Markov Process Work-Life Expectancy Tables, the LPE Method for Measuring Worklife Expectancy, and Why the Gamboa-Gibson Worklife Expectancy Tables Are Without Merit

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This paper has three parts. The first considers the various methods used by economic experts to measure worklife expectancy for purposes of determining damages for loss of earning capacity in personal injury cases or loss of financial support in wrongful death actions. Based on surveys of members of the National Association of Forensic Economics, the predominant method is use of Markov process statistical work-life expectancy tables, with the LPE method as a distant second, and use of a fixed retirement date as a close third and median or mean years to final labor force separation a distant fourth. The primary focus of this paper is on a comparison of Markov process approach and the LPE approach, with an explanation of the advantages and disadvantages of each method. The second part deals with the issues posed by worklife expectancy and disability. The second part will provide suggestions for how an economic expert can assist a jury in dealing with the possibility that permanent disability may shorten the period over which a worker in residual employment will have a reduced worklife. The third and shortest part of the paper will deal with why the Gamboa-Gibson LPE based disability work-life expectancy tables are without merit and should not be used.

Introduction

This paper has three parts that could each have been treated as a shorter paper by itself. Each part deals with the issue of how to measure or present the issue of work-life expectancy to a jury, but each part has a somewhat different emphasis. The first part describes the methods used by forensic economists to measure or deal with work-life expectancy in calculating damages or loss of financial support. The focus of the first part will be a comparison of the advantages and disadvantages of two of those methods, the Markov process method and the LPE method, but other methods will also be briefly described and critiqued. The second part will deal with the fact that disability can shorten a worker's residual worklife expectancy. It will offer suggestions about how an economist can assist a jury in considering how to think about the degree of shortening of work-life expectancy in residual employment that may be involved. The third part will provide an explanation for why both the disability and non disability work-life expectancy tables produced by Gamboa and Gibson (2006) are without merit and should not be used in preparing reports of loss by forensic economists.

Methods for Considering Worklife Expectancy

In order to value loss of earnings, the number of years over which that loss will take place must somehow be measured. Typically, that is done by using measures of work-life expectancy.

Work-life expectancy is the number of years and partial years that a worker would be expected to participate in the labor market before either death or final retirement from the labor market. While some economists argue that there is a difference between the number of years a worker would be expected to earn and the number of years that a worker has the capacity to earn[1], any calculation of lost earnings must take into account the number of years over which earnings loss will occur. In the context of this paper, the term "work-life expectancy" is used to refer to any method for determining the period of time a worker is assumed to have worked before his or her injury or after his or her injury. Both the Markov process model and the LPE model are based on expectancy that a worker would participate a specific number of years in the commercial labor market, but other approaches do not necessarily make that assumption. The other approaches, however, make the assumption that a worker would work specific periods of time for purposes of measuring lost lifetime earnings and thus will be referred to as "worklife expectancy approaches" in this paper.

A number of surveys have been conducted over the years of members of the National Association of Forensic Economics (NAFE) that have asked questions about the methods used by forensic economists. While these surveys are not true scientific surveys, they provide the limited information that is available about the current practices of forensic economists. That information is provided in Table 1 of this paper for the years 1997, 2006 and 2009. By an increasingly overwhelming margin, the preferred approach is use of statistical tables compiled by Markov process methods. As of the most recent survey, 61.6 percent of respondents use statistical tables compiled by Markov process methods. The LPE method is a distant second with 8.1 percent, with 7.0 percent using fixed retirement dates, and another 2.9 percent using either median or mean years to retirement methods. An additional 20.3% use some combination of these methods.

Mean or median years to retirement methods are based on determining the number of years expected retirement without regard to whether a worker would actually be expected to work all years to that age. Fixed date of retirement methods assume that there is some age at which retirement would ordinarily occur, often a person's "full" Social Security retirement age or age 70, again without regard to whether a worker would actually be expected to work all of the years to that age. (These methods are sometimes justified on the basis of alleged differences between "expected earnings" and "earning capacity.") Both ordinary Markov process statistical worklife expectancy tables and and LPE tables measure "expected earnings" and are the focus of this paper. Each of those methods will be explained in turn in the next two sections of the paper, starting with the LPE method.

The LPE Method

The LPE method was first mentioned with that name by Brookshire and Cobb in 1983. This same method was explained, but not with the "LPE" name in Baker and Seck in 1987 and with that name by Brookshire in 1987. The LPE name stands for (L) the probability that an average individual in a particular demographic category will be alive during any given year in the future; (P) the probability, given that the individual is alive, an average individual within in a particular demographic category will be a participant in the labor market during any given year in the future; and (E) the probability that an average individual within a demographic category who is both alive and a labor market participant will be employed in the labor market during any given year in the future. When multiplied together the probabilities for the three factors determine the probability that an average individual in a given demographic category will be alive, a participant in the labor market (defined as either having employment or actively seeking employment), and employed in the labor market. This joint probability is often referred to as "worklife probability."

