of α_s when care is paid for by Medicaid indicates a low

[9] We discuss some of these reasons in more depth in Section 8.2

consumption value of publicly-funded care relative to privately-funded care.

Utility when alive is denoted U_s where the subscript s denotes the individual's state of care. Thus the individual's utility function while alive is given by: $U_s\left(C_{s,t} + \alpha_s * F_{s,t}\right)$, where $F_{s,t}$ denotes the consumption portion of long-term care expenditures and α_s may vary depending on whether the care is paid for by private or public funds. Note that when the individual receives no care, $F_{s,t}$ is equal to zero, so that utility is defined solely over ordinary consumption. Our model also allows us to consider utility from bequests at death, defined as a function of non-annuitized wealth remaining at the time of death.

The individual's value function $V_{s,t}(W_t; A)$ denotes the individual's maximum expected discounted lifetime utility at period t from following an optimal consumption path, given that the individual is in care state s and period t. W_t is financial wealth at time t, and A is a Tx1 vector of annuity payments, such as from Social Security. Using standard dynamic programming techniques (e.g. Stokey and Lucas, 1989), we are able to define $V_{s,t}(W_t; A)$ recursively in the form of a Bellman equation, discretize the relevant state (financial wealth), and solve for the optimal consumption path iteratively from the final period (T) back to the beginning. Note that $V_{5,t+1}$ is the utility the individual in period t expects if he or she dies in the next period, i.e., a bequest function.

Formally, the recursive Bellman equation is:

$$\underset{C_{s,t}}{Max} V_{s,t}\left(W_t; A\right) = \underset{C_{s,t}}{Max} U_s\left(C_{s,t} + \alpha_s * F_{s,t}\right) + \sum_{\sigma=1}^{5} \frac{q_{t+1}^{s,\sigma}}{\left(1+\rho\right)} V_{\sigma,t+1}\left(W_{t+1}; A\right) \qquad (1)$$

All values are expressed in real terms. ρ is the discount rate. We denote by $q_{t+1}^{s,\sigma}$ the conditional probability that an individual who is in care state *s* at time *t* is in care state σ at time t+1. We define t in terms of months, and we assume a maximum lifespan of 105 years, so that T=480 months.

The individual chooses an optimal consumption path to maximize the value function in equation (1) subject to three constraints: (i) an initial level of non-annuitized financial wealth, W_0, and a given trajectory of annuitized income, A; (ii) a no borrowing constraint (imposed to eliminate the possibility that the individual may die in debt), and (iii) the wealth accumulation equation. In the absence of

Medicaid, the wealth accumulation equation is:

$$W_{t+1} = \left(W_t + A_t + \min\left[B_{s,t}, X_{s,t}\right] - C_{s,t} - X_{s,t} - P_{s,t}\right) \cdot \left(1 + r\right) \qquad (2)$$

In other words, wealth next period is simply wealth this period plus inflows (income and insurance payments) minus outflows (consumption, care expenditures, and premium payments) plus interest. As described in Section 2.1, the long-term care insurance policy pays a benefit equal to the lesser of the per-period benefit cap ($B_{s,t}$) and the actual costs incurred ($X_{s,t}$). It charges a monthly insurance premium of $P_{s,t}$ that is fixed in nominal terms and is paid only in states in which the individual is not receiving benefits. We assume that once an individual purchases a LTC policy, she holds it until death. When the individual has no insurance, $B_{s,t}=P_{s,t}=0$. Unconsumed financial wealth accumulates at the real interest rate r.

Constraint (2) shows how financial wealth evolves in a world where the individual is solely responsible for his own care. In practice, however, if an individual is receiving paid care and meets certain state-specified income and asset tests, his care will be paid for by Medicaid. These payments alter the wealth accumulation equation (2) above. Medicaid, as discussed, is a secondary payer that covers care once an individual has met certain income and asset tests. To be eligible for Medicaid reimbursement, the individual must be (i) be receiving care, (ii) meet the asset test (i.e., must have $W_t < \underline{W}$, where $\underline{W}$ is the asset test cutoff), and (iii) meet the income test. The income test requires that the income from the annuity A_t, plus any insurance benefits $\min[B_{s,t}, X_{s,t}]$, minus the actual care expenditures $X_{s,t}$, be less than the co-payment rate, which we denote as $\underline{C}_s$. If a person is eligible, Medicaid pays an amount equal to $X_{s,t} - \left(A_t - \underline{C}_s\right) - \min(B_{s,t}, X_{s,t}) - \max(W_t - \underline{W}, 0)$. In words, Medicaid pays for all expenses ($X_{s,t}$) that are not covered by current income over the disregard level ($A_t - \underline{C}_s$), private insurance ($\min(B_{s,t}, X_{s,t})$), or wealth over the asset test limit ($\max(W_t - \underline{W}, 0)$.

Using these relations, we can re-write the wealth accumulation equation that applies when the individual is receiving Medicaid as follows:

$$W_{t+1} = \left[W_t - \max(W_t - \underline{W}, 0) + \left(\underline{C}_s - C_t\right)\right]\left(1 + r\right) \qquad (3)$$

In other words, when on Medicaid in period t, wealth carried into period t+1 will be equal to the wealth in period t, minus any wealth that Medicaid rules required be used for period t care ($\max(W_t - \underline{W}, 0)$), plus any saving the individual does out of their income disregard level $\left(\underline{C}_s - C_t\right)$.[10]

We will show below that these Medicaid asset and income tests are important determinants of the value of private insurance. With more generous program rules (i.e., higher $\underline{C}_s$ and $\underline{W}$), Medicaid is a more attractive substitute for private long-term care insurance, and thus the willingness to pay for private insurance declines. Similarly, with stricter rules, private insurance becomes more attractive.

4.2 Data and Initial Parameterization

To solve the utility maximization problem (1) subject to the relevant constraints, we assume a constant relative risk aversion (CRRA) utility function. A long line of simulation literature (Hubbard, Skinner, and Zeldes 1995; Engen, Gale, and Uccello 1999; Mitchell et al 1999; Davis, Kubler, and Willen 2002; and Scholz, Seshadri, and Khitatrakun 2003) uses a base case value of 3 for the risk aversion coefficient. However, a substantial consumption literature, summarized in Laibson, Repetto & Tobacman (1998), has found risk aversion levels closer to 1, as did Hurd's (1989) study among the elderly. Given this, we will report most results for risk aversion levels of 1, 2, and 3. Recognizing that still other papers report higher levels of risk aversion (e.g., Barsky et al 1997, Palumbo 1999), we also explore the sensitivity of our results to even higher levels of risk aversion.

We initially examine a private insurance policy that covers all three types of care with no deductible, an unlimited benefit period, and offers a constant nominal maximum daily benefit of $100. A $100 constant nominal daily benefit is about average for policies bought in 2000 (HIAA 2000a).

For the loads on the policy, we start with 0.50 for men and –0.06 for women. These loads indicate that on average, a man (woman) gets back 50 cents ($1.06) in EPDV benefits for every dollar paid in EPDV premiums. These are the lower bound of the estimates in Brown and Finkelstein (2003) of current

[10] In practice, there will be little incentive to save out of the income disregard because if the person is in care in period t+1, any such savings would be implicitly taxed away at a 100% rate by the t+1 asset test.

market loads and correspond to an annual premium of $1,816.[11]

For the transition probabilities $q_{t+1}^{s,\sigma}$, we use the age- and gender-specific transition probabilities described in detail in Section 3. As noted, these estimates are designed to be representative of the general population. We use the same estimates when estimating maximum lifetime utility achievable with and without private insurance, an assumption supported by empirical evidence indicating that care utilization rates for insured individuals are indistinguishable from those for the population at large (Society of Actuaries, 2002; Finkelstein and McGarry, 2003).

Data on average national daily care costs for nursing homes, assisted living facilities, and home health care $(X_{t,s})$ are taken from Metlife Market Survey data (MetLife 2002a, MetLife 2002b).[12] The national average daily cost of nursing home care in 2002 is $143 per day for a semi-private room (private rooms are more expensive), and thus already above the $100 maximum daily benefit. By contrast, care costs for an assisted living facility are on average less than a $100 benefit cap, at $72 per day. Home health care is by far the least expensive type of care, and accounts for only one-quarter of total long-term care expenditures (US Congress, 2000). We estimate that even a current 90 year old male (female) in home health care would only incur, on average, $30 ($45) per day of insurable home health care costs. Furthermore, we multiply estimated home health care costs by 0.65 to reflect that fact that Medicare will reimburse 35 percent of these home health care costs, whether or not the individual has private insurance, and thus the individual will never be exposed to these expenditures (Brown and Finkelstein, 2003).

We project forward these estimates of 2002 long-term care costs using the general industry consensus that, because the primary cost for all of these types of care is the labor input, costs will grow at the rate of real wage growth (Wiener et al. 1994, and conversations with industry officials).[13] We use the Wiener et

[11] Brown and Finkelstein (2003)'s lower bound estimate is about 0.50 for men and a little better than actuarially fair for women. We set to –0.058 for women so that the premium is the same for men and women.
[12] These data were collected in order to determine pricing for the new federal long-term care insurance program, and were in fact used for that purpose. The survey covers all 50 states and the District of Columbia.
[13] The image of an individual in a nursing home hooked up to many machines is in fact a tiny share of the nursing home population. As Wiener et al. (1994) note, "long-term care is extremely labor intensive, and much of it involves hands-on, personal services, where opportunities for substantial gains in productivity are few."

al. (1994) and Abt (2001) assumption of 1.5 percentage point annual real growth in care costs. We assume the real interest rate, discount rate, and inflation rate are all set equal to 0.03 annually.[14] Given all these parameters, we estimate that the minimum amount of financial wealth needed in the absence of any payer of last resort to be absolutely certain that long-term care expenditures could not completely exhaust one's resources is $1.55 million.[15]

For the food and housing consumption value when in facility-based care (i.e. $F_{alf,t}$ and $F_{nh,t}$), we use the monthly amount ($513) that the Supplemental Security Income (SSI) program pays to a single, elderly individual in 2000. We choose this value since SSI is designed to provide a minimum subsistence level of food and housing. Our base case assumes no consumption value from home health care expenditures (i.e. $F_{hhc,t} = 0$) since, unlike facility-based care expenditures, home health care expenditures do not substitute for food or rent that must otherwise be purchased.

