Brown and Finkelstein *Journal of Economic Perspectives* Appendix: Calculating Loads and Comprehensiveness

In this appendix we describe the data and calculations underlying our estimates of loads and comprehensiveness and present some additional results. Our approach follows closely the calculations produced in Brown and Finkelstein (2007), and that paper provides more detail. In Brown and Finkelstein (2007), we calculated loads and comprehensiveness based on 2002 prices and other inputs from as close to that time as possible. As described below, the current are based on updated 2010 prices other inputs as feasible.

Analytical framework

The load on a policy is the difference between unity and the ratio of the expected present discounted value of benefits to the expected present discounted value of premiums. Specifically, we define the load as[1]

$$\text{Load} = 1 - \frac{\text{EPDV(Benefits)}}{\text{EPDV(Premiums)}} = 1 - \frac{\sum_{t=0}^{T}\left(\frac{Q_t * B_t}{(1+i)^t}\right)}{\sum_{t=0}^{T}\left(\frac{\mathrm{P_t}}{(1+i)^t}\right)} \tag{1}$$

where Q_t is the probability the individual is in care in month t, B_t is the benefit paid out if the individual is in care in month t, P_t is the monthly premium, and i is the nominal interest rate. As is readily apparent from equation (1), the load will be lower if the probability of care use increases, the benefit amount that is paid out for care use increases, or the monthly premium decreases. Since premiums on average are paid earlier relative to benefits, the higher the interest rate i used to discount future premiums and benefits, the higher the load.

An actuarially fair policy will have a load of zero. The load therefore speaks to the pricing of a policy relative to an actuarially fair price. Another useful summary measure of a policy besides the load is the policy's "comprehensiveness"; this measures the expected share of long-term care expenditures that a policy covers. We define comprehensiveness as the ratio of the expected present discounted value (EPDV) of benefits from a policy relative to the EPDV of total long-term care expenditures for which the individual is at risk. Specifically[2]:

[1] The formula in equation (1) abstracts from a number of specific details that we take account of when actually calculating the load. Our actual calculation takes into account the separate probability of being in each *type* of care, including the costs of nursing homes, assisted living facilities, and home care. We also allow for a time-varying (as opposed to constant) interest rate. See equation (1) of Brown and Finkelstein (2007) for the more detailed formula.

[2] As with the load calculation, this equation is a simplified representation of our actual calculations which account for transition probabilities and differential costs across different types of care, time varying interest rates, and various policy features such as elimination periods or lifetime benefit caps. For a more complete discussion, see equation 2 in Brown and Finkelstein (2007)

$$\text{Comprehensiveness} = \frac{\text{EPDV(Benefits)}}{\text{EPDV(LTC Expenditures)}} \frac{\sum_{t=0}^{T}\left(\frac{Q_t * B_t}{(1+i)^t}\right)}{\sum_{t=0}^{T}\left(\frac{Q_t * X_t}{(1+i)^t}\right)} \qquad (2)$$

where X_t represents monthly long-term care expenditures. A policy that covers all long-term care expenditures would have a comprehensiveness of one; a policy that covered nothing would have a comprehensiveness of zero.

Data

As made clear by equations (1) and (2), the key data elements needed to calculate loads and comprehensiveness are premiums (*P*), benefit details (*B*), long-term care utilization probabilities (*Q*), long-term care costs (*X*), and the nominal interest rate (*i*). We discuss the sources (and assumptions) behind each in turn. We follow the basic approach used in Brown and Finkelstein (2007) in our choice of data inputs, updating them to more recent estimates where feasible and appropriate. In Brown and Finkelstein (2007), we provide a more detailed discussion on the rationale for some of the choices, as well as the sensitivity of estimates to alternative plausible assumptions.

Prices and benefits (P and B)

To obtain data on annual premiums for typical private long-term care insurance policies, we purchased the software package "LTC Quote Plus," which provides information on the prices on the long-term care insurance policies offered by most major carriers. "LTC Quote Plus" is a database sold by Stratecision, Inc., which produces software for agents, brokers, and other parties that reports the prices of different long-term care insurance policies.[3] Stratecision aims to survey all comprehensive, stand-alone long-term care policies from major carriers; they estimate that they have data on the vast majority of the market. We pulled pricing information from July 21, 2010.

