

BY MOSHE A. MILEVSKY, PHD

How Risky is Longevity?

IN THE PRACTICE OF RETIREMENT INCOME planning, financial advisors routinely toss around survival probabilities for clients — “there’s a 10 percent chance you’ll live to 100” or “there’s a 50 percent chance one of you will reach 90.” Numerous Web-based calculators allow you to determine these probabilities with only a few basic inputs (see www.qwema.com for an example).

But the truth is that working out these sorts of odds is more subtle and problematic than is commonly acknowledged. In this article I’ll delve more deeply into longevity risk and argue that it’s actually much riskier and less knowable than you might think.

Risk vs. Uncertainty

In the 1920s, the University of Chicago economist Frank H. Knight introduced his colleagues and the profession to the core distinction between the *quantifiable* notion of “risk” versus the *qualitative* concept of “uncertainty.” Today, we tend to use the words risk and uncertainty interchangeably, but they actually represent very different levels of knowability. The financial crisis of 2008-2009 has taught practitioners that many of the things we thought were only risky — and to which we could assign comforting odds and probabilities — were actually much worse: they were highly *uncertain*.

Dead or Alive: The Facts

Let’s start with the known facts. According to the Human Mortality Database (HMD), managed by the University of California at Berkeley, in the year 2007 there were 431,980 living Americans older than 95. Think about that: close to half a million people who have lived through what is likely three decades of retirement! Of this group, 79 percent were female and a mere 21 percent were male. (Guys, imagine the selection you’ll have...*if you can wait*.) Now, this 431,980 number, despite its apparent precision, is undoubtedly an approximation, as it’s virtually impossible to get an accurate population count in any given year, especially for people at advanced ages.

(The table on the next page lists the age-by-age counts from ages 95 to 105 and up.)

An important way to think about our group of people older than 95 is from the perspective of *birth cohorts*, which are groups of people born in the same year. Of all the Americans who were age zero (i.e., born) in the year 1912, only 132,375 were still alive in the year 2007, or 95 years later (see table). From the cohort group of those born in the year 1911, only 97,555 were alive in the year 2007, which was 96 years later. Likewise, the 1910 birth cohort had 68,418 survivors in 2007.

Now step back for a moment and think about how an actuary (a.k.a. an insurance statistician) can use these numbers to forecast that you (or your client) stand an x percent chance of living y more years. The actuary has a large table similar to the one below, starting from age zero to the maximum age at which people are still alive in 2007. The data can be grouped by gender, race and even health status. The actuary will have access to data going back years, decades and even centuries.

Using this data, an actuary can derive the expected number of people alive at age 94 (in 2006) who didn’t make it to age 95 (in the year 2007) — or their one-year survival and mortality rates. In fact, the one-year survival and mortality rates are so fundamental to actuaries and demographers that they each have their own symbol, the letter p and the letter q . The survival rate (p) is 100% minus the mortality rate (q), or $p=1-q$. If my *mortality rate* in any given year is $q=10\%$, then my *survival rate* is $p=90\%$.

Bear with me here. It is important to understand that mortality rates derived in this manner are applied to a given age (say 94) and a given birth cohort (say 1912). So, for example, the mortality rate of a generic 94-year-old, i.e., the odds that person will die in the next year, depends on the year of birth — as well as on gender, race, socio-economic status,

and more. The q at 95, 96 or 97 is by no means a universal constant.

Declining Past Mortality Rates and Uncertain Future Rates

Now, if you have some time and energy to wander around the Human Mortality Database and compare the reported mortality rates across different birth cohorts, you will see that $q[94,1912]$ is smaller than $q[94,1911]$ which itself was smaller than $q[94,1910]$. (The first number represents the age, the second represents the birth year.) In other words, the mortality rates for 94-year-olds have been declining over time.