For our base Medicaid parameterization, we choose eligibility rules that are very strict in terms of their income and asset requirements for eligibility.[16] By doing so we make Medicaid a less attractive substitute for private insurance and bias ourselves against finding a substantial crowd-out effect of Medicaid. Specifically, we use the rules for a single individual. This is a conservative assumption that will make Medicaid appear to be a less attractive substitute for private insurance because it ignores the much larger asset and income disregards permitted when there is a community-based spouse. We use the modal state rules in 1999 which imposed a deductible of all but $2,000 of one's assets (i.e. $\underline{W} = \$2000$), and a co-payment of all but $30 per month of one's income (i.e. ($\underline{C}_{alf}, \underline{C}_{nh}$) = $30) before it would cover institutional care for a single individual.[17] These parameters are on the low end of the states' disregards, even for individuals; again, we choose them to bias ourselves against finding that Medicaid is an

[14] These are all fairly standard assumptions in the literature ((Hubbard, Skinner, and Zeldes 1995; Engen, Gale, and Uccello 1999; Mitchell et al 1999; and Davis, Kubler, and Willen 2002).
[15] This is the amount needed in the extremely unlikely "worst case" outcome that an individual enters a nursing home at age 65 and remains in it until death at the maximum age of 105.
[16] All of the information in this paragraph is from AARP (2000).
[17] By way of contrast, the modal state asset disregard when the individual has a community-based spouse is over $80,000.

attractive substitute for private insurance.[18] For home health care, the same asset test applies, but we set the income disregard ($\underline{C}_{hhc}$) considerably higher, at $545 per month, to reflect the fact that the individual is permitted to keep a higher level of income when in home care than in institutional care in order to meet day-to-day living expenses. Again, this choice is on the restrictive end of the spectrum.

Our base parameterization thus represents a more restrictive set of Medicaid rules than typically apply. However, in one respect we may be overstating the generosity of Medicaid. Although all states currently provide home care benefit under Medicaid, these benefits are not an entitlement the way that nursing home care is; states set enrollment caps and these may bind. In the sensitivity analysis in Section 8, we investigate alternative specifications designed to capture the fact that Medicaid may not always cover home health care – and that individuals may prefer receiving care at home to receiving it in an institution. Our basic results are not sensitive to these alternative specifications.

More generally, our base case is intentionally designed to abstract from the large number of parameters over which there is considerable uncertainty. Therefore, the initial parameterization assumes state independent utility $(U_s = U \; \forall \; s)$, no consumption value for home health care ($F_{hhc,t} = 0$), no difference in the consumption value of care provided by public and private payers $(\alpha_s = 1 \; \forall \; s)$, no bequest motives, no role for family members in providing home health care, and no within-household risk sharing. In Section 8 we relax each of these assumptions in turn and conclude that our core findings are not sensitive to these alternative models.

5. Willingness to pay: basic findings.

In this section we present the initial findings of the model, with the parameterization described above, for various points in the wealth distribution. The key finding of this section is that the model produces results that are broadly consistent with survey data in terms of the limited fraction of the elderly who buy insurance, and the patterns of coverage by gender and by wealth. This gives us confidence to use the

[18] Of the 15 states that had a different asset disregard , 11 had a higher level (ranging from $2,500 to $5,000); all of the 30 states that had a different income disregard had a higher income disregard (that ranged from $35 to $75).

model to investigate counterfactual questions about the impact of changes in prices, benefit structure, and the structure of Medicaid on private insurance coverage.

We calculate the willingness to pay for 65-year old men and women at each decile in the wealth distribution. Our estimate of the wealth distribution is based on a sample of individuals who are 65 in the 1996, 1998 or 2000 Health and Retirement Survey (HRS).[19] Total wealth is defined as the sum of financial wealth (which excludes housing wealth and any annuitized wealth) and annuitized wealth. Annuitized wealth is defined as the sum of the present discounted value of Social Security benefits and defined benefit pension wealth, which are calculated using the Social Security and pension calculators from Coile & Gruber (2000). All wealth measures are computed on a household basis, and converted to individual wealth levels using an equivalence scale approach.[20] The results are shown for men and for women in Figures 1 and 2 respectively.[21] Table 2 provides the exact numbers underlying the figures. As in all subsequent tables, positive willingness to pay estimates are shaded gray.

According to this model, most individuals throughout the wealth distribution are not willing to pay for this long-term care insurance policy at existing prices. This is consistent with the high non-purchase rate (90 percent) among the elderly population found in survey data. The ability of the model to replicate the basic stylized fact on coverage is particularly noteworthy given the inability of standard models to explain the level of insurance purchases in other related markets, such as life insurance (e.g. Auerbach and Kotlikoff, 1991) and annuities (Mitchell et al, 1999).

For example, at risk aversion of 3, private insurance only becomes attractive at the 70th percentile for men and the 60th percentile for women.[22] At lower levels of risk aversion, the negative willingness to pay

[19] We are extremely grateful to Courtney Coile and Josh Rauh for their help constructing these estimates in the HRS.
[20] We assume an equivalence scale of 1.25, where 1 implies perfect economies of scale and 2 implies no economies of scale in household consumption. The existing literature (Citro and Michael 1995; Jorgenson and Slesnick 1997) generally finds higher equivalence scales. Our assumption is thus conservative, in that it biases up and individual's "effective wealth" and thus our estimate of willingness to pay for private long-term care insurance.
[21] These figures report results starting at the 30th percentile of the wealth distribution. This is because at lower points in the wealth distribution, the welfare effect of a forced purchase of long-term care is worse than losing all of the individual's limited financial wealth.
[22] We ascertained (in results not shown) that the negative willingness in the bottom half of the wealth distribution persists at substantially higher risk aversion levels at well. For example, at the fourth decile, it is not until risk

extends much farther up the wealth distribution; indeed, with log utility (CRRA = 1), even a male or female at the 90th wealth percentile would find the purchase of the policy welfare reducing. Moreover, all of these results are based on the lower bound estimates of loads from Brown and Finkelstein (2003) of 0.50 for men and –0.06 for women. If instead we use the higher (upper bound) estimates of 0.70 for men and 0.40 for women, we find (in results not reported) that even at risk aversion 3, men and women do not have a positive willingness to pay until the 80th percentile.

To get a sense of the interpretation of the willingness to pay estimates, consider the estimate for a male at the 50th percentile of the wealth distribution with risk aversion of 3. He has a willingness to pay (over and above the required premiums) of -$11,412. This means that if the individual were forced to purchase the given policy at existing prices, it would reduce his welfare the same amount as a loss of $11,412 in financial wealth. This is a significant welfare loss, both relative to the individual's total wealth (approximately $222,500) and relative to the expected present discounted value of premiums paid by this individual for this policy (approximately $16,260).

Our results suggest that, given the features of private insurance contracts and the structure of public insurance, most risk-averse life cycle consumers would not be willing to pay for private insurance. We now investigate whether this limited willingness to pay primarily reflects supply-side market failures that could raise the loads and reduce benefit comprehensiveness of the available contracts, or whether it primarily reflects limitations in demand due to the public Medicaid program. We approach this problem in two complementary ways. In Section 5 we hold the structure of Medicaid constant and examine the willingness to pay for actuarially fair, comprehensive insurance. In Section 6, we hold constant the loads of existing insurance and examine the willingness to pay if Medicaid is made less generous.

Before proceeding with this analysis, it is worth noting that the basic results of the model presented thus far already suggest a large effect of Medicaid on the demand for private long-term care insurance. First, willingness to pay is negative for women for most of the wealth distribution *despite* prices that are

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aversion reaches 8 for men and 10 for women that the individual has a positive willingness to pay for the contract; at the fifth decile, risk aversion of 5 is required.

lower than actuarially fair (i.e. negative loads). This suggests that Medicaid is severely curtailing at least the women's demand for private long-term care insurance, because in the absence of Medicaid, we would expect a risk averse individual to be willing to pay something above actuarially fair prices for insurance.

Second, willingness to pay becomes positive for men and women at a given risk aversion level at basically the same point in the wealth distribution. This finding of the model is consistent with the empirical evidence that long-term care insurance coverage rates are comparable for men and for women (Brown and Finkelstein, 2003). Similar coverage rates and willingness to pay might both seem surprising, given that unisex pricing results in substantially higher loads on policies for men than for women. An offsetting factor that can help explain this finding is that, because their expected lifetime utilization of long-term care is greater, women are even more likely than men to end up on Medicaid with or without private insurance, and thus the implicit tax Medicaid places on private insurance payments decreases the willingness to pay for women relative to men.

Finally, we find that willingness to pay rises monotonically with wealth for both men and women. Again, this finding of the model is consistent with the empirical distribution of long-term care insurance coverage, which also rises substantially with wealth (Brown and Finkelstein, 2003). However, in the absence of Medicaid, CRRA utility implies that willingness to pay to insure against a fixed loss distribution should be decreasing with total wealth.[23]

6. Correcting potential market failures: How much insurance coverage can this stimulate?

There are two aspects of the private insurance contract studied in Table 2 that may be reducing the individual's willingness to pay. First, for men there is an enormous load (i.e. markup) on the contract. Second, the $100 daily benefit cap results in an insurance policy that is far from comprehensive. As we

[23] The existence of Medicaid suggests that the relationship between willingness to pay and wealth should in fact be an inverted U-shape; those at the low end of the distribution may not find it valuable due to the existence of Medicaid while those at the high end may be able to self insure. We believe this pattern is not observed in empirical survey data simply because the "peak" in insurance value occurs in practice extraordinarily high up in the wealth distribution. For example, we have confirmed that willingness to pay for insurance is still rising with wealth – albeit at a diminishing rate – as total wealth levels as high as $3 million.

discussed at the outset, there are a variety of supply-side market failures – such as asymmetric information and imperfect competition – that could be responsible for this limited comprehensiveness and the high loads. We do not specify the particular market failure(s) that may be involved. Rather, we examine the willingness to pay for hypothetical contracts that might be available in the absence of such failures, namely, *actuarially fair* contracts, and *comprehensive* private insurance contracts.

We begin in Table 3 by replicating the analysis in Table 2 of the willingness to pay for policies with a $100 daily benefit, except that we now make the policies actuarially fair. Of course, for women, willingness to pay goes down, since the current market loads used to calculate willingess to pay in Table 2 are actually better than actuarially fair for women (i.e. –0.06 rather than 0).

The results for men are more interesting. Here, we have reduced the load substantially – from 50 cents on the dollar to 0 – thus cutting annual premiums in half from $1,816 to $908. Now the median male is just willing to pay for private insurance, but only at risk aversion of 3, and the value is quite low.[24] Moreover, this reduction in load seems substantially greater than what public policy is likely to accomplish. By way of comparison, we estimate that, even under generous assumptions, the recently-introduced federal tax subsidies for employer-provided long-term care insurance (Wiener et al., 2000) could only reduce the load on the policy to 0.17 for men.[25] At this load, willingness to pay remains negative for the median male, even at risk aversion 3.[26]

Of course, although we have made the policies actuarially fair, they provide very little insurance. Because of the $100 daily benefit cap, the policy covers only about two-fifths of the expected present discounted value of long-term care expenditures. This is because at the expected age of entry into care (see Table 1), $100 is only two-thirds of daily assisted living facility costs and one-third of daily nursing

[24] An alternative way to do this exercise is – recognizing that policies are priced on a unisex basis – to make the premiums actuarially fair on average but to keep prices unisex. In this case the loads are reduced for men from 50 cents to 36 cents and for women from minus 6 cents to minus 36 cents. In this case, we find even less of an effect of the subsidy. Specifically, it is not until the 60th percentile that the median male or female is willing to purchase the policy, even with risk aversion of 3.