We used these data to calculate median annual premiums in July 2010 for eight different common policies that vary in their exact policy features. These policies were defined to match the eight different policy "scenarios" we studied in Brown and Finkelstein (2007). The scenarios are defined based on three policy features. First: does the policy cover only facility care (i.e. care in a nursing home or an assisted living facility) or does it cover both facility and home care? Two of the policies ("scenario 1" policies) cover only facility care while the other six cover both facility and home care. Second: what is the deductible on the policy; the deductible specifies the number of days in otherwise-covered care during which no benefits are paid toward the policyholder's expense. The scenarios range from a 90-day deductible to no deductible. Third: what is the benefit period on the policy? The benefit period specifies the maximum length of time during which the policy will may benefits. The scenarios range from a 2-year benefit period

[3] Brown and Finkelstein (2007) use data supplied by Weiss Ratings, which surveyed providers of long-term care insurance policies. Weiss Ratings was subsequently sold to TheStreet.com, which no longer conducts its own surveys but instead uses premium data from Stratecision.

to an unlimited benefit period. In addition to these three features (type of care covered, deductible length and benefit period) which define the "scenario," there are two other features of the policy that we set. One is the maximum daily benefit rate; unlike most private acute health insurance policies which reimburse for covered expenses (subject to reasonable charges), a key feature of private long-term care insurance policies is that they set a relatively low maximum on the amount of covered expenses that the policy will reimburse per day in care. Based on data on typical policies purchased in 2005, we study policies with a $150 maximum daily benefit. The other feature is whether or not the maximum daily benefit is a constant nominal amount or escalates over time (typically at 5 percent per year compounded in nominal terms). We examine both escalating and constant nominal daily benefits.

Table A1 summarizes the features in each of the eight policies and the annual median premiums. Data on characteristics of policies purchased in 2005—the latest currently available information—suggest that a typical policy purchased is closest to a scenario 2 policy with a $150 maximum daily benefit and a benefit level that escalates in nominal terms (AHIP 2007).[4] The data in Table A1 indicate that for this typical policy, the median annual premium is $4,459. If instead the same policy were purchased with a constant nominal benefit the median annual premium would fall to only $2,244. As we shall see, the difference between constant nominal and escalating nominal benefits is very important for the policy's comprehensiveness.

Finally note that while for completeness we include the "scenario 1" policies that cover only nursing homes and not home health care, these are now virtually non-existent among purchases; they are about 3 percent of purchases compared to about 14 percent in 2000.[5]

Long-term care utilization probabilities (Q)

One of the most important inputs in the load and comprehensiveness calculations is the distribution of utilization risk. Data on age-and gender-specific probabilities of using different types of care are crucial for estimates of the load and comprehensiveness. We use the Robinson actuarial model of care utilization that has been widely used by insurance companies and the Society of Actuaries, and that we previously used (and described) in Brown and Finkelstein (2007). Among its many attributes are that it has information on utilization of all the different types of long-term care covered by private policies (rather than just nursing home care), and that it distinguishes between episodes of care that would and would not be eligible for insurance reimbursement based on the health of the individual. In particular, long-term care utilization is only reimbursable if the individual satisfies the health-related "benefit triggers" specified in the policy. We use the triggers used by Medicaid and the vast majority of private policies which require that for care to be reimbursable, the individual must either need substantial assistance performing at least 2 out of 6 activities of daily living (ADLs) with assistance expected to last at

[4] Brown and Finkelstein (2007) concluded, based on a survey of buyers in 2000 (HIAA 2000) that the typical policy bought at that time was closest to a "scenario 2" policy (i.e. covering home and facility care with a 90-day deductible and a 2-year benefit period) with a $100 daily benefit and a constant nominal benefit level.