But — and this is key — *nobody really knows with certainty what these numbers will look like going forward*. In fact, there is a raging debate in the academic world of demographic research about whether future q 's will continue to plummet as they have in the past (so say professors Jim Oeppen and James Vaupel) or whether they will stage a recovery rally (so say professors Jay Olshansky and Bruce Carnes). For every path-breaking pharmacological discovery that promises to extend life on one hand, there is an epidemic, disease or war that may extinguish it on the other.

So, all I really know with certainty today is that I am currently alive. In other words, I have survived my personal $q[0,1967]$, $q[1,1967]$, $q[2,1967]$, and so on, all the way to $q[41,1967]$. However, to obtain *forward-looking* survival probabilities — to my age 95, for example — I need values for $q[42,1967]$, $q[43,1967]$, $q[44,1967]$, all the way up to $q[94,1967]$. But those values are not yet available. What will they be? Are the values $q[42,1966]$ or $q[42,1965]$, which have already been revealed, good enough proxies for me?

Some argue that knowing the historical values for current 55-, 65-, or 75-year-olds is not enough to provide sufficient certainty. And yet, this string of values — from $q[42,1967]$ all the way to $q[94,1967]$ — is absolutely necessary for forecasting the odds I will live to 95 — and we really don't have those numbers yet, only estimates based on older people. (Remember, actuaries project forward by looking backward.) But as they say in the mutual fund and investment business, past performance is no indication of future returns!

Minding Your Clients' ps and qs

So, what are the assumptions you are

implicitly making when you calculate a survival probability for a client? First, you are assuming that past mortality improvement, as described above, is indicative of future mortality improvement. Secondly, you are assuming that your client will experience "average" mortality. Both are tall orders for long-term forecasts.

Annuity companies can afford to live and die (i.e., set reserves) based on these actuarial values and calculations because they sell a lot of longevity insurance — and they often take both sides of the deal by selling life insurance as well. So, even if they are way off on their qs , it can come out for them in the wash. However, *on an individual basis*, and for your clients, survival probabilities have less meaning and less significance. Looked at this way, a 95 percent probability that you have enough money to last for the rest of your life might not be as comforting as it sounds. First of all, what happens in the remaining 5 percent of scenarios? More importantly, how confident are you in your ps and qs ?

Here's the practical bottom line: The next time you advocate the use of any kind of annuity product to hedge away some of your clients' longevity risk, you are doing more than just improving the odds their retirement will be sustainable. You are building on what we know about risk, longevity and survival probabilities to reduce the *uncertainty* of their retirement — something which is probably more important now than ever before.

*Moshe A. Milevsky, Ph.D., is an Associate Professor of Finance at the Schulich School of Business in Toronto, the Executive Director of the IFID Centre and President and CEO of the QWeMA Group. He is also the author of the recently published book Are You a Stock or a Bond? Create Your Own Pension Plan for a Secure Financial Future (Pearson/FT 2008). **R***

POPULATION DEMOGRAPHICS IN 2007:

Who Survived At Least Three Decades Of Retirement?

| AGE RANGE | # ALIVE | FEMALES | MALES |
|----------------|---------|---------|-------|
| 95 to 96 | 132,375 | 76.0% | 24.0% |
| 96 to 97 | 97,555 | 77.6% | 22.4% |
| 97 to 98 | 68,418 | 78.9% | 21.1% |
| 98 to 99 | 47,844 | 80.3% | 19.7% |
| 99 to 100 | 32,257 | 81.4% | 18.6% |
| 100 to 101 | 20,848 | 82.9% | 17.1% |
| 101 to 102 | 13,153 | 84.0% | 16.0% |
| 102 to 103 | 8,219 | 84.9% | 15.1% |
| 103 to 104 | 4,978 | 85.7% | 14.3% |
| 104 to 105 | 2,917 | 86.7% | 13.3% |
| 105 and Beyond | 3,414 | 87.4% | 12.6% |

Source: Calculations based on raw numbers from the Human Mortality Database (UC Berkeley), www.mortality.org