Typically, reports using the LPE method provide a schedule of years and the individual's age with probabilities for L, P, and E (or some combination of L, P, and E) for that age. Technically, such tables should run to age 100 (or 110 if one is a stickler for detail), but present values for incremental earnings after about

Table 1
Methods Used to Deal With Worklife Expectancy in NAFE Surveys

	1997	2006	2009
Statistical Markov Process Tables	45.0%	54.5%	61.6%
Mean or median years to final labor force separation	6.7%	4.5%	2.9%
LPE method	9.6%	10.9%	8.1%
Fixed Retirement Date or Age	8.4%	9.0%	7.0%
Combination of Methods	25.3%	21.2%	20.3%

age 85 discounted for L, P, and E are small enough that they are often ignored. A specific worklife expectancy can be derived from such a table by summing the annual joint conditional worklife probabilities as if the percentage equaled the fraction of each year that the individuals would be expected to work. Thus, for example, if the worklife probability in 2019 when the individual would be 54 is 0.7215, it is expected that the individual would have worked 72.15% of the year in 2019 and 0.7215 can be added to the sum of fractional years in determining the individual's total worklife expectancy. Sometimes such a total worklife expectancy is provided in reports using this method, but often no single worklife expectancy value is stated. To see how the three probabilities are combined, see Brookshire and Cobb (1984), Brookshire (1987) or Baker and Seck (1987). This topic is also covered in the Appendix to this paper.

The LPE approach is often referred to as a three factor approach based on L, P, and E, but that is not an adequate description of the method involved. The LPE system overtly includes two types of variables and assumptions related to those variables. One type of variables consists of the L, P, and E factors, but also includes one other non-fixed variable. The other type of variable involves the "fixed factors" that are also involved in defining the demographic categories within which the method determines worklife probability. To understand the LPE method, one must understand all of the variables and the ways in which assumptions about each variable may limit the accuracy of calculations based on that method. The fourth non-fixed variable is the age of the individual, which also changes from year to year. Thus, there are four changing variables in the LPE method: Age, L, P, and E. Survival probabilities are derived from a standard life table, usually the most recent United States Life Table, currently based on the year 2004. How this is done is discussed in the Appendix to this paper. Current participation rates for various demographic categories and current employment rates for those demographic categories can be obtained from the Bureau of Labor Statistics[2]. One of the virtues claimed for this method is that data for P and E can be found up through the last full calendar year, while survival data lags between four and five years. (Data used in Markov process calculations tends to be several years older. Most economists are now using tables based on data from 1997-98, as will be discussed below.)

However, it is important to consider the other "fixed" variables in the LPE method. These are the variables used to define the demographic group for which LPE tables are constructed. Those variables as used by most economists can include sex, education, and "race," to which the Gamboa-Gibson tables also add several disability statuses. Whether or not to use "race" as a defining characteristic for demographic groups in all types of models is a controversial topic that would require a paper in itself. In this paper, "race" will be ignored as a defining demographic characteristic for that reason, but economists are generally in agreement that both sex and education are defining demographic characteristics that should be taken into account. With sex, this poses only minor problems. Transsexuals are only a tiny percentage of all workers, so that "sex" is well defined binary descriptive characteristic of an individual that will not change over time. It is safe to assume that if a male is a male in year 2009, that same individual, if alive, will still be a male in 2025. The implicit assumption that if one is a male (or female) in time period 0 one will always be a male (or female) is an assumption that few would question.

Education, however, raises more questions. It is an assumption of the LPE method that if a given individual has a high school degree as her highest level of education she will always have a high school degree as her highest level of education. If she is a high school graduate in year 2009, she will be a high school graduate in 2025. This assumption is more restrictive. A woman at age 23 who has a high school degree as her highest level of education in 2009 has some chance of going back to school and acquiring some college, but no degree, an Associate Degree, a Bachelor Degree or even a graduate degree before the year 2025. To use a term that will be come important in this paper, she might *transition* from being a high school graduate to being a woman with "some college but no degree" to having her Bachelor degree from a college or university to having a Graduate degree. While we have no generally accepted data that lays out the rates at which such transitions are likely to occur, we know generally that the probability of such transitions probably decreases every year from age 18 to the end of life. If the general method used in the LPE approach was used to address this question, a woman at age 18 who has graduated from high school has an average probability of going on to college and an average probability for graduating from college with her bachelor degree. As years go by after age 18, the probability of her going to college or graduating from college declines, but it never becomes as small as the probability that a woman who is a woman at age 18 would become a man in the year 2025. In short, the assumption that a person will always have the education level he or she has in 2009 is not as solid as an assumption that woman who is a woman in 2009 will also be a woman in 2025.

The key point is that the LPE system does not account for the possibility that a woman's (or a man's) educational level may change as years go by. To that extent, the LPE model is weaker than a model that had a reliable way for accounting for such transitions. (This problem also applies to first order Markov process models and thus is not unique to the LPE approach, however.) Since both the LPE and Markov process models show that increasing a person's education level increase a person's worklife expectancy at any given age, failure to account for possible transitions to higher education levels understates the true worklife expectancy of an individual. What tables show is the average worklife expectancy of an individual assuming that the individual's sex does not change and that the individual's education level does not change. Since assuming that an individual's sex will not change in the future is a safe assumption, making that assumption introduces no weakness into the measurement of worklife expectancy. Making the assumption that educational level will not increase, however, introduces weakness and causes distortion in a downward direction. To the best of this author's knowledge, no one has tried to calculate how much weakness this introduces but the amount is probably relatively minor, at least after a certain number of years.

An expert might deal with this weakness by finding out whether an injured plaintiff intended to go back to school. If so, one could calculate lost earnings based on the assumption that the individuals went back to school and earned a bachelor's degree and an assumption that the individual did not do so. This would leave it to a jury to determine which projection of lost earnings was likely to be more accurate. If at age 23, a woman had given no consideration to obtaining more education beyond a high school degree she earned at age 18, an expert might conclude that it was reasonable to assume she would not have gone back to school. However, these kinds of judgments have *ad hoc* characteristics that go beyond what can be assumed on the basis of scientific measurement. Making this point will be recurrent in this paper. An expert is relying upon common sense and general experience when making points of this kind without specific data to back up those points.