[5] The comparison of policies purchased in 2000 and 2005 is facilitated by the fact that the 2000 data (HIAA 2000) and the 2005 data (AHIP 2007) are both collected and compiled by the same underlying source—LifePlans Inc. Indeed the 2000 results—along with earlier years—are summarized for comparison purposed in AHIP (2007).

least 60 days, or must require substantial supervision due to severe cognitive impairment (Wiener et al., 2000, LIMRA 2002, Stone 2002). Note that as a result, our "comprehensiveness" estimates are estimates of the comprehensiveness of a policy relative to the total amount of care that meets these health-related benefit triggers, not to all care.

Despite its many strengths, a very important limitation of this model is that the underlying utilization data are from the 1980s and early 1990s, and there are likely important changes in the relative use of different types of care since then. There is certainly great need for estimates of different types of care utilization using more recent data. Unfortunately we do not know of any existing estimates.

Relatedly, we do not incorporate any projected change in utilization over the lifetime of the policy. As discussed in Brown and Finkelstein (2007), this appears to be consistent with standard industry practice and presumably reflects the considerable disagreement in the literature over how utilization will change over the next several decades.

Finally we note that the Robinson data are based on population estimates (rather than estimates from among the insured population). We believe, however, they are representative of the insured population because estimates from Society of Actuaries (2002) and Finkelstein and McGarry (2006) suggest that insured individuals have similar utilization profiles to the general population of the same age and gender.

Cost of Care (X)

In addition to entering directly into the denominator of the comprehensiveness calculation in (2), costs of care (X) will also affect the calculation of benefits (B) since benefits depend on the daily cost of care (up to the daily benefit cap). We use data from the Metlife Mature Market Institute (2009) to obtain the average daily cost of a Nursing Home and Assisted Living Facility. This is the later version of the Metlife Mature Market Institute (2002) survey we used in Brown and Finkelstein (2007).

For average home health care costs, we use data from the Robinson model that produces age- and gender-specific estimates of the number of hours of home care provided by a registered nurse and by the number of hours provided by other home health care providers. The Metlife Mature Market Institute (2009) study gives average hourly wage rates for a home health aide which we use to monetize the "non RN" home health care providers. To approximate the wages of registered nurses, we use data from the Metlife Mature Market Institute (2002) on the wages of licensed practical nurses (LPNs), which we inflate to 2008 using data from the BLS's Occupational Employment Statistics survey on wage group of LPNs from May 2002 through May 2008.

To project forward our current estimated care costs during the "lifetime" of the policy, we use the general consensus (discussed in Brown and Finkelstein, 2007) that, since the primary cost for all of these types of care is the labor input, they will grow at the rate of real wage growth. We once again assume a 1.5 percentage point annual real growth in wage (care) costs and convert cost growth to nominal terms using the inflation expectations that are implicit in the difference in yields on nominal and real U.S. treasury securities.

Finally, we make adjustments to our cost of care estimates to account for the impact of public insurance programs. Medicaid, the public health insurance program for the indigent, will not affect our estimates of policies' loads or comprehensiveness since it is a secondary payer; private insurance policies pay first before Medicaid pays for any residual expenses it covers. However, Medicare, the public health insurance program for the elderly, is a primary payer; therefore any care that is eligible for Medicare will not be reimbursed by private insurance and therefore should not be included in our estimates of care expenditures (*X*). Specifically, we adjust home health care expenditures downward to account for the fact that Medicare pays an estimated 35 percent of home health care costs (see Brown and Finkelstein, 2007 for more details).

Interest rate

For the nominal interest rate *(i)* we use the term structure on yields of U.S. Treasury strips from the same date in July 2010 that we pulled the pricing data. If in fact insurance companies hold a riskier portfolio, the appropriate interest rate may be higher than the riskless rate, which would drive up our estimate of the load (since premiums are front loaded relative to benefits) and our estimate of comprehensiveness (since the ratio of insured to total expenditures is higher in earlier years due to the fixed nominal daily benefit). More generally, the load and comprehensiveness estimates will be sensitive to our particular assumptions, which is a standard feature of load estimates and discussed and explored in more detail in Brown and Finkelstein (2007).