[25] This assumes that the employer pays all of the premiums, that the incidence of the subsidy is fully on the employee, and that the median individual has a marginal tax rate of 27.5 percent.

[26] This same exercise suggests that the load on the policy for women would fall to –0.76. We estimate that even at that level, willingness to pay for the median woman remains negative.

home costs.[27] Since the value of an insurance contract stems from its ability to improve consumption smoothing by reducing uncertainty, the limited coverage offered by the policy studied may not provide enough consumption smoothing to be welfare enhancing, especially given above-actuarially fair pricing.

An important question therefore is whether individuals would be willing to pay for more comprehensive contracts if they were made available. Table 4 therefore repeats the analysis in Table 3 for actuarially fair policies with no daily benefit cap. These "uncapped" policies offer comprehensive, full insurance. The results are striking and represent a key finding of our paper: *even if we eliminate all potential market failures and make fully comprehensive policies available at actuarially fair prices, most individuals would still be unwilling to pay for these policies*. For example, at risk aversion levels of 3, willingness to pay for an actuarially fair comprehensive policy is not positive for men until the 60th percentile and for women until the 70th percentile; at risk aversion of 1, willingness to pay does not become positive for either men or women until the 90th percentile.

We also demonstrate a second, related finding. At actuarially fair premiums, not only are most individuals not willing to pay for an uncapped full insurance policy, but they are *less willing to pay for an uncapped policy than for a more limited (capped) policy.* In other words, at actuarially fair prices, most individuals desire very low coverage. To illustrate this, Figures 3 and 4 graph the willingness to pay at different daily benefit levels for an actuarially fair policy for the median woman and man (respectively) with risk aversion 3. These figures indicate that the willingness to pay for an uncapped policy is over twice as negative as the willingness to pay for the same policy with a $100 daily benefit cap.[28]

Indeed, Figure 3 shows that, at actuarially fair prices, the median female with risk aversion of 3 has a negative willingness to pay for all positive daily benefit levels. Moreover, willingness to pay decreases monotonically in the benefit level, so that the woman is least unhappy buying the smallest amount of

[27] Nonetheless, it is slightly *more* comprehensive than typical policies bought in 2002 which tend to have similar daily benefit levels but also some deductibles and limited benefit durations that further reduce the comprehensiveness to about one-third (Brown and Finkelstein, 2003).

[28] In results not reported, we examined these results at higher levels of risk aversion. For the median female, we find that it is not until risk aversion of 7 that the willingness to pay for an uncapped policy is higher than the willingness to pay for the $100 daily benefit policy (although both are still negative). For the median male, we find that at risk aversion of 4, the uncapped policy is just barely preferred to the policy with a $100 daily benefit cap.

insurance possible. Even at actuarially fair prices she is not willing to pay for a very small policy; given that the first unit of insurance is generally thought to be the most valuable, this is particularly striking.

Figure 4 shows that for the median male with risk aversion of 3, the willingness to pay for an actuarially fair policy is highest for a $55 per day constant nominal benefit cap; such a policy covers only 30 percent of expected present discounted value of expenditures. Thus even if we made actuarially fair policies available at any comprehensiveness level, the median male would only want to buy a policy covering less than one-third of expenditures. Thus although the results in Table 3 indicated that the median male has a positive willingness to pay for an actuarially fair policy with a $100 daily benefit cap, Figure 4 indicates that in fact his preferred policy at actuarially fair prices covers less than half as much.

This preference of the median individual for capped relative to uncapped policies even at actuarially fair prices highlights an important impact that Medicaid can have – even when market failures are corrected –in reducing not just the proportion of the elderly who are willing to pay for private insurance, but also the amount of insurance individuals demand. The intuition for our finding that Medicaid reduces the value of comprehensiveness is that a more comprehensive policy provides coverage that is more redundant of what Medicaid would otherwise provide. In other words, conditional on being eligible for the benefits offered by a comprehensive (uncapped) policy but not by a limited (capped) policy, the individual has to have substantial long-term care expenditures; but it is precisely in such catastrophic cases that Medicaid will provide coverage. By contrast, a limited private insurance policy is more likely than a comprehensive policy to offer benefits that, in the absence of this policy, would be paid for out of pocket rather than by Medicaid. For example, even a $25 constant nominal daily benefit would be sufficient to cover all of a 65-year old man's home health care expenditures for the first 15 years of the policy. It is unlikely that such expenditures alone would qualify a median-wealth individual for Medicaid. Thus a limited policy can provide valuable consumption smoothing in some states, but without completely substituting for "free" Medicaid coverage in cases where the individual's expenditures are catastrophic.

7. Altering the structure of Medicaid: how much insurance coverage can this stimulate?

The above results indicate that in the presence of Medicaid, most individuals do not want to buy comprehensive – or even substantial – long-term care insurance, even if it is offered at actuarially fair prices. We now demonstrate a key related result: reducing the generosity of Medicaid can substantially increase both the proportion of the elderly who are willing to pay for private insurance *and* the amount of coverage that they want to buy, *even at current market loads.*

7.1 The impact of altering Medicaid income and asset disregards on WTP for private insurance

In Table 5 we explore the percentage reduction in the income disregard and the asset eligibility thresholds for Medicaid (i.e. $\underline{C}_s$ and $\underline{W}$) required to induce the 30th and 50th percentile male or female to be willing to pay for a private long-term care insurance with a $100 daily benefit at the current market loads. The results indicate, for example, that to make the willingness to pay positive for a male at the median of the wealth distribution with risk aversion 3, the income and wealth eligibility thresholds would have to be reduced by 35 percent. In other words, if the asset test limit were lowered from $2000 to $1300, the income disregard from institutional care lowered from $30 to just under $20, and the income disregard for home care lowered from $545 to $354, this individual would have a positive willingness to pay for a policy with a $100 daily benefit cap at current market loads.

Moreover, when Medicaid is scaled down so that the median wealth individual now has a positive willingness to pay for a $100 daily benefit policy, this individual would also now prefer a much more substantial – indeed a fully comprehensive – insurance policy. This is in stark contrast to the prior results where we found that making insurance actuarially fair could not necessarily induce the median individual to buy private insurance and if it did (for example for a male with risk aversion of 3), the amount of insurance demanded was very small.

Figure 5 (respectively, 6) shows the willingness to pay for different daily benefit levels by the median male (respectively, female) with risk aversion 3. Each figure shows the willingness to pay for two cases: at current Medicaid income and asset thresholds and at income and asset thresholds that are 75% lower

than the current threshold. All results are shown at *current market loads*. They indicate that, at the current Medicaid income and asset thresholds, the median male or female with risk aversion 3 has a negative willingness to pay for *any* daily benefit level. By contrast, with the income and asset thresholds lowered to one-quarter of their current level, the median male or female has a large positive willingness to pay for any benefit level, including a comprehensive policy. By contrast, Figures 2 and 3 indicated that making policies actuarially fair is not sufficient to induce the median female with risk aversion 3 to purchase *any* daily benefit, or to make the median male willing to pay for a policy of more than $125 per day.[29]

Again, the intuition behind these results is that for the median individual, Medicaid reduces the value of more comprehensive policies relative to less comprehensive policies because a more comprehensive policy is more duplicative of what Medicaid would otherwise provide. Put another way, the cases in which long-term care expenditures exceed those provided by a policy with a $100 maximum daily benefit cap are cases in which the median individual is likely to end up on Medicaid absent private insurance. A more limited policy, in contrast, will provide reimbursement for care episodes that might not be sufficiently costly to otherwise qualify the median individual for Medicaid (i.e. spend down enough assets) and which therefore absent private insurance he would have to pay completely out of pocket.

Of course, the effect of Medicaid will vary across the wealth distribution, because the higher one's wealth, the greater the spend-down of assets required before Medicaid will pay for expenses that a comprehensive private policy would otherwise cover. Thus, higher wealth individuals should value a comprehensive policy compared to a capped policy relatively more than lower wealth individuals, and even more so at higher levels of risk aversion. The results in Tables 3 and 4 are consistent with this.

Finally, it is worth noting that although our results suggest that Medicaid is an important factor behind the current limited demand for comprehensive policies throughout much of the wealth distribution, they do not show that changes to Medicaid policy would be sufficient to substantially alter the comprehensiveness of policies purchased in equilibrium. A variety of supply-side market failures –

[29] The preferred daily benefit is around $75 per day for men (i.e. covering slightly more than one-third of EPDV expenditures) and around $200 per day for women (i.e. covering about two-thirds of EPDV expenditures).

including asymmetric information and aggregate risk of increased medical costs (Cutler, 1996) – may ration the *offering* of more comprehensive contracts, even if reductions to Medicaid's generosity stimulated demand for such policies.

7.2 Why does Medicaid have such a large crowd out effect?

We noted at the beginning of the paper that the structure of public insurance for long-term care expenditures (i.e. Medicaid) is very different from the structure of public insurance for acute health expenditures (i.e. Medicare) even though both pay about 50 percent of the respective expenditures. Here, we briefly consider what aspect of the design of Medicaid is primarily responsible for the large crowd-out effects that we have estimated.

There are two critical aspects of Medicaid that limit demand for private insurance. First, by providing catastrophic coverage as a payer of last resort, Medicaid reduces the out of pocket risk exposure faced by an individual and thus reduces the willingness to pay for private insurance. Second, because Medicaid is a secondary payer, a private insurance policy must pay benefits even if the individual's asset and income levels make them eligible for Medicaid. Thus part of the premiums on a private insurance policy pay for benefits that may face an implicit 100% tax by Medicaid. The fact that private insurance premiums reflect in part these redundant benefits decreases the net value of the policy.

Both the catastrophic coverage and the "benefit tax" imposed by Medicaid reduce willingness to pay for private insurance. To gain some sense of the relative importance of each factor, we investigated the effect on willingness to pay of a type of Medicaid reform that several states – including New York and California –enacted in the early 1990s (Wiener et al., 2000). These reforms raise the asset disregard ($\underline{W}$) *if and only if* the individual has bought a qualifying private long-term care insurance policy. By allowing the individual to retain more financial assets when receiving Medicaid benefits if the individual has private insurance, this reform reduces the implicit tax that Medicaid places on the private insurance policy. In other words, private insurance now buys something, namely a higher level of retained assets, even in states of the world in which Medicaid would otherwise pay.

Our analysis suggested that such reforms have little effect on willingness to pay for private long-term care insurance policies. For example, even when the asset disregard is set at $40,000 (approximately double the expected present discounted value of benefits from a private policy for a woman, and four times that for a man) when the individual has private insurance compared to only $2,000 when the individual does not, willingness to pay remains substantially negative for the median individual with risk aversion of 3 (specifically –8,400 for men and –5,200 for women, compared to –11,400 and –11,500 in the base case without this reform). Consistent with these results, only a handful of private insurance policies have been sold to individuals through these state-run reform programs (Wiener et al., 2000).