With that as a background, it will now be useful to look at the LPE factors themselves. L is the probability that an individual would remain alive in each future year. In the calculations of L, transitions are allowed in the LPE system. An individual can transition from being alive to being dead. If the individual does so, he or she drops out of the measurement system. Being alive is a precondition for being a participant in the labor market and for being employed. Transitions can only go in the direction of from being alive to being dead. The same, however, is not true of P and E. Individuals can transition back and forth between being participants in the labor market and being employed if participating in the labor market. In the LPE system, the possibility of transitions is accounted for, but in a way that is not very accurate. Each year, it is assumed that each individual in a defined demographic group is assumed to have an average probability for the group as a whole of being a participant in the labor market and of being employed. We know this is not correct. Some individuals in the defined demographic group have been both participants and employed during each of the past ten years and some individuals in the defined demographic group have neither been participants nor employed in any of the past ten years. If two individuals with these records are the same age, each will have the same worklife probability in an LPE table next year in an LPE table. If each has a survival probability next year of 0.950, the LPE method would assign to both of them a 0.500 probability of participation. Since employment rates are based on participants only, the probability of employment based on recorded statistics would be 100% based the inclusion of the first individual and the exclusion of the second individual from the average statistic. This would mean that the two person average worklife probability for both persons would be 0.950 x 0.500 x 1.00 = 0.475. This will understate the true worklife probability of the first individual and overstate the true worklife probability for the second individual.

Thus, while the LPE system may the advantage of being based on current information, it has disadvantages in that it provides no systematic way to measure educational transitions or to account for differences in the work records of individuals, both in terms of being participants in the labor market and in terms of the probability of being employed. Another advantage argued for the LPE system is that it avoids distortions due to front-loading of years of worklife expectancy. That issue goes beyond the purview of this paper, but may have merit[3]. Still another advantage argued for the LPE system is that it projects earnings possibilities to advanced ages. However, it is common for users of this method to use arbitrary cut-offs at earlier ages because annual worklife probabilities become very small. Cross-examining attorneys can also sometimes make it appear that consideration of unlikely work possibilities in advanced years is overreaching. If arbitrary cutoffs are employed, the "spreading out of years of worklife" advantage of the LPE model is partially removed. A problem with the LPE method as typically practiced is that P and E values for persons over age 65 are values for a 36 year cohort of workers over that age, hiding what are probably significant differences in participation by persons from age 65 to 69, 70 to 74, 75 to 79, 80 to 85, 85 to 89, 90 to 94, and 95 to100. A final advantage of the LPE method is that it can provide P and E values for more educational categories than are provided for worklife measurements in any Markov statistical worklife expectancy table.

Markov Process Statistical Worklife Expectancy Tables

In a Markov process statistical worklife expectancy table (also called "increment-decrement"), the key difference from an LPE type model is the measurement of transition rates between "active" and "inactive" statuses in the labor market. These are terms for whether or not a person was a participant in the labor market at a specific time in the past. A person is defined as "active" if he or she is employed or actively seeking employment and inactive if he or she was neither employed nor actively seeking employment. Persons can transition from active to inactive states and from inactive to active states. Compiling Markov process tables involves calculating rates of transitions back and forth between the two states and calculating estimated worklife expectancies on the basis of those calculated transition rates. Most explanations provided in published Markov process worklife expectancy tables contain extensive mathematical specifications for how this is done, but the essence is fairly simple. [See Foster and Skoog (2005) for a basic introduction to assumptions made in a Markov model.] A worker who is "active" in time period 0 has some chance of transitioning to the "inactive" state in time period 1 and then transitioning back to "active" in time period 2. The probabilities of transitions between states are estimated from the survey data and then applied in calculations of expected worklife. Since (P) in an LPE model does not take into account whether a person was "active" or "inactive" last year, this is not done in the LPE approach.

Most existing Markov Process tables that are being used by forensic economists rely on a "two state, first order" Markov process. A two state model means that transitions between the active and inactive states are being incorporated into the measurement of worklife expectancy. One of the existing tables is a "three state" model because it also incorporates transitions between the employed and unemployed states along with transitions between active and inactive states (Millimet et al., 2002). All of the models being employed are "first order" models in that they go back only one year in measuring transitions. A "second" order model would go back two years, but would exponentially increase the number of transitions to be measured as follows: A transition rate between active and inactive statuses this year for persons who were "active" during both of the last two years; a transition rate for persons who were active last year but inactive the year before; a transition rate for persons who were inactive last year, but active the year before; and a transition rate for persons who were inactive in each of the past two years. A "third order" Markov model would go back three years and require the measurement of nine transition rates. To capture differences based on a ten year time horizon for a two state model would require measurement of 1024 different transition rates and would almost certainly run into the problem that data would provide insufficient sample sizes for reliable estimates for most of those transition rates. A three state model would require 59049 (3 to the 10^{th} power) transition rates unless it was argued that the transition rates for participation and employment (from each initial state) affected each other (as they very probably do), in which case the number would vastly increase.