Results

Loads

Table A2 shows the load calculations for each of the scenarios for a 65 year-old purchaser. The first 3 columns show loads under the assumption that an individual, after purchasing a policy, continues to pay premiums until they die. These results show that for a typical policy purchased (scenario 2: 60-day deductible and 4-year benefit period) with a $150 maximum daily benefit that escalates at 5% nominal per year) the average load is 0.32. In other words, for every dollar paid in expected present discounted value premiums, the policyholder can expect to get back only 68 cents in expected present discounted value benefits. Among policies commonly purchased (recall that “facility only” policies shown in scenario 1 are virtually never purchased) the loads range from 0.29 to 0.51.

One of the striking facts is that loads are much higher for men than for women. For example, again on this typical policy purchased, although the average load (across genders) is 0.32, it is 0.55 for men and only 0.13 for women. This reflects the much higher long-term care utilization (and hence expected benefits) for women than men, combined with the fact that premiums are the same for men and women.

The other striking fact that emerges is when we look at the right-hand panel of Table A2 which shows loads “accounting for termination.” The loads in the first three columns assume that the individual holds the policy until death. In practice, however, individuals often stop paying premiums on existing policies, a phenomenon known in the industry as “policy lapsation”; when individuals lapse on their policies, they generally lose eligibility for any subsequent benefits. We investigate how accounting for this policy termination probability affects estimates of loads (and later comprehensiveness). It turns out it has a large effect. For example, for the typical policy purchased (scenario 2 with escalating benefits), the unisex load rises from 32 cents on the dollar to 50 cents on the dollar once termination probabilities are accounted for.

The large impact of termination probabilities on loads reflects two factors. First, lapsation is quite common; on average about 5 percent of policies lapse per year, and lapse rates are particularly high in the few years immediately after purchasing a policy (Society of Actuaries, 2007). Second, lapsation is costly because expected benefits are increasing with age (given the age—long-term care utilization gradient) and premiums—which are constant nominal amounts and not paid when care is utilization—are therefore quite front loaded relative to their benefits.

Comprehensiveness

Table A3 shows the estimates of comprehensiveness for these same 8 policies. For the typical policy purchased (scenario 2–60 day deductible and 4-year benefit period—with escalating benefits) the comprehensiveness is 65 percent. In other words, the typical policy purchased covers about 65 percent of the expected present discounted value of long-term care costs. This number is slightly higher for men than women (72 versus 61 percent) reflecting the fact that women have much higher expected utilization of care and thus the benefit limits (both daily and lifetime caps) are more binding. Not surprisingly, accounting for termination causes the comprehensiveness to fall substantially—for example for the typical policy purchased the comprehensiveness falls from 65 percent to 37 percent.

Also not surprisingly, comprehensiveness varies greatly based on policy features. Escalation of benefits has a very large impact on comprehensiveness. This is because the real value of constant nominal benefits erodes over time, and for a policy purchased at age 65, benefits are in expectation first paid out 15 to 20 years later.[6] For the same reason, moving to an unlimited benefit period substantially increases comprehensiveness. For a policy whose $150 maximum daily benefit escalates at 5% per year in nominal terms and that has an unlimited benefit period, comprehensiveness is close to complete (95 to 98 percent).

Comparison to loads and comprehensiveness estimates in 2002

As noted earlier, in Brown and Finkelstein (2007) we reported estimates of the load and comprehensiveness of similar policies based on 2002 premium data. It is tempting to compare those estimates to the ones here and infer how loads and comprehensiveness have evolved between 2002 and 2010. We strongly suggest that caution be exercised in doing so for several reasons. First, the "typical" policy bought has changed over time (see AHIP 2007); the average daily benefit has increased and—more importantly—most policies now purchased have benefits that escalate in nominal terms. One therefore needs to consider whether the analysis is of how the load on a given policy has changed or how the load experienced by the average buyer has changed.

Second, although the data source for premiums for 2002 and 2010 is similar—as noted earlier, the source for the 2010 premiums is the company that bought the prior source—it is not sufficiently clear from the available information if the sample of companies in the data may have

[6] The typical age of nursing home use, conditional on a 65 year-old ever entering one, is in one's early 80s (Brown and Finkelsten, 2009)

changed in any meaningful way. The description of the aim of the data remains the same, but one has to wonder about variability in the set of respondents.