These findings suggest that the major aspect of Medicaid limiting private insurance demand is its role in providing catastrophic coverage, rather than the tax it places on private insurance policies as a secondary payer. This suggests that increases in private insurance demand would require reductions in the catastrophic coverage provided by Medicaid, which would increase the risk exposure for any individuals who still do not purchase private insurance.

7.3 Concluding thoughts: How Does Medicaid Affect Total Insurance Coverage?

We have found that Medicaid has a substantial negative effect on both the proportion of the elderly population with private insurance coverage and the amount of private insurance coverage demanded. Of course, if Medicaid were itself a reasonably comprehensive or "good" insurance product, its crowd-out effect on private insurance coverage may not be important for *total* insurance coverage (although it would be important for the cost of public funds).

In fact, however, Medicaid is far from a comprehensive insurance product. By requiring a deductible of virtually one's entire assets and income, Medicaid imposes a severe restriction on an individual's ability to engage in optimal consumption smoothing across states and over time. In addition, for individuals who recover and exit from care, the substantial reduction in wealth that Medicaid imposes limits the consumption opportunities available for the rest of their life.

To simply illustrate this point, we calculate an individual's utility gain (relative to the utility achieved under existing Medicaid rules) of removing the income and asset tests of Medicaid so that individuals

have all care expenses reimbursed by Medicaid. For a male with risk aversion 3 at the median of the wealth distribution, we find that a comprehensive Medicaid program would generate a welfare gain of $26,692 relative to the existing Medicaid program. This welfare gain is 50 percent *higher* than the actuarial value of the EPDV of the benefits paid by a Medicaid program with no asset or income tests. Thus, if we financed this expanded Medicaid program with a lump sum tax equal to the actuarial value of the EPDV of the benefits paid, the individuals would still have a net welfare gain of over $9,000.[30]

Thus there is a considerable net welfare cost to the risk not insured by the existing Medicaid program. Of course, this analysis says nothing about the structure of the "optimal" Medicaid program, as it does not incorporate the efficiency costs of raising the public funds required to pay for such a program, nor the incentive effects of the program. Given the evidence in this paper of the substantial crowd-out effect of Medicaid on private long-term care insurance coverage, we consider analysis of optimal Medicaid design a natural and important direction for further work.

8. Sensitivity analysis

In this section we investigate the sensitivity of our core results to alternative modeling assumptions. Specifically, we examine the sensitivity of two key findings: i) the ability of the basic model to generate a lack of demand for existing insurance contracts at existing prices throughout most of the wealth distribution (i.e. Table 2) and ii) the finding that most of the wealth distribution is not willing to pay for comprehensive policies even at actuarially fair prices (i.e. Table 4).

Given the nature of our results, our primary concern is whether reasonable alternative modeling assumptions could overturn these findings by substantially increasing the willingness to pay for a long-term care insurance policy. We are therefore not interested in exploring extensions to the model here that would simply strengthen our findings. For example, we do not explore how willingness to pay would change if we incorporate the presence of uninsured aggregate risk – such as the risk that public insurance

[30] This is an understatement of the welfare gain. The cost of moving to a public program with no asset or income tests is lower than the actuarial value of the benefits paid by this program because some of these benefits would have been paid by the existing Medicaid program.

may become more generous over time (thus making one's private insurance benefits redundant) or the risk that long-term care costs will rise substantially (Cutler, 1996) – because this would serve only to further lower the willingness to pay for private contracts.

We concentrate instead on three factors that the base case model does not account for and that have the potential to increase willingness to pay for private insurance, or to make more comprehensive policies relatively more attractive than limited policies. These are: i) the fact that the utility derived from home health care may be different (and higher) from that derived from institutional care, ii) the possibility that Medicaid-covered care is less attractive than privately-funded care, and iii) the potential for the presence of family members to increase the willingness to pay for private long-term care insurance.

To conserve space, we present only a subset of the results for these alternative specifications. Specifically, we show the sensitivity of the base case results at the 30^{th}, 50^{th}, 70^{th} and 90^{th} percentiles of the wealth distribution and at risk aversion of 3 for both men and women; results for other risk aversion levels (not shown) were similar. Overall, we find that our results are remarkably robust to all of these alternative specifications. Indeed, despite our attempt to focus on alternative specifications that might increase willingness to pay for private long-term care insurance, in several cases we find that willingness to pay is *lower* under the alternative specifications. Moreover, in general the specifications that increase willingness to pay do not have a quantitatively large effect.

Table 6 reports the willingness to pay under these alternative specifications for a policy with a $100 maximum daily benefit and current market loads. Table 7 reports the willingness to pay under these alternative specifications for an uncapped, actuarially fair policy. We now discuss each of the alternative specifications and the results in Tables 6 and 7 in detail.

8.1 Utility from home health care

The first set of alternative specifications investigate the possibility that individuals may view being in an institution as worse than residing at home. The results are summarized in rows 2 and 3 of Tables 6 and 7. The first approach we take – shown in row 2 – is to allow for state dependent utility. Following the findings of the empirical work of Viscusi and Evans (1990) and Evans and Viscusi (1991) we assume that

both the level of utility and the marginal utility of consumption decrease as health declines (i.e. are lower in an institution than when at home). In particular, we report results for the case in which $U_{alf} = U_{nh} = 0.5 \cdot U_{nocare} = 0.5 \cdot U_{hhc}$.

A second approach – shown in row 3 – is to allow for the provision of home care to provide direct consumption value, which is not included in our base case. To investigate the maximum effect this might have on willingness to pay, we show the willingness to pay for private insurance when every dollar of expenditures on home health care $(X_{hhc,t})$ provides a dollar of consumption value.

Neither specification alters our core finding that most people do not want to pay for either existing policies (Table 6) or uncapped actuarially fair policies (Table 7). Indeed, both alternative specifications *lower* willingness to pay relative to the base case. In the case of state dependent utility, this is because the marginal utility of consumption has declined in the major state of care (namely institutional) to which insurance allows you to transfer consumption.[31] In the case of allowing consumption value from home health care, willingness to pay decreases in part because allowing individuals to get consumption value from home health care expenditures provides something of a consumption floor while in home care, thus effectively making the individual less risk averse. In addition, when the person places no value on the consumption of care, then their consumption while on Medicaid is effectively limited to the amount permitted by the income disregard, which may interfere with optimal consumption smoothing across states of care. However, if the individual also gets utility from the consumption of care, then Medicaid's constraints on consumption in home care are essentially less binding, making such smoothing easier.

8.2 Medicaid-covered care may be very unattractive relative to privately funded care

Our second major set of specification tests concerns the potential that Medicaid may be a less attractive substitute for privately funded care than we have modeled it. We consider two related ways in which Medicaid-funded care may be considerably less appealing than privately funded care. First, as

[31] As an alternative approach to modeling state dependent utility, we tried *increasing* the marginal utility of consumption in institutional care while simultaneously decreasing the level of utility when in institutional care. This increases willingness to pay relative to the base case; however the magnitude of the effect is again quite small, and therefore does not alter our fundamental findings.

noted above, Medicaid coverage of home health care is capped in many states; therefore an individual who needs home health care but lacks the private resources to pay for it may have to forgo this care and potentially suffer negative health consequences, or may have to go into a less appealing setting (e.g., a nursing home) to receive care.[32] Second, the quality of care provided by Medicaid-funded providers may be lower than care provided by privately funded providers. This could be because the consumption value of the care is lower, or because individuals feel some stigma associated with receiving Medicaid and this reduces the consumption value from any care received.

We address these various possibilities in a reduced form way by allowing the consumption value from long-term care expenditures to differ based on whether this care is paid for by private payers (out of pocket or private insurance) or by Medicaid. To maximize the potential effect that this could have on willingness to pay for private insurance, we begin by allowing the individual to get consumption value equal to the *full* extent of home health care expenditures (both unskilled and skilled), plus our base case assumption that care from assisted living and nursing homes of $545 per month (i.e. the case already shown in row 3 of Tables 6 and 7). We then show results for cutting these consumption values in half only when care is paid for by Medicaid (i.e., $\alpha_s = 0.5$). We show two separate cases, corresponding to only home health care quality being lower when on Medicaid (row 4 of Tables 6 and 7) and all three types of care quality being lower while on Medicaid (row 5 of Tables 6 and 7).

The results indicate that, not surprisingly, reducing the quality of care provided by Medicaid increases willingness to pay (i.e. compare rows 4 and 5 to row 3). However, for the specifications shown, the core findings remain. Indeed, in results not reported, we find that even if we reduce the consumption value of home health care to *zero* if paid for by Medicaid – to capture the fact that individuals in need of home health care may be substantially worse off if there only source of funding is Medicaid – we still find that most of the wealth distribution is unwilling to purchase private insurance and prefers more limited policies to more comprehensive policies.

[32] Indeed, in a survey of long-term care insurance purchasers, over half of those surveyed rank "freedom to choose" one's type of care as a very important reason for buying the policy (HIAA 2000a).

8.3 Presence of family members

Our final set of specification tests concerns the role that the family may play in affecting willingness to pay for insurance. Here, we consider several ways that the family may increase willingness to pay for long-term care insurance. We begin by examining the role of bequest motives. Bequest motives provide an individual with another reason to value the protection of wealth offered by long-term care insurance besides the reason in the base case that the insurance protects wealth that can be used to finance future consumption by that individual. Because there no consensus in the literature on how to model bequests, and even less on how to parameterize the bequest function, we examine how our results are affected by two alternative bequest specifications. The first specification uses constant relative risk aversion utility function over wealth remaining at death, using the same risk aversion coefficient for bequests as for consumption. The second specification uses a linear bequest motive, so that the individual is not risk averse over the size of his bequest.[33] Specifically, we define the utility of the bequest as $U_5(W_t) = W_t$; this is a substantially stronger bequest motive than that estimated empirically by Hurd (1989).[34]

The results, shown in rows 6 and 7 of Tables 6 and 7, indicate that a bequest motive increases willingness to pay for insurance, but that the effect is quantitatively small. This is because bequest motives have several offsetting effects on the willingness to pay for long-term care insurance. One the one hand, if an individual is risk averse with respect to bequest size, the presence of bequest motives should increase the willingness to pay for long-term care insurance which reduces the volatility of bequests. On the other hand, in the presence of positive load factors (such as those that we estimate for men), the purchase of a long-term care insurance policy actually reduces the expected discounted value of resources available for consumption and bequests, thus reducing the willingness to pay for private insurance when there is a bequest motive relative to when there is not. Finally, as shown by Hurd (1986) and Jousten (2001), the presence of a bequest motive changes the shape of the optimal consumption path and thus affects the desirability of insuring against expenditure risk.