Since only one second and no third order worklife expectancy tables have been compiled, economic experts are limited to first order models. This means that Markov models add the important advantage of being able to account for differences between persons who were either active or inactive in the labor market at the time of their injuries. Not surprisingly, all existing tables show that active individuals have longer worklife expectancies than inactive individuals and that the differences are significant. However, it remains true that a person who was inactive nine of the ten past years, but active in the labor market at the time of an injury would have the same worklife expectancy as another person who was active in all ten of the past ten years. In that circumstance, it might be the case for a given individual that an LPE measurement would be more accurate than a Markov measurement that included transitions. However, this would be rare because very few individuals would have been inactive for nine of the past ten years but active last year. For that reason, use of a Markov process model that makes distinctions based on the time of injury is likely to increase accuracy compared with an LPE model that makes no distinctions for any year between individuals in a given demographic category. Still, an expert should know something about the work history of every plaintiff so that an expert would be aware of such rare circumstances. A well-prepared expert would be aware that a given worker had not been in the labor market nine of the past ten years and that a worker with that record might be more like a worker who was inactive at the time of injury than a worker who was active at the time of injury. The data is not complete enough to prevent the need for individual judgment that is well informed about the structure of the data being utilized.

A wag once defined an expert as someone who says, "I don't know," a lot, but at the right times. We do not have reliable worklife expectancy data that takes into account differences between occupations (with a partial exception in the case of railroad workers), health differences or differences between people other than educational differences, sex difference, labor force status, and age. A book by Richards and Abele (1999) purports to provide detailed information about both life and worklife expectancies based on Hispanic origin, English language proficiency of persons of Hispanic origin, smoking status, occupational status and marital status. Some of the tables reported by Richards and Abele are based on Markov process models. Others are not. This source is not generally thought to be reliable or used by most forensic economists, at least in the experience of this author or as indicated in the NAFE surveys cited earlier. In the ten years since publication of Richards and Abele, this author has not seen tables from that source used in reports. What

Richards and Abele call "the conventional model" is a version of worklife expectancy tables that was used by the Bureau of Labor Statistics that contained no measurement of transition rates and was abandoned in 1982 by the BLS when its use of Markov process models began.

What we have are the following Markov process studies, all of which provide worklife expectancies by age, education, and sex:

(1) Bureau of Labor Statistics, Bulletin 2254, published February 1986 and based on 1979-80 data. This is a two state, first order study.

(2) Millimet et al., *Journal of Econometrics*, published 2003 and based on pooled data from 1992 to 2000. This is a three state, first order study that also includes consideration of unemployment..

(3) Ciecka, Donley and Goldman, *Journal of Legal Economics*, published 1999-00 and based on 1997-98 data. This is a two state, first order study.

(4) Ciecka, Donley and Goldman, *Journal of Legal Economics*, published 2000-01 and based on 1997-98 data with more educational categories. This is a two state, first order study.

(5) Skoog and Ciecka, *Journal of Legal Economics*, published 2001 and based on 1997-98 data with detailed educational categories and greater detail about statistical variation. This is a two state, first order study.

(6) Skoog and Ciecka, *Journal of Forensic Economics,* published 2004 and based on 1997-98 data with explanation for how various types of studies relate to each other.

(7) Krueger, *Journal of Forensic Economics*, published 2004 and based on pooled data from 1998 to 2004. This is a two state, first order study.

For male worklife expectancies, there is surprisingly little difference among the studies. Millimet et al shows somewhat smaller worklife expectancies as should be expected because the study includes reduction for unemployment. For female worklife expectancies, however, the 1986 Bureau of Labor Statistics study shows significantly lower worklife expectancies than any of the more recent studies, all of which contain data that is significantly more recent than the BLS study. This is also as expected, given the growth in female labor force attachment between 1979-80 and 1997-98. Because much of the difference between male and female worklife expectancy can be explained by the greater role of females in stay-at-home child care and elder care, some forensic economists use male worklife expectancies for females when females have shown consistent labor force attachment.

Since Markov process studies other than Millimet et al., do not consider unemployment, experts who want to account for unemployment must make reductions for unemployment. This is argued by Brookshire and Barrett (2009) to be an advantage of the LPE method, which incorporates unemployment, over Markov process models. However, for school teachers and government workers with tenure or seniority, the chance of unemployment is small enough to be ignored. For such workers it is arguably an advantage of Markov process studies (other than Millimet et al.) that they do *not* include adjustment for unemployment. Similarly, in occupations with greater than average potential for unemployment, this may be an argument in favor of Markov process studies in comparison with LPE studies that use an average rate of unemployment for each demographic group. Another relevant issue is that unemployment, particularly in occupations such as construction with important seasonal elements, may have already have been taken into account in an expert's consideration of an injured person's work history.

Readers with the mathematical skills for doing so should read Skoog and Ciecka (2004, 2009) to more fully understand the problems posed by LPE and other non Markov approaches for measuring worklife expectancy. Their discussion of the two LPE variants, LPd and LPi, is interesting, but a reader must be prepared to deal with a variety of new terminology and unfamiliar equations. Skoog and Ciecka talk about assumptions that would have to be made for either of two possible interpretations of the LPE model that could theoretically be made. Their point is that the LPE model is a mis-specified model in either form. If we know that a worker is active, the chance next year that a worker will be "active" has to be higher, on average, than if the person is "inactive." Ignoring that fact will produce biased estimates.