Third, although we were able to update the data on costs of care using a more recent version of the data that we used previously, we were not able to update the estimates of long-term care utilization probabilities. Even in 2002 these data may have been out of date in important ways (since they are based on data from the 1980s and early 1990s), and subsequent changes in utilization patterns between 2002 and 2010 could introduce difficulties into time series comparisons.

With these substantial caveats in mind, Table A4 presents 2002 and 2010 median premiums for the eight different scenarios; to compare like to like, we report premiums in both years for policies with a $100 maximum daily benefit. Nominal premiums have risen slightly over the eight years. For example, for the scenario 2 policy, with an escalating benefit, annual premiums have risen from $2,140 to $2,547 or about 19 percent (compared to a 22 percent increase in the CPI-U over this same period).

Table A5 compares loads on these $100 daily benefit policies in 2002 compared to 2010. It appears that loads have fallen slightly (by a few percentage points) on typically purchased policies.

Table A1

Premiums and Sample Size for the Eight Policies Studied, 65 year-olds

		Median annual premium	*Sample size*
Scenario 1: Covers Facility Care Only, 90-day deductible, 2-year benefit period	Constant Nominal Benefits	$1,118	8
	Benefits escalate at 5 percent per year	2,179	8
Scenario 2: Covers Facility and Home Care, 60-day deductible, 4-year benefit period	Constant Nominal Benefits	2,244	17
	Benefits escalate at 5 percent per year	4,459	17
Scenario 3: Covers Facility and Home Care, 30-day deductible, unlimited benefit period	Constant Nominal Benefits	3,889	26
	Benefits escalate at 5 percent per year	7,689	27
Scenario 4: Covers Facility and Home Care, No deductible, unlimited benefit period	Constant Nominal Benefits	4,321	13
	Benefits escalate at 5 percent per year	9,308	13

Note: All policies are for a 65 year-old. They have a $150 maximum daily benefit. Deductible specifies the number of days in otherwise-covered care during which no benefits are paid toward the policyholder's expenses. Benefit period gives the maximum length of time for which the policy will pay the daily benefit. The daily benefit gives the maximum amount paid by the company per day toward covered care. In all of the policies studied, the daily benefit is the same across all types of care.

Table A2
Loads for Various Policies, Age 65

		Held till death			*Accounting for termination*		
		Unisex	*Male*	*Female*	*Unisex*	*Male*	*Female*
Scenario 1: Covers facility care only, 90-day deductible, 2 year benefit period	Constant nominal benefits	17.8%	40.8%	-0.7%	35.9%	53.1%	21.5%
	Benefits escalate at 5 % per year	4.6	34.8	-19.6	30.7	51.8	13.4
Scenario 2: Covers facility and home care, 60-day deductible, 4 year benefit period	Constant nominal benefits	28.7	51.9	9.8	44.3	61.7	29.6
	Benefits escalate at 5 % per year	32.1	55.4	13.2	49.9	66.4	36.0
Scenario 3: Covers facility and home care, 30-day deductible, unlimited benefit period	Constant nominal benefits	42.2	64.5	22.4	54.8	71.7	39.3
	Benefits escalate at 5 % per year	42.8	66.4	21.9	57.6	74.5	42.0
Scenario 4: Covers facility and home care, No deductible, unlimited benefit period	Constant nominal benefits	46.3	66.7	28.3	58.0	73.5	43.8
	Benefits escalate at 5 % per year	51.3	71.1	33.8	63.9	78.1	50.8

Note: All policies are for a 65 year-old. They have a $150 maximum daily benefit. Premiums are given in Table A1. Load is defined in equation (1). “Held till death” assumes the policyholder pays premiums until death. Results “accounting for termination probability” use the empirical termination probabilities in Society of Actuaries (2007).