[33] Jousten (2001) discusses the use of linear bequest motives in a life-cycle model.
[34] Hurd (1989), in a model of consumption that excludes housing wealth, estimates the coefficient on the linear bequest motive to be approximately $5x10^{-7}$, but statistically insignificant.

In addition to bequest motives, the family may also affect willingness to pay for insurance by providing a substitute for private long-term care insurance, either through the direct provision of unpaid care or through informal financial risk sharing among family members (i.e. a financial substitute for private insurance) (Kotlikoff and Spivak, 1981; Pauly 1990). We consider each in turn.

In results not shown, we confirm that allowing family members to provide unpaid home health care in lieu of formal paid care lowers willingness to pay for private long-term care insurance that covers the remaining risk of institutional care expenditures. This is because the family care provision reduces the total expenditure risk facing the individual by removing variation in home health care expenditures. This analysis assumes that the individual was indifferent to receiving home health care from a family member or from a formal employee. If instead the individual receives substantial *dis*utility from family provided care (e.g., aversion to "being a burden"), this could increase the value of private insurance.

To investigate this, we examine an extreme case that is most likely to increase the willingness to pay for private insurance. We assume that members of the family will provide all home health care that is not reimbursed by private insurance (i.e. would be paid for out of pocket or by Medicaid). We further assume that the individual receives lower utility from family-provided care than if the care is provided by formal employees. Thus we assume that the individual gets utility from home health care consumption equal to home health care expenditures (i.e. as examined in row 3) *only if* that care is financed by private insurance. The results are shown in Row 8 of Tables 6 and 7. Comparing these results to those in row 3 (where there is consumption value from home health care and no issue of not wanting to be a burden), we see that the willingness to pay for long-term care insurance does increase. However, it still remains lower than the base case in which there is no consumption value from home health care.

To allow for *financial* risk sharing among family members, we estimate willingness to pay in a model where household decision-making is modeled under the assumption that a husband and wife maximize a joint utility function.[35] It is possible that the household may have a substantially higher willingness to pay

[35] Readers interested in the details of how the joint-decision making model is implemented are encouraged to consult Appendix A.

for private insurance than a unitary decision maker because the utility consequences of Medicaid's asset and income tests may be more onerous if one spouse continues to reside in the community. Offsetting this, however, are two factors. First, in practice, Medicaid rules allow a community-based spouse to retain substantially more assets and income, thus effectively making Medicaid a better substitute for private insurance than in the case of single individuals; for example, in 2000, all states allowed the community-based spouse to keep at least $16,824 in assets when an individual enters a nursing home in addition to the $2,000 allowed for the institutionalized individual (Stone 2002).[36] Second, as shown by Kotlikoff and Spivak, spouses who share a joint budget constraint can partially substitute for formal insurance markets by informally insuring one another, thus making private insurance less attractive. As shown in table 8, our results indicate that these latter two factors dominate, and that the net effect of allowing for within household financial risk sharing is to further *lower* the willingness to pay for private insurance. For example, at risk aversion of 3, the combined willingness to pay for our base case private contracts ($100 daily benefit at existing market loads) covering both the husband and the wife at the median of the wealth distribution is estimated to be approximately -$42,898.[37] At the 90th percentile, the couple does find the joint purchase of the policies welfare enhancing, with a willingness to pay of $12,587. It is worth noting, however, that this is still significantly less than the willingness to pay for either product separately in our model of a unitary decision maker (table 2). In the second row of table 8, we also report results for uncapped, actuarially fair policies and find similar patterns. At least as high as the 70th percentile, couples would not wish to purchase private LTCI. At the 90th, such a purchase is welfare enhancing, although still less so than in the unitary model.

[36] $16,824 was the federal minimum in 2000, and 12 states used this minimum level. The remaining states used higher allowance levels.

[37] The finding that within-household risk sharing lowers the willingness to pay for private insurance is consistent with the findings of Brown and Poterba (2001), who find that the willingness to pay for life annuities is substantially lower when modeled in this way than when modeled using a unitary decision maker.

9. Conclusions

This paper has presented the first careful examination of the relative role played by the public Medicaid program and potential private market failures in contributing to the limited size of the private long-term care insurance market. To do so, we developed an analytical framework for estimating a risk averse individual's willingness to pay for a long-term care insurance contract. We calibrated the model using detailed actuarial data on long-term care expenditure risk and the current structure of the public Medicaid program and existing private insurance policies. Our model produces results that are broadly consistent with the empirical patterns in survey data in terms of the limited fraction of the elderly who buy insurance, and the patterns of coverage by gender and by wealth.

One of the primary findings from the model is that *even at actuarially fair prices*, individuals throughout most of the wealth distribution prefer not to purchase private insurance. Moreover, for those individuals for whom actuarially fair prices would induce purchase, the preferred policy is one with extremely limited coverage. Thus even if we eliminate potential supply-side market failures so that comprehensive insurance policies are available at actuarially fair prices, most individuals would still not want to buy these policies given the existing Medicaid rules.

Our other major finding is the complement to this first finding. Specifically, we find that reducing the generosity of Medicaid can both generate positive willingness to pay for many of the current non-purchasers *and* to induce them to demand policies of considerably higher comprehensiveness than existing policies.

Together, these two findings reveal a fundamental role played by Medicaid as a payer of last resort in limiting demand for private long-term care insurance. Furthermore, they suggest that government interventions in the private long-term care insurance market – such as subsidizing premiums or imposing minimum comprehensiveness standards on private policies – are unlikely to substantially alter the role played by private insurance in covering long-term care expenditure risk.

REFERENCES

Abt Associates. 2001."Financing long-term care for the baby boom generation." HSRE Working Paper 8.

AARP. 2000. "Medicaid Financial Eligibility for Older People: State variations in access to home and community-based waiver and nursing home services." April.

Auerbach, Alan J. and Laurence J. Kotlikoff. 1991. "The Adequacy of Life Insurance Purchases." *Journal of Financial Intermediation.* Vol. 1, No. 3, 215-41.

Barksy, Robert. B, Miles S. Kimball, F. Thomas Juster, and Matthew D. Shapiro. 1997. "Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study." *Quarterly Journal of Economics* 112 (1), May.

Brown, Jeffrey R. and James M. Poterba, "Joint Life Annuities and Annuity Demand by Married Couples," *Journal of Risk and Insurance*, Vo. 67, No. 4, December 2000, 527 - 553.

Brown, Jeffrey R. and Amy Finkelstein. 2003. "High prices, limited benefits: New evidence on the long-term care insurance market.

Citro, Constance F. and Robert T. Michael, 1995, *Measuring Poverty: A New Approach*, National Academy Press: Washington, D.C.

Coile, Courtney and Jonathan Gruber 2000. "Social Security Incentives for Retirement." NBER working paper 7651. April.

Congressional Budget Office. 1999. "Projections on expenditures for long-term care services for the elderly." March.

Cutler, David and Jonathan Gruber. 1996. "Does Public Insurance Crowd Out Private Insurance?" *Quarterly Journal of Economics*.

Cutler, David. 1996. "Why Don't Markets Insure Long-Term Risk?" Mimeo.

Davidoff, Tom, Jeffrey R. Brown and Peter A. Diamond. 2003. "Annuities and Individual Welfare." NBER Working Paper #9714. May.

Davis, Steven J., Felix Kubler, and Paul Willen, "Borrowing Costs and the Demand for Equity Over the Life Cycle," NBER Working Paper #9331

Dick, Andrew, Alan Garber and Thomas MaCurdy. 1994. Forecasting Nursing Home Utilization of Elderly Americans. In David Wise (ed) Studies in the Economics of Aging.

Engen, Eric M., William G. Gale and Cori R. Uccello, 1999, "The Adequacy of Retirement Saving," Brookings Papers on Economic Activity, 2, 65-165

Evans, William and W. Kip Viscusi. 1991. "Estimation of State-Dependent Utility Functions Using Survey Data." *Review of Economics and Statistics* 73:1. pp. 94 – 104

Finkelstein, Amy. Forthcoming. "The interaction of partial public insurance programs and residual private insurance markets: evidence from the U.S. Medicare Program." *Journal of Health Economics.*

Finkelstein, Amy and Kathleen McGarry. 2003. Private Information and Its Effect on Market Equilibrium: New Evidence from Long-Term Care Insurance. NBER WP 9957.

Health Insurance Association of America (HIAA). 2000a. Who buys LTC insurance in 2000?

Health Insurance Association of America (HIAA) 2000b. LTC insurance in 1997 – 1998.

Health Insurance Association of America (HIAA). 2001. Who buys long-term care insurance in the workplace? A study of employer long-term care insurance plans 2000-2001.

Hubbard, Glenn, Jonathan Skinner, and Stephen Zeldes. 1995. "Precautionary Savings and Social Insurance." *Journal of Political Economy* vol 103, iss 2, pp. 360-99.

Hurd, Michael D. 1989. "Mortality Risk and Bequests." *Econometrica* 57 (4) 779-813.

Institute of Medicine. 2001. Improving the quality of long-term care. National Academy Press.

Jorgenson, Dale W. and Daniel T. Slesnick, "Aggregate Consumer Behavior and Household Equivalence Scales," in Dale W. Jorgenson, ed., Welfare Volume 2: Measuring Social Welfare. The MIT Press. 1997. 219 - 251.

Jousten, Alain. 2001. "Life-Cycle Modeling of Bequests and Their Impact on Annuity Valuation." Journal of Public Economics v79, n1 (January): 149-77

Kaplan, Richard. 2004. "Cracking the Conundrum: Toward a Rational Financing of Long-Term Care." *University of Illinois Law Review* forthcoming.

Kemper, Peter and Christopher Murtaugh. 1991. Lifetime use of nursing home care." *New England Journal of Medicine* 324: 595-600.

Kotlikoff Laurence and Avia Spivak. 1981. The Family as an Incomplete Annuities Market. *Journal of Political Economy* 89(2):372-391.

Lakdawalla, Darius, Jay Bhattacharya, and Dana Goldman. 2001. "Are the young becoming more disabled?" NBER Working Paper 8247.

Lakdawalla, Darius and Tomas Philipson. 2002. "The rise of old-age longevity and the market for long-term care." *American Economic Review* Vol 92, Number 1 pp. 295-306.

Laibson, David, Andrea Repetto and Jeremy Tobacman. 1998. "Self Control and Saving for Retirement." *Brookings Papers on Economic Activities.*

Manton, Kenneth, Larry Corder and Eric Stallard. 1997. "Chronic disability trends in the elderly United States populations: 1982 – 1994." *Proceedings of the National Academy of Sciences* Vol 94, pp.2593-2598. March.

Manton, Kenneth and XiLiang Gu. 2001. "Changes in the prevalence of chronic disability in the United States black and nonblack population above age 65 from 1982 to 1999." *Proceedings of the National Academy of Sciences*, Vol 98, no 11, pp. 6354-6359, May.