A Suggested Method for Presenting Possibly Reduced Post-Injury Worklife

The focus of the second part of this paper is on what an economic expert can do to assist a trier of fact in dealing with the reality that permanent injuries can sometimes lead to a shortening of the worklife expectancy of an injured person after an injury. If an injury makes an individual unemployable in the commercial labor market, there will be no residual employment. This is easy to deal with. An individual may also suffer from a permanent disability that is unlikely to affect his or her worklife after he or she is able to return to work. Losing a leg below the knee and having been fitted with an appropriate prosthesis, for example, may not have any impact on the duration of the individual's post-injury expected future worklife expectancy. The worker will almost surely have a period in the past during which he or she was recovering and going through rehabilitation to be able to walk with a prosthesis. That worker may be excluded from a number of occupations that require extensive standing or walking, but will probably not have any shortening of the number of years of expected worklife in a sedentary employment if no continuing problems exist with the site of amputation. Not all and perhaps not even most permanent injuries cause reductions in worklife expectancy. However, some permanent injuries are likely to require future medical treatment and may be predicted to shorten the period of time that person is likely to be able to work after an injury. The last part of this paper will explain why no reliable tables exist or are likely to ever exist that can provide specific information about reduction in worklife expectancy caused by a specific disability. What, then, can an expert do to assist a jury in making such determinations? In this section, thoughts will be offered about what an economic expert can do that would assist a jury in dealing with a situation in which an individual has a reasonable likelihood of reduced worklife in residual employment after an injury.

An expert should make it clear that economic expertise does not allow an expert to arrive at any opinion about how much an individual's worklife expectancy has been reduced (other than actual losses between the date of an injury and the date or expected date on which the individual returned to work). However, even though no specific reduction can be assumed, an economic expert can show the impact on damages of a reduction in post-injury worklife expectancy of one year, two years and all years up to the number of years of pre-injury expected worklife. Ultimately the trier of fact will have to decide how many years, if any, should be subtracted from the injured person's post-injury worklife expectancy because of the injury, but an economic expert can make it easier for a judge or jury to determine the appropriate present value of damages based on the amount of reduction the judge or jury finds reasonable. This will be done with two examples, with the first example simpler than the second example.

The first example is shown in Table 2. In this case a worker is assumed to have had an earning capacity in 2008 of $50,000 per year with a 20 year pre-injury worklife expectancy. Earnings are expected to increase at 2.5% per year, with reduction to present value in 2010 and thereafter at a gross discount rate of 4.5% per year. The worker returned to work after the injury on January 1, 2008 and has been working full time ever since with no reduction in pay. However the worker has a disabling condition as a result of the worker's injury that has a reasonable likelihood of reducing the worker's post injury worklife by some unknown number of years. There were past damages that were accounted for separately, but those damages are not shown in the example. The worker was

Table 2
Worklife Expectancy Reduction Table (Post-Injury Earnings Rate = Pre-Injury Earnings Rate)

Year	Age	Earning	Present Value	Cumulative	Yrs Yrs Lost	Future Year PV	PV of Loss
2008	40	$50,000	$50,000	$50,000	1st	$36,193	$36,193
2009	41	$51,250	$51,250	$101,250	2nd	$36,900	$73,093
2010	42	$52,531	$50,269	$151,519	3rd	$37,620	$110,713
2011	43	$53,845	$49,307	$200,826	4th	$38,354	$149,067
2012	44	$55,191	$48,363	$249,190	5th	$39,102	$188,169
2013	45	$56,570	$47,438	$296,627	6th	$39,865	$228,034
2014	46	$57,985	$46,530	$343,157	7th	$40,643	$268,677
2015	47	$59,434	$45,639	$388,797	8th	$41,436	$310,113
2016	48	$60,920	$44,766	$433,562	9th	$42,244	$352,357
2017	49	$62,443	$43,909	$477,471	10th	$43,069	$395,426
2018	50	$64,004	$43,069	$520,540	11th	$43,909	$439,335
2019	51	$65,604	$42,244	$562,785	12th	$44,766	$484,101
2020	52	$67,244	$41,436	$604,221	13th	$45,639	$529,740
2021	53	$68,926	$40,643	$644,863	14th	$46,530	$576,270
2022	54	$70,649	$39,865	$684,729	15th	$47,438	$623,708
2023	55	$72,415	$39,102	$723,831	16th	$48,363	$672,071
2024	56	$74,225	$38,354	$762,184	17th	$49,307	$721,378
2025	57	$76,081	$37,620	$799,804	18th	$50,269	$771,647
2026	58	$77,983	$36,900	$836,704	19th	$51,250	$822,897
2027	59	$79,933	$36,193	$872,897	20th	$50,000	$872,897

out of work for a period of time and lost wages during that period. When the worker returned, earnings were at the rate that would have applied if the worker had not been injured, but the worker may have a reduction in worklife expectancy because of his or her permanent injury that will cause a shortening of the worker's worklife by some unknown period.

Earnings for each year are shown in the Earnings column. The present value of those earnings is shown in the Present Value Column. The Cumulative column provides a running total of accumulating present values, which total $872,897 for a 20 year expected worklife. This would have been the amount the worker lost if the worker had never been able to work again and thus lost the present value of 20 years of earnings. The next column is labeled "Yrs Lost" and represents the number of years of reduced post-injury worklife expectancy. If one year of earnings is lost, the lost year will be the 20th year, not the next year. As such the corresponding present value of damages lost when the 20th year was lost would be $36,193, the present value for the year 2027. Thus the present value of the first year reduction in worklife expectancy would be $36,193, not the $50,000 shown for the year 2008. In effect, the Present Value column is inverted in the Future Year Present Value column. The present value of earnings lost in 2027 is the first year of earnings loss reduction. The present value of earnings lost in 2026 is the second year of earnings loss reduction, and so forth. The final column Reverse Cum shows an accumulating total of losses as the first year is lost, the second year is lost and so forth. Thus, for example, if the trier of fact thinks that a five year reduction is appropriate, the appropriate reduction is shown in the row for the fifth year, which is 2013, but for which the loss period would be from 2023 through 2027. The trier of fact can find the present value damage amount for this 5 year reduction as **$188,169**, and so forth.