Table A3
Comprehensiveness for Various Policies, Age 65

		Held till death			*Accounting for termination*		
		Unisex	*Male*	*Female*	*Unisex*	*Male*	*Female*
Scenario 1: Covers facility care only, 90-day deductible, 2-year benefit period	Constant nominal benefits	20.6%	24.7%	18.6%	12.3%	15.2%	11.0%
	Benefits escalate at 5 % per year	46.6	53.1	43.1	25.9	30.5	23.6
Scenario 2: Covers facility and home care, 60-day deductible, 4-year benefit period	Constant nominal benefits	34.4	39.0	32.0	20.8	24.2	19.1
	Benefits escalate at 5 % per year	65.1	71.7	61.2	37.2	42.3	34.5
Scenario 3: Covers facility and home care, 30-day deductible, unlimited benefit period	Constant nominal benefits	48.7	50.0	48.2	29.4	31.1	28.8
	Benefits escalate at 5 % per year	95.3	93.7	96.0	54.5	55.4	54.3
Scenario 4: Covers facility and home care, no deductible, unlimited benefit period	Constant nominal benefits	50.2	52.0	49.4	30.3	32.4	29.5
	Benefits escalate at 5 % per year	98.0	97.4	98.3	56.1	57.6	55.7

Note: All policies are for a 65 year-old. They have a $150 maximum daily benefit. Comprehensiveness is defined in equation (2). "Held till death" assumes the policyholder pays premiums until death. Results "accounting for termination probability" use the empirical termination probabilities in Society of Actuaries (2007).

Table A4
Comparison of Premiums for 65 Year-Olds, 2002 and 2010.

		2002	*2010*
Scenario 1: Covers facility care only, 90-day deductible, 2-year benefit period	Constant nominal benefits	$530	$589 (8)
	Benefits escalate at 5% per year	1,016	1,240 (8)
Scenario 2: Covers facility and home care, 60-day deductible, 4-year benefit period	Constant nominal benefits	1,192	1,249 (17)
	Benefits escalate at 5% per year	2,140	2,547 (17)
Scenario 3: Covers facility and home care, 30-day deductible, unlimited benefit period	Constant nominal benefits	1,872	2,031 (26)
	Benefits escalate at 5% per year	3,450	3,977 (26)
Scenario 4: Covers facility and home care, no deductible, unlimited benefit period	Constant nominal benefits	1,698	2,350 (12)
	Benefits escalate at 5 % per year	3,326	4,652 (12)

Note: All policies are for a 65 year-old. They have a $100 maximum daily benefit. 2002 data are taken from Brown and Finkelstein (2007). Deductible specifies the number of days in otherwise-covered care during which no benefits are paid toward the policyholder's expenses. Benefit period gives the maximum length of time for which the policy will pay the daily benefit. The daily benefit gives the maximum amount paid by the company per day toward covered care. In all of the policies studied, the daily benefit is the same across all types of care. For 2010, the sample size (number of policies) is in parentheses.

Table A5: Comparison of Loads, 2002 and 2010.

		Male		*Female*	
		2002	*2010*	*2002*	*2010*
Scenario 1: Covers facility care only, 90-day deductible, 2-year benefit period	Constant nominal benefits	27.5%	24.6%	-22.3%	-28.1%
	Benefits escalate at 5% per year	19.6	17.6	-47.3	-51.8
Scenario 2: Covers facility and home care, 60-day deductible, 4-year benefit period	Constant nominal benefits	44.1	34.7	-4.4	-22.9
	Benefits escalate at 5% per year	44.7	40.9	-7.8	-16.6
Scenario 3: Covers facility and home care, 30-day deductible, unlimited benefit period	Constant nominal benefits	54.9	48.4	2.7	-12.8
	Benefits escalate at 5% per year	55.7	50.5	-2.5	-17.1
Scenario 4: Covers facility and home care, no deductible, unlimited benefit period	Constant nominal benefits	48.1	53.6	-10.3	-0.1
	Benefits escalate at 5% per year	52.1	56.0	-9.2	-2.7

Note: All policies are for a 65 year-old. They have a $100 maximum daily benefit. All calculations assume policies are held till death. 2002 estimates are taken from Brown and Finkelstein (2007, Table 8).

References (new to Appendix):

Health Insurance Association of America (HIAA). 2000. "Who Buys LTC Insurance in 2000?" Washington D.C.