MetLife Mature Market Institute. 2002a. "MetLife Market Survey of Nursing Home and Home Care Costs 2002."

MetLife Mature Market Institute. 2002b. "MetLife Survey of Assisted Living Costs 2002"

Mitchell, Olivia S., James M. Poterba, Mark Warshawsky, and Jeffrey R. Brown. 1999. New Evidence on the money's worth of individual annuities. *American Economic Review*, 89(December), pp.1299-1318.

Murtaugh, Christopher, Peter Kemper, Brenda Spillman, and Barbara Carlso. 1997. "Amount, distribution, and timing of lifetime nursing home use." *Medical Care* (35): 3 pp. 204-218.

National Center for Health Statistics, 2002. Health, United States, 2002 with Chartbook on Trends in the Health of Americans. Hyattsville, Maryland: 2002.

Norton, Edward. 2000. "Long-term Care." In AJ Culyer and JP Newhouse (eds) Handbook of Health Economics, vol 1, ch 17. Elsevier Science.

Pauly, Mark. 1989. Optimal Public Subsidies of Nursing Home Insurance in the United States. *The Geneva Papers on Risk and Insurance* Vol 14, No 50, pp.3-10.

Pauly, Mark. 1990. The Rational Nonpurchase of Long-Term-Care Insurance. *Journal of Political Economy* 98(1): 153-168.

Palumbo, Michael G. 1999, "Uncertain Medical Expenses and Precautionary Saving Near the End of the Life Cycle" *The Review of Economic Studies*, Vol. 66, No. 2. (Apr., 1999), pp. 395-421.

Robinson, James. 1996. "A Long-Term Care Status Transition Model," presented at the 1996 Bowles Symposium on the Old-Age Crisis: Actuarial Opportunities. Georgia State University, September.

Robinson, James. 2002. "A long-term care status transition model." Mimeo, University of Wisconsin, Madison.

Scholz, John Karl, Ananth Seshadri and Surachai Khitatrakun. 2003. "Are Americans Saving 'Optimally' for Retirement?" University of Wisconsin working paper.

Society of Actuaries. 1992. "Report of the long-term-care experience committee: 1985 national nursing home survey utilization data." *Transactions of the Society of Actuaries*, 1988-89-90 Reports. pp.101-164.

Society of Actuaries. 1996. "Long-term care insurance valuation methods; society of actuaries long-term care insurance valuation methods task force." *Transactions of the Society of Actuaries*, 1995. vol 47. pp.599-773.

Society of Actuaries. 2002. "Long-term care experience committee InterCompany Study 1984-1999." http://www.soa.org/sections/intercompany_study.pdf.

Stokey, Nancy and Robert Lucas. 1989. Recursive methods in economic dynamics. Harvard University Press, Cambridge MA.

Stone, Julie Lynn. 2002. "Medicaid: Eligibility for the Aged and Disabled." CRS Report for Congress RL31413. July 5.

Tillinghast - Towers Perrin. 2002. 2002 Pricing Methodology Survey. August.

United States Congress, Committee on Ways and Means (2000). Green Book 2000: Background Material on Programs Under the Jurisdiction of the Committee on Ways and Means, Washington DC: GPO.

Viscui, W. Kip and William Evans. 1990. "Utility Functions That Depend on Health Status: Estimates and Economic Implications." *American Economic Review* 80(3): 353-374.

Wiener, Joshua, Laurel Hixon Illston, and Raymond Hanley. 1994. Sharing the burden: strategies for public and private long-term care insurance. The Brookings Institution, Washington DC.

Wiener, Joshua, Jane Tilly and Susan Goldenson. 2000. "Federal and state initiatives to jump start the market for private long-term care insurance." *The ElderLaw Journal* 8(1): 57-99.

Young, Virginia R. and Mark J. Browne. 1997. "Explaining Insurance Policy Provisions via Adverse Selection." *The Geneva Papers on Risk and Insurance Theory* 22: 121-134.

Table 1: Descriptive Statistics of Care Utilization for 65 year old, from Robinson Model

				Duration of Use (Among Users)			Exit and reentry (among users)	
Type of Care		Probability Ever Use	Average Age of First Use (Among Users)	Average Years Spent in Care	Prob use more than 1 year	Prob use more than 5 years	Prob ever exit to non-death state	Avg # of spells
Nursing Home (NH)	Men	0.27	83	1.3	0.33	0.05	0.65	1.28
	Women	0.44	84	2.0	0.42	0.12	0.66	1.39
Assisted Living Facility (ALF)	Men	0.12	82	0.58	0.16	0.01	0.90	1.18
	Women	0.20	85	0.48	0.13	0.01	0.93	1.26
Home Health Care (HHC)	Men	0.29	79	1.9	0.52	0.09	0.67	1.45
	Women	0.35	81	2.3	0.52	0.15	0.77	1.68
Any Care (NH, ALF, or HHC)	Men	0.40	80	2.9	0.77	0.17	0.33	1.20
	Women	0.54	82	4.2	0.85	0.31	0.35	1.27

Note: All statistics are based on an individual who at 65 has no limitations to activities of daily living and is not cognitively impaired. Care utilization is measured as care utilization by individuals whose health characteristics simultaneously satisfy the benefit triggers required for care costs to be reimbursable by insurance contracts. See text for further details.

Table 2: Willingness to pay for policy with $100 maximum daily benefit at current market loads

Wealth Percentile	Total Wealth	Percent Annuitized	Men Risk Aversion 1	Men Risk Aversion 2	Men Risk Aversion 3	Women Risk Aversion 1	Women Risk Aversion 2	Women Risk Aversion 3
10th	58,450	98	*	*	*	*	*	*
20th	93,415	91	*	*	*	*	*	*
30th	126,875	82	-17.4	-18.0	-18.2	-19.6	-20.3	-20.7
40th	169,905	70	-17.2	-17.1	-16.2	-19.1	-19.2	-18.9
50th	222,570	60	-16.2	-14.5	-11.4	-17.3	-15.4	-11.5
60th	292,780	52	-14.6	-10.8	-3.0	-14.2	-8.9	1.5
70th	385,460	41	-13.4	-6.5	6.4	-11.4	-1.3	14.4
80th	525,955	35	-10.9	0.2	17.7	-6.3	9.9	29.8
90th	789,475	26	-8.2	6.8	25.6	-0.1	21.0	41.6

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: All willingness to pay estimates are in thousands of dollars. Positive willingness to pay results are shaded gray. Table reports a 65 year old's willingness to pay for a policy that covers all three types of care, has no deductible and an unlimited benefit period, and pays a (constant nominal) maximum daily benefit of $100. The load on the policy is 0.50 for men and –0.058 for women (providing both with an equal monthly premium of $151). The real rate of interest, the discount rate, and the annual rate of inflation are all .03. Medicare pays for 35% of home care costs. Real cost growth is 1.5% annually. Medicaid pays for care for individuals with wealth less than or equal to $2000, and who meet the income test (with a monthly income disregard of $30 for institutional care and $545 for home health care). It is assumed that care in an assisted living facility or a nursing home provides consumption value of $513 monthly, and that this value is the same regardless of the source of funding for the care.

Table 3: Willingness to pay for a $100 maximum daily benefit at actuarially fair premiums

Wealth Percentile	Men Risk Aversion 1	Men Risk Aversion 2	Men Risk Aversion 3	Women Risk Aversion 1	Women Risk Aversion 2	Women Risk Aversion 3
10th	*	*	*	*	*	*
20th	*	*	*	*	*	*
30th	-8.0	-8.1	-7.9	-20.7	-21.4	-21.8
40th	-7.0	-6.2	-4.4	-20.4	-20.6	-20.3
50th	-5.7	-3.2	0.8	-18.6	-16.9	-13.1
60th	-3.9	0.9	9.7	-15.6	-10.4	0.02
70th	-2.4	5.2	18.5	-12.8	-2.7	12. 9
80th	0.2	11.9	29.3	-7.7	8.5	28.4
90th	3.1	18.6	36.9	-1.5	19.7	40.3

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: All willingness to pay estimates are in thousands of dollars. Positive willingness to pay results are shaded gray. All results assume actuarially fair premiums (0 load). Otherwise, all parameters are as specified in the notes to Table 2.

Table 4: Willingness to pay for an uncapped policy at actuarially fair premiums

Wealth Percentile	Men Risk Aversion			Women Risk Aversion		
	1	2	3	1	2	3
10th	*	*	*	*	*	*
20th	*	*	*	*	*	*
30th	-16.8	-17.4	-17.7	*	*	*
40th	-15.5	-14.6	-12.7	-44.2	-46.1	-47.1
50th	-13.1	-9.2	-2.7	-41.1	-39.7	-35.8
60th	-9.6	-1.2	14.8	-34.6	-24.8	-6.2
70th	-6.6	7.8	33.0	-27.7	-5.7	30.7
80th	-1.1	22.1	59.5	-15.7	23.6	84.2
90th	6.0	40.3	88.7	0.6	61.7	140.9

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: All willingness to pay estimates are in thousands of dollars. Positive willingness to pay results are shaded gray. All results assume actuarially fair premiums (0 load) and "uncapped" daily benefit level. Otherwise, all parameters are as specified in the notes to Table 2.

Table 5: Percent reduction in Medicaid needed to make WTP positive (policy has a $100 maximum daily benefit and current market loads)

Wealth Percentile	Men Risk Aversion			Women Risk Aversion		
	1	2	3	1	2	3
30th	>95	88	69	>95	78	62
50th	>95	71	35	90	51	26

Note: Table reports the percent by which the Medicaid income and asset thresholds must be reduced in order to make willingness to pay for a policy with a $100 daily benefit cap positive at current market loads. All other parameters are as specified in the notes to Table 2.

Table 6: Sensitivity analysis of results in Table 2: Policy has $100 maximum daily benefit and current market loads (risk aversion 3)

Specification	Insurance Value for Men				Insurance Value for Women			
	Pctile 30	Pctile 50	Pctile 70	Pctile 90	Pctile 30	Pctile 50	Pctile 70	Pctile 90
1. Base Case	**-18.2**	**-11.4**	**6.4**	**25.6**	**-20.7**	**-11.7**	**14.7**	**41.6**
2. State dependent utility[1]	-18.3	-12.1	4.5	24.5	-20.8	-12.5	10.2	37.2
3. Consumption value from HHC[2]	-19.9	-19.8	-11.7	4.4	-21.2	-19.3	-6.5	24.3
4. Consumption value from Medicaid-funded HHC is half that from privately-funded HHC[4]	-19.1	-18.4	-9.7	5.8	-20.6	-17.7	-3.7	26.0
5. Above + consumption value of Medicaid-funded institutional care is also half that from privately-funded care[5]	-18.4	-13.0	1.3	18.4	-19.7	-10.3	13.9	38.8
6. CRRA Bequest Motive	-18.1	-10.9	7.3	26.1	-20.6	-11.1	15.4	41.8
7. Linear Bequest Motive	-18.2	-10.0	7.2	43.6	-20.7	-8.5	14.8	51.1
8. Do not want to be a burden on family members[3]	-18.5	-17.0	-7.7	7.3	-18.6	-12.7	4.1	32.0

Notes: All willingness to pay estimates are in thousands of dollars Cases where willingness to pay is positive are shaded gray. All results are for risk aversion 3. Otherwise, all parameters are as specified in notes to Table 2 except as indicated in the left hand column. Base case results are in **bold.**

[1] $U_{alf} = U_{nh} = 0.5 * U_s \forall s \neq alf, nh$

[2] $F_{hhc,t} = X_{hhc,t}$

[3] $F_{hhc,t} = X_{hhc,t}$ for expenditures paid by private insurance; $F_{hhc,t} = 0$ otherwise. See text for further details.