The process becomes more complicated if post-injury earnings do not equal pre-injury earnings because a number of additional columns have to be added and understood. In Table 3, the same pre-injury earnings rate of $50,000 in 2008 is retained. The growth rate remains 2.5%. The discount rate in 2010 and thereafter remains 4.5%. However post injury earnings are now estimated at $20,000 per year in 2008, with the same 2.5% growth rate and 4.5% discount rate as for pre-injury earnings. PresValue1 now becomes the present value for pre-injury earnings only and a column for PresValue2 is added to show the present value of post injury earnings. For a worklife expectancy of 20 years, the Cum PV Diff accumulates the differences between the values for PresValue1 and PresValue2 so that this is a normal accumulation of losses by year if there is no reduction in worklife expectancy. Over a 20 year period, the total present value of the loss becomes $523,738.

The Yrs Lost column has the same meaning as in Table 2. In the first row it signals the loss of 1 year of worklife expectancy for post year employment. Note that the years lost index from 1st to 20th has no relationship with the years shown in the Year column. The last four columns of the table are based on that index and not the years from 2008 through 2027. The first number shown in Fut Yr PV2 is $14,477. The residual earnings in 2027 have a 2009 equivalent value of $20,000 and a present value in 2009 of $14,477. The figures shown in Fut Yr PV2 is a reversal of the values shown in the PresValue2 column because they are now based on years being lost in reverse order rather than being accumulated in ascending order. The column labeled "PV of Loss" starts from the total present value of the loss assuming that the individual will have an average worklife expectancy in post injury employment of $523,738 and adds the present value of earnings projected in post-injury earnings for the year 2027 of $14,477 to that amount because one year of post-injury earnings being added to the loss based on the assumption of a one year loss of worklife expectancy for post-injury employment. The figure shown for the second year assumes the loss of two years of worklife expectancy, and so forth, such that if all 20 years of post-injury worklife were lost, the total loss would equal the total present value of pre-injury losses of $872,897. Based on the number of years a judge or jury thinks may have been lost in the post-injury earnings column, a present value for the corresponding loss is immediately available.

This is not as satisfying as providing a specific value to a judge or jury, but it is an approach that is consistent with reality.

Why the Gamboa-Gibson Worklife Expectancy Tables Are Without Merit

The final section of this paper discusses why the Gamboa-Gibson worklife expectancy tables published most recently in 2006, but with earlier versions in 1987, 1991, 1995, 1998, and 2002, are without merit. (The 2006 publication is cited in the reference section, but not earlier versions of the tables, all of which are cited in the 2006 publication.) Most of what will be said in this section repeats analysis that was provided in Ireland (2009) in a paper with a title similar to the title of this section. The earlier Ireland paper compiled arguments made by Ciecka, Rodgers and Skoog (2002), Hale (2001, 2008), the Bureau of Labor Statistics websites (undated, undated), and Jones (2005) into a concise statement identifying three fundamental reasons why the Gamboa-Gibson tables are without merit. The three reasons are:

(1) The data used from either the Current Population Survey and the American Community Survey to compile the Gamboa-Gibson tables are not an ap-

Table 3
Worklife Expectancy Reduction Table (Pre-Injury = $50,000 in 2008; Post-Injury = $20,000 in 2008)

Year	Age	Pre Earning	PresValue1	Post Earning	PresValue2	Cum PV Diff	Yrs Lost	Future Yr PV2	PV of Loss
2008	40	$50,000	$50,000	$20,000	$20,000	$30,000	1st	$14,477	$538,215
2009	41	$51,250	$51,250	$20,500	$20,500	$60,750	2nd	$14,760	$552,975
2010	42	$52,531	$50,269	$21,012	$20,108	$90,911	3rd	$15,048	$568,023
2011	43	$53,845	$49,307	$21,538	$19,723	$120,496	4th	$15,341	$583,365
2012	44	$55,191	$48,363	$22,076	$19,345	$149,514	5th	$15,641	$599,005
2013	45	$56,570	$47,438	$22,628	$18,975	$177,976	6th	$15,946	$614,951
2014	46	$57,985	$46,530	$23,194	$18,612	$205,894	7th	$16,257	$631,209
2015	47	$59,434	$45,639	$23,774	$18,256	$233,278	8th	$16,574	$647,783
2016	48	$60,920	$44,766	$24,368	$17,906	$260,137	9th	$16,898	$664,681
2017	49	$62,443	$43,909	$24,977	$17,564	$286,483	10th	$17,227	$681,908
2018	50	$64,004	$43,069	$25,602	$17,227	$312,324	11th	$17,564	$699,472
2019	51	$65,604	$42,244	$26,242	$16,898	$337,671	12th	$17,906	$717,378
2020	52	$67,244	$41,436	$26,898	$16,574	$362,532	13th	$18,256	$735,634
2021	53	$68,926	$40,643	$27,570	$16,257	$386,918	14th	$18,612	$754,246
2022	54	$70,649	$39,865	$28,259	$15,946	$410,837	15th	$18,975	$773,221
2023	55	$72,415	$39,102	$28,966	$15,641	$434,298	16th	$19,345	$792,566
2024	56	$74,225	$38,354	$29,690	$15,341	$457,311	17th	$19,723	$812,289
2025	57	$76,081	$37,620	$30,432	$15,048	$479,882	18th	$20,108	$832,397
2026	58	$77,983	$36,900	$31,193	$14,760	$502,022	19th	$20,500	$852,897
2027	59	$79,933	$36,193	$31,973	$14,477	$523,738	20th	$20,000	$872,897
Totals			$872,897		$349,159	$523,738		$349,159	$872,897

propriate sources from which to identify disabled persons for purposes of constructing tables dealing with disability. [Bureau of the Census (Undated), Bureau of Labor Statistics (Undated)[5], Hale (2001, 2008), Skoog and Toppino (1999), Skoog andToppino (2002), and Jones (2005, 2006)]. Jones has also noted that substantial portions of the disability questions in the American Community Survey that were relied upon by Gamboa and Gibson have now been dropped from that survey as of 2008.