[4] $F_{hhc,t} = X_{hhc,t}$; $\alpha_{hhc} = 0.5$; $\alpha_{alf} = \alpha_{nh} = 1$

[5] $F_{hhc,t} = X_{hhc,t}$; $\alpha_{hhc} = 0.5$; $\alpha_{alf} = \alpha_{nh} = 0.5$

Table 7: Sensitivity analysis of results in Table 4: Policy in uncapped and is priced actuarially fairly (risk aversion 3)

Alternative Specification	Insurance Value for Men				Insurance Value for Women			
	Pctile 30	Pctile 50	Pctile 70	Pctile 90	Pctile 30	Pctile 50	Pctile 70	Pctile 90
1. Base Case	**-17.7**	**-2.7**	**33.0**	**88.7**	*	**-35.8**	**30.7**	**141.9**
2. State dependent utility	-18.6	-7.5	20.1	68.6	*	-41.2	9.1	107.1
3. Consumption Value from HHC	-19.7	-12.5	11.6	67.6	*	-45.3	-1.2	107.6
4. Consumption value from Medicaid-funded HHC is half that from privately-funded HHC	-18.9	-11.0	13.7	69.0	*	-43.9	1.7	109.0
5. Above + consumption value of Medicaid-funded institutional care is also half that from privately-funded care	-14.3	10.6	56.0	110.9	*	-14.8	75.9	177.1
6. CRRA Bequest Motive	-17.6	-2.0	35.2	90.9	*	-35.0	33.6	144.4
7. Linear Bequest Motive	-17.7	-2.7	34.0	108.4	*	-35.8	31.1	150.6
8. Do not want to be a burden on family members	-18.3	-9.4	16.4	71.1	*	-39.7	10.8	116.3

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: All willingness to pay estimates are in thousands of dollars. Policy is actuarially fair and uncapped. Cases where willingness to pay is positive are shaded gray. All results are for risk aversion 3. Left hand side corresponds to specification described in Table 6. See notes to Table 6 for more detail. Otherwise, all parameters are as specified in notes to Table 4. Base case results are in **bold.**

Table 8: Sensitivity analysis using a household joint decision making model (risk aversion 3)

Case	Insurance Value for Household			
	Pctile 30	Pctile 50	Pctile 70	Pctile 90
$100 daily benefit, current market loads	*	-42.9	-31.5	12.6
Uncapped benefits, actuarially fair prices	*	-73.8	-51.1	63.7

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: All willingness to pay estimates are in thousands of dollars. All WTP measures are for the couple's willingness to simultaneously purchase a policy to cover the husband, and an additional policy to cover the wife. Cases where willingness to pay is positive are shaded gray. All results are for risk aversion 3.

Figure 1: Willingness to Pay: 65 Year old Male
Current Market Loads; $ 100 Daily Benefit

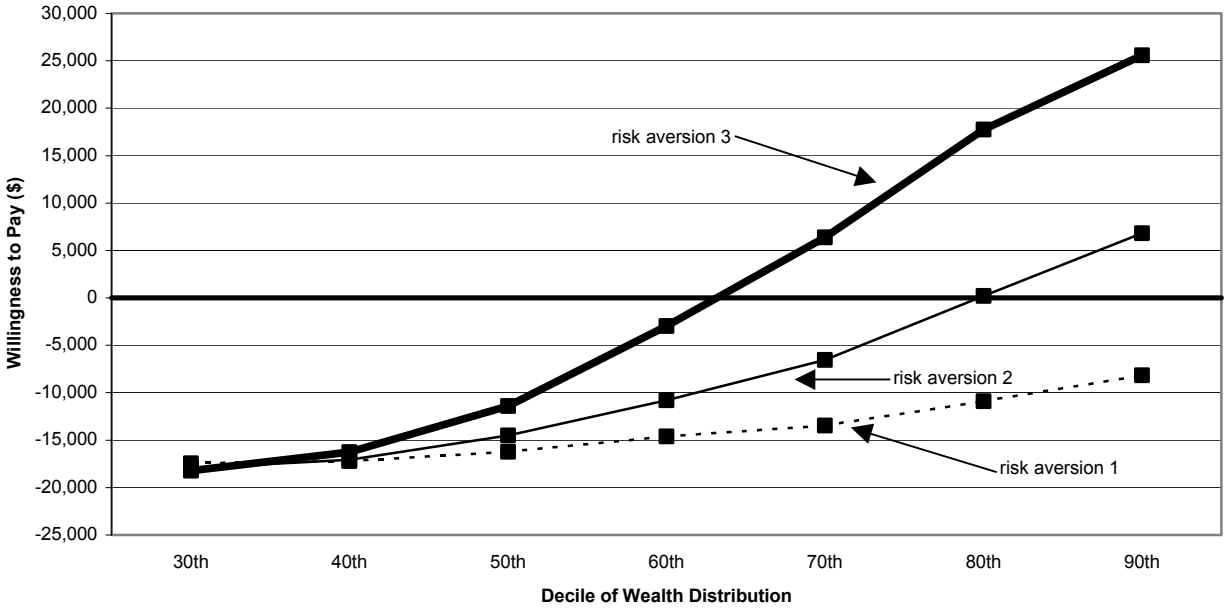


Figure 2: Willingness to Pay: 65 Year old Female
Current Market Loads; $100 Daily Benefit

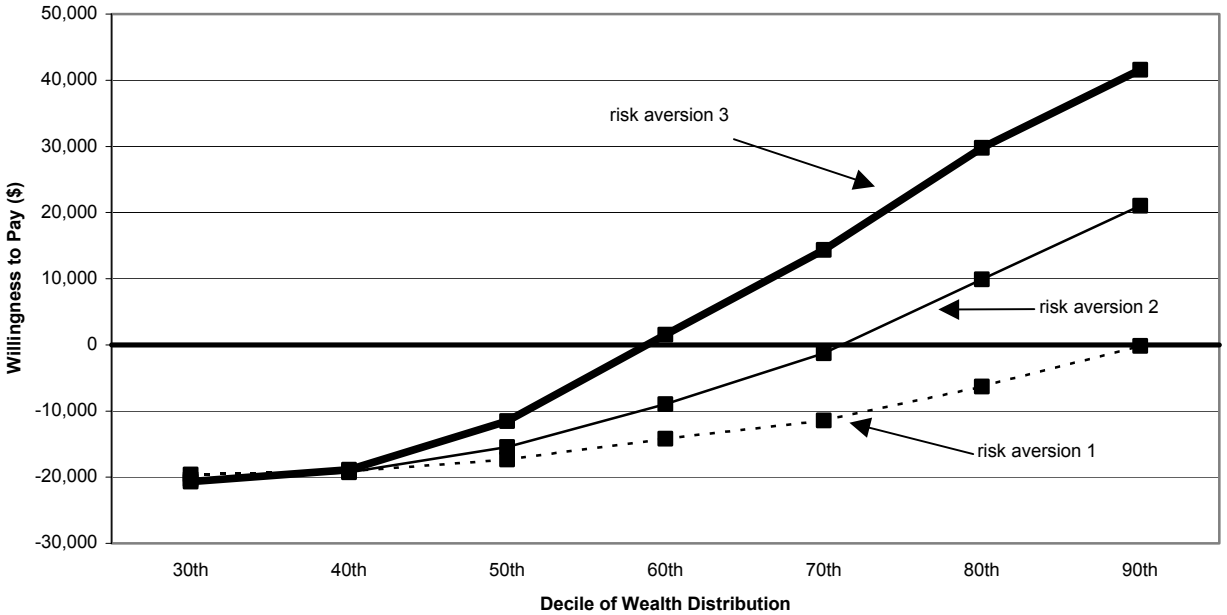


Figure 3: Willingness to Pay as Vary Daily Benefit Cap:
Median Female, Risk Aversion 3, Actuarially Fair Prices (Load = 0)

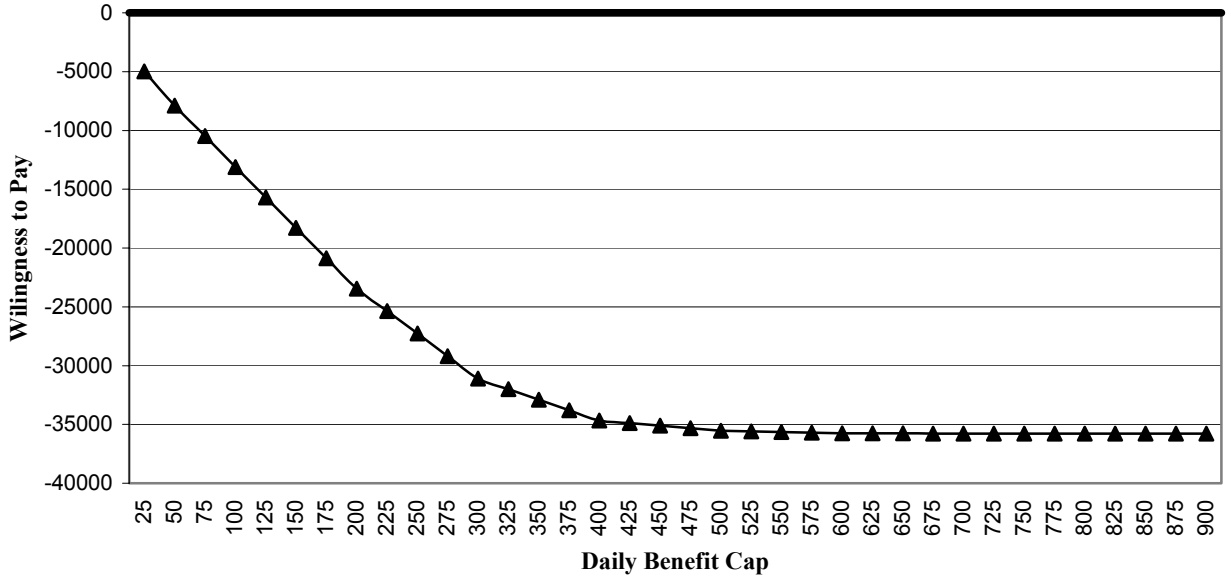


Figure 4: Willingness to Pay as Vary Daily Benefit Cap:
Median Male Risk Aversion 3, Actuarially Fair Prices (Load = 0)

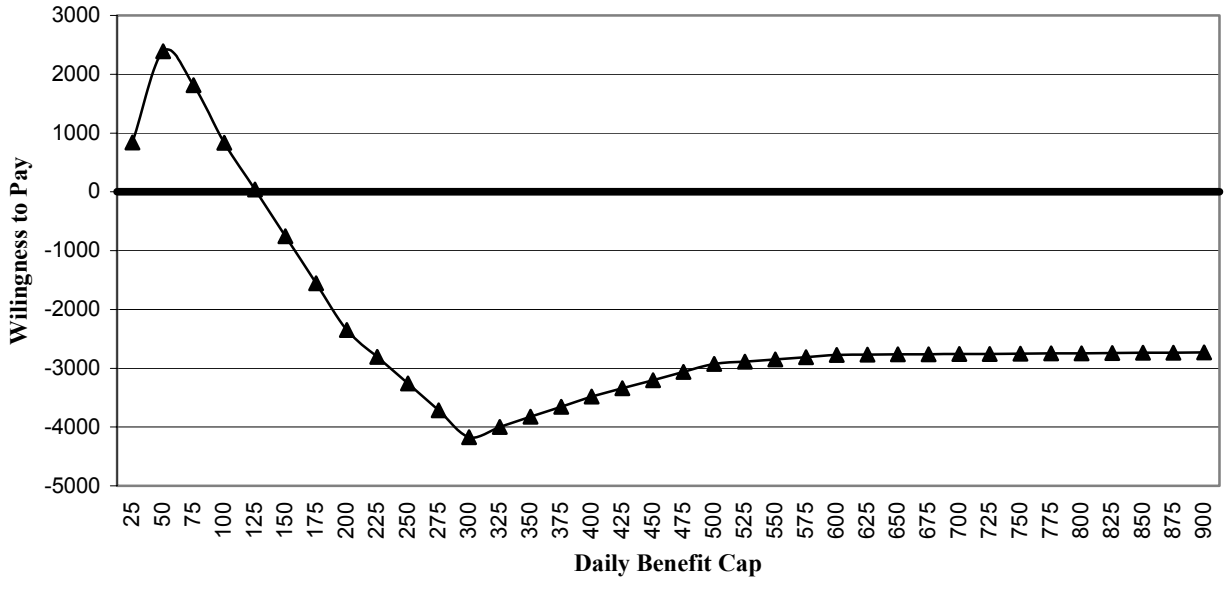


Figure 5: Willingness to Pay As Vary Daily Benefit Cap
Median Male, Risk Aversion 3, Load = 0.50

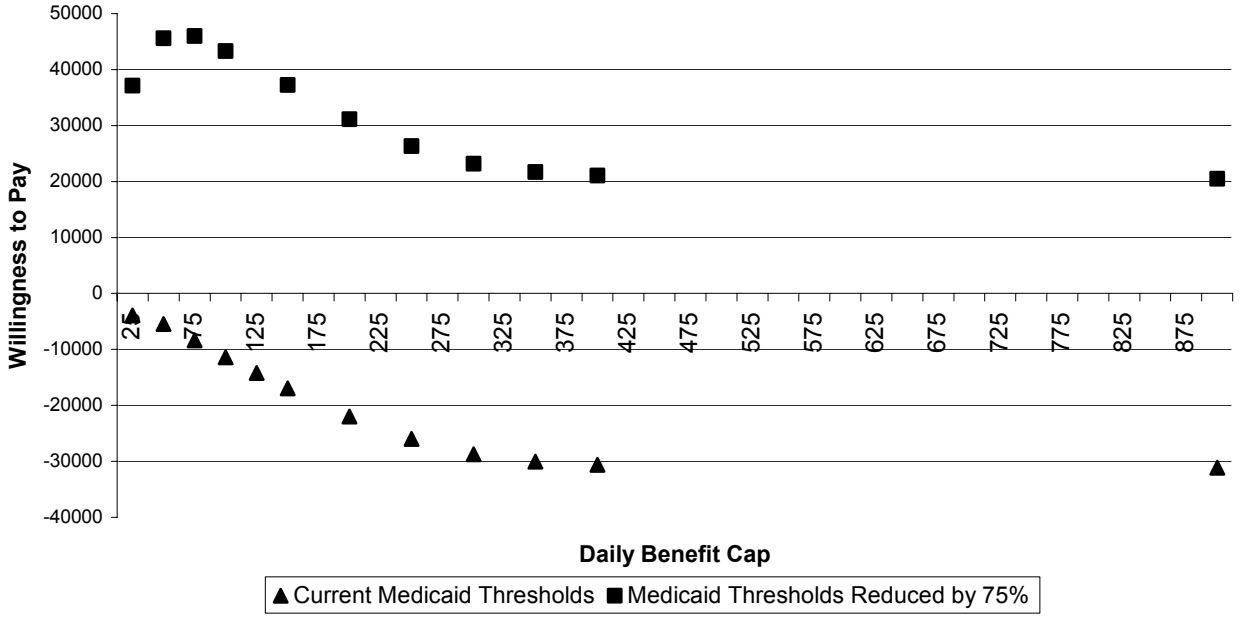
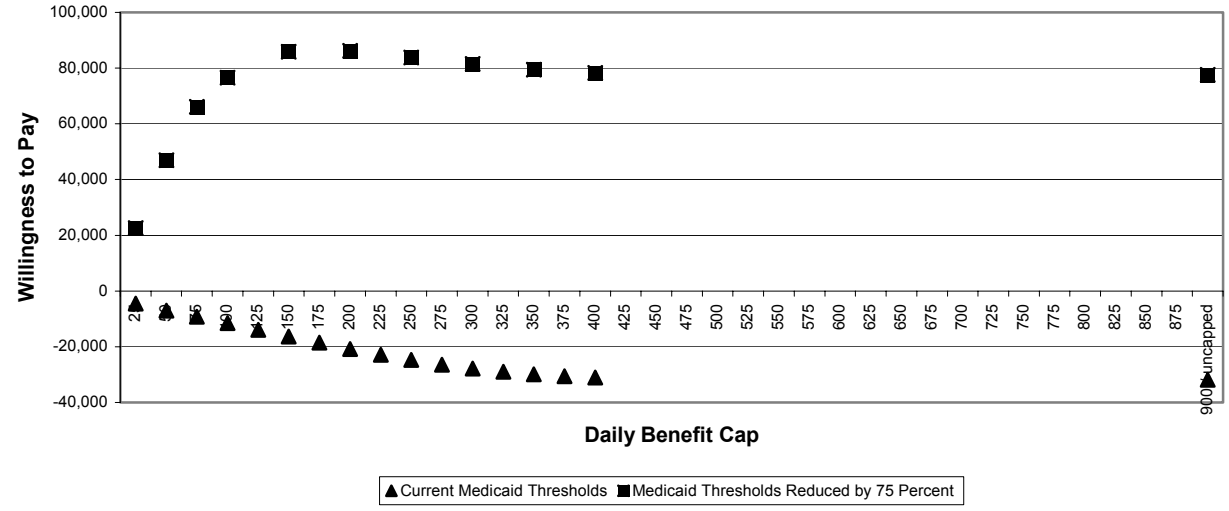


Figure 6: Willingness to Pay As Vary Daily Benefit Cap
Median Female, Risk Aversion 3, Load = -0.06



Appendix A
Estimating Willingness to Pay in a Joint Household Decision Framework

When using a joint household decision making framework, Hurd (1999) shows that optimal consumption depends on the structure of the household utility function, and highlights the absence of an agreed-upon framework for modeling joint decisions by couples. We use a model that is a natural extension of our model of a unitary decision maker, and follows closely the model used by Kotlikoff and Spivak (1981) to analyze the gains from annuitization for married individuals. Specifically, we assume that the household utility function is simply the equally weighted sum of two spousal sub-utility functions:

$$U_{s,\sigma}^{couple}\left(C_{t,s}^{m}, C_{t,\sigma}^{f}, F_{t,s}^{m}, F_{t,\sigma}^{f}\right) = U_{s}^{m}\left(C_{t,s}^{m}, F_{t,s}^{m}\right) + U_{\sigma}^{f}\left(C_{t,\sigma}^{f}, F_{t,\sigma}^{f}\right)$$

where superscripts m and f denote the male and the female in the household, s subscripts the husband's care stat, and σ the wife's care state. We further assume that $U^m=U^f$, i.e., that the functional form of the sub-utility functions are both CRRA utility functions with the same risk aversion coefficient.

The assumption of equal weighting and identical functions (e.g., same risk aversion for husband and wife) of the two sub-utility functions implies that couples will always try to divide household consumption equally when both spouses are alive. Following Kolikoff and Spivak, we assume no economies of scale in consumption so that $1 of household consumption divided equally between the spouses results in $C_t^m = C_t^f = .5$. The exception is that consumption from care $F_{s,t}$ enters into the utility function only of the spouse receiving care. If, for example, the husband is in care where $F_{s,t}>0$, and the wife is at home receiving no care, then the household will optimally allocate all household consumption to the wife until she reaches a consumption level $C_t^f = F_{s,t}$, and then above this level, the spouses will evenly share any remaining consumption. When one spouse dies, the utility function of the couple reverts to that of the surviving spouse.

Because there are 5 states of care for each spouse, there are now effectively 25 states of care for the couple, and thus the Bellman equation (equation 1) must sum over all 25 possible transitions across states

of care. The wealth accumulation equations with and without Medicaid (equations 2 and 3) are the same, except that all variables now refer to expenditures for the entire household. For example, $X_{s,\sigma,t}$ refers to total long-term care expenditures for the couple. Moreover, the Medicaid asset and income requirements ($\underline{C}_{s,\sigma}$ and $\underline{W}_{s,\sigma}$) will now vary depending on the care state of both spouses.

For the household model, Medicaid's rules depend on the joint care status of the husband and wife. If only one spouse is receiving Medicaid, the non-Medicaid spouse is permitted to keep an additional $2000 per month in income and $16,000 of financial wealth, over and above the amounts allowed in the case of a single individual. As such, the couple has an effective $\underline{W}$ of $18,000 and an effective $\underline{C}$ of $2,030 if one spouse is institutionalized and the other is receiving no care. If both spouses are receiving Medicaid, the effective asset and income limits are simply the sum of the two separate individual limits.

For this joint-decision making model, we use the wealth distribution constructed from the sample of married households with at least one spouse age 65 in the 1996, 1998 or 2000 Health and Retirement Survey (HRS). We consider the willingness to pay for the couple to have both of them insured. Empirically this seems to relevant case since empirically within-couple ownership is highly correlated; although only 10 percent of the elderly have long-term care insurance, 60 percent of individuals whose spouses have long-term care insurance also have this insurance (Finkelstein and McGarry, 2003).