(2) The LPE method used by Gamboa and Gibson for deriving both disabled and non disabled worklife expectancy tables would be a fundamentally flawed method even if the data sources that were used were appropriate for identifying disability. See Ciecka, Rodgers and Skoog (2002) and the earlier Skoog and Toppino (1999; 2002) papers.

(3) Even if the data being used was appropriate and an appropriate method was being used to derive worklife expectancies for the "disabled," "not severely disabled," "severely disabled" and "non disabled" categories used in the Gamboa-Gibson tables, the tables would not be applicable to persons with specific disabilities.

From (Ireland, 2009): "In short, they [Gamboa and Gibson] used the wrong method with the wrong data and produced results that would not be applicable to a person with a specific disability even if the results were accurate in general."

The evidence that exists suggests that economists generally do not regard the Gamboa-Gibson tables to have validity. The 2009 NAFE Survey (Brookshire, Luthy, & Slesnick, 2009) included the following question (#33 in the survey): "Vocational experts are often asked to estimate the worklife of a plaintiff after an injury occurs. Some will utilize privately published worklife disability tables, which are normally based upon U.S. Census data. In your opinion, are such tables reliable for the purpose of estimating worklife?" This question had a not well hidden agenda of finding out what members of the National Association of Forensic Economics thought of the Gamboa-Gibson tables. 17.6% answered yes. 61.8% answered no. 20.6% answered that they were not familiar with such tables. Brookshire, Luthy and Slesnick also provided "Selected Written Comments from Survey Respondents on Question 33." Only one of eight reported comments was supportive of use of the tables. That comment was: "Better than pretending that disability simply doesn't exist. Close is better than obviously wrong." That comment is an example of BAD, use of "**b**est **a**vailable **d**ata," on the ground that using something is better than using nothing.

Use of the Gamboa-Gibson tables, supported by 17.6% of NAFE survey respondents, must be on the basis of the BAD principle that using even bad results must be better than using no measurement given widespread agreement that disability *can* result in a reduction in post injury worklife expectancy. Clearly, it does not *always* do so. Many injuries that preclude an individual from many occupations the individual had before an injury impose no significant limitations in the occupation the individuals enters after an injury. A wide range of permanent disabilities will prevent an individual from continuing in one or many occupations, but will not affect his or her worklife in another specific occupation. The Gamboa-Gibson tables develop reductions in worklife based on permanent injuries based on broad groupings of disabled persons, not on the specific circumstances of specific workers in specific occupations. This produces numbers that are consistent with the common sense expectation that some permanent disabilities will have reduced worklife expectancies, but not numbers that are consistent with any specific disability for a specific person. These numbers are not better than nothing. They are worse than nothing.

The core issue is that each permanent disability affects the worklife of an individual in a way that is unique and different from any other worker. Even the loss of a little finger will be career ending for a concert pianist, but it will be a relatively minor nuisance for a college professor or persons in most occupations. Such an injury, barring unexpected medical complications, is permanent, but will not reduce even the concert pianist's worklife expectancy. The injured person will have to find a new career, but the lack of need for further medical treatment and the lack of any indication that this injury will shorten the former pianist's life expectancy prevent any conclusion that there is a loss of future worklife expectancy. There may have been a period of past loss immediately following the injury and some time spent in rehabilitation, but there should be no further loss of time when the individual will be unable to work. It makes no common sense to lump such persons with persons who have physical problems that will result in lost work time and then to derive worklife estimates for persons in such lumped groups that will not properly fit any members of the group.

The problem with using an LPE method with disability is that disability status is much more flexible status than even education. In the first part of this paper, a distinction was drawn between fixed and other variables. The fixed variables for a normal LPE calculation were the person's sex and education (and "race" in many of the tables). The person's age, L, P, and E were all permitted to change in the LPE method. In the Gamboa-Gibson use of the LPE method another fixed descriptive variable is added to cover the person's disability status based on their determinations. The problem is that disability is a state with significant transitions. Some persons who start out as non disabled would have transitioned to "not severely disabled" and then "severely disabled" categories even if persons in those categories could be accurately determined from the underlying surveys. However, the transitions would not go only in one direction. A person who has a broken leg is disabled until the leg heals. A person who may have a disability that limits that person in one occupation may change occupations so that the disability provides no limitation in another occupation, and so forth.

In theory, with adequate definitions for disability status and a survey designed for that purpose, the transition rates between different disability states could be determined and a Markov process framework could take such transitions into account in developing worklife estimates. Doing so would be very complex, but it would at least be theoretically possible. At present, if a person is categorized as "non disabled" in time period 0 in the Gamboa-Gibson tables, the potential that the person will become disabled in the future is effectively eliminated. Since disability is an important potential source for future loss of worklife, the worklife expectancy figures for non disabled persons is exaggerated in a way that would not be the case with normal LPE tables that do not treat disability as a status variable. Because of the lack of treatment of transitions between non disabled and disabled statuses, the Gamboa-Gibson tables overstate worklife expectancy for non disabled persons and understate worklife expectancy for disabled persons. However, even if transitions between disability statuses could be properly calculated and properly employed in a Markov model designed to handle transitions between those statuses, the error involved in lumping disabled persons together would preclude such measures from being better than nothing. Accurate and reliable tables showing disability worklife for individuals based on specific disabilities are unlikely to be produced. Sample sizes for persons with adequately defined comparable disabilities would be far too small to allow computations to have any statistical significance. For that reason, it is not possible to do in a valid scientific way what Gamboa and Gibson set out to do.

Please see the Appendix at the end of the article for an explanation as to how to construct an LPE table.

Endnotes

[1] In most states, the term "loss of earning capacity" is used to describe the right of an injured worker to recover for lost earnings. Forensic economists differ about the nature of the difference, if any, between "expected lost earnings" and "lost earning capacity." In the context of measuring work-life expectancy, that difference comes down to whether there is a difference

between the average number of years an individual "would be expected to work" and the number of years an individual "would have been able to work." If such a difference exists, it would not be captured by either ordinary Markov process measurement systems or LPE measurement systems. In most states, the standard for recovery in wrongful death cases is "loss of financial support" for survivors, which would generally be based on "expected lost earnings." See Martin (1999) for an elaboration of these issues. It is this author's opinion that differences between "expected earnings" and "earning capacity" are quite small and usually non-existant for reasons that go beyond the purview of this paper.

[2] The specific source for P and E at present is the BLS's "Table 10, Employment status of the civilian noninstitutional population by educational attainment, age, sex, and Hispanic or Latino and Non-Hispanic Ethnicity," which is an unpublished table. PDF's of all the tables can be downloaded at http://www.valueeconomics.com/data.html. That site also provides an Excel spreadsheet that contains the population, labor force and employment data needed to calculate both the P and E in LPE. The 2008 version of the BLS unpublished Table 10 is also available in Martin (2009), pages 12-50 and 12-51.

[3] "Front-loading" refers to the fact that years of worklife are not always worked in succession. Thus, a person with a worklife of 15 years might work those 15 years over a 20 year period. If the assumed rate of wage increase is smaller than the assumed interest rate used for discounting to present value, treating the 15 years as occurring successively (front-loading) will produce a somewhat larger present value than spacing out those 15 years over a 20 year period. Since an LPE model automatically calculates "worklife probabilities" for each year out to age 100, front-loading does not occur in that model. If a Markov process table is used to project 15 consecutive years of earnings losses, the present value of losses will be exaggerated to some extent (Skoog & Ciecka, 2007). However, Skoog and Ciecka (2007) provide tables that would permit appropriate corrections. Earlier work by Skoog and Ciecka (2001) would allow construction of annual worklife probabilities that would allow front-loading to be avoided.

[4] BLS unpublished Table 10, referenced in footnote 2 and the Appendix to this paper, provides P and E values for 15 different educational classifications. Markov process models provide tables for Less than High School, High School, Some College but No Degree, Bachelor degree, and Graduate Degree.

5 One of the questions in frequently asked questions (FAQ) at the BLS site is the question: "Does each of the questions identify a group with a specific disability?" The answer that is given is: "Given this research and the relatively small sample size of the CPS, data users are advised to avoid using the CPS for purposes of identifying persons with a specific disability."

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Biography

Thomas R. Ireland earned his Bachelor of Arts degree in economics from Miami University in 1964 and his doctorate in economics from the University of Virginia in 1968. Dr. Ireland is now a professor emeritus of economics with the University of Missouri at St. Louis. He has written, co-written or co-edited twelve books, 120 papers, comments or book reviews in professional journals, and has appeared a corresponding number of times as a paper presenter, program chair or commenting panelist at professional meetings of economists. He is a former president of the American Academy of Economic and Financial Experts and the American Rehabilitation Economics Association and is a former vice president of the National Association of Forensic Economics. He is a past Editor of *The Earnings Analyst,* past Associate Editor of the *Journal of Forensic Economics* and the *Litigation Economics Digest* and currently on the editorial board of the *Journal of Legal Economics.* Dr. Ireland has worked as a consultant for attorneys in the area of forensic economics since 1974 and has a consulting practice that is fairly evenly divided between plaintiff and defense assignments.

Appendix: Constructing an LPE Table

This appendix provides a "how to" explanation for constructing an LPE evaluation of the earnings loss of an injured 65 year old man with a Bachelor's degree who was earning $25,000 per year on December 31, 2008 when he was injured badly enough to be unable to remain in the labor market. Data required for this calculation were taken from the 2004 United States Life Table 2 for all men and BLS unpublished Table 10 for the year 2008. (Note that a number of LPE practitioners might average data for Participation and Employment over a number of years to avoid depending entirely on the most recent year, as is done in the LPE Table in this appendix.) Calculations are shown in spreadsheet format in the "LPE Table for 65 Year Old Injury Victim" (henceforth "LPE Table") provided in this appendix. Based on the U.S. Life Table for 2004 for men, 79,213 persons remained alive at age 65 out of 100,000 born 65 years earlier. That number is shown for the year 2009 in the "#Alive" column of the LPE Table. The table assumes that there is a 100% chance that the injured male worker will survive through the year 2009. That is shown in the "%Alive(L)" column by the probability 1.0000. Based on BLS unpublished Table 10, it is assumed that there is a 26.9% probability that this man will remain in the labor market through 2009 (and all over following years) and that the chance this man will be employed is 96.7%. Those values are shown as 0.269 and 0.967 in the "%Part(P)" and "%Empl(E)" columns. The 0.260 value shown in the "Work Prob" column for the year 2009 is equal to 1.0000 x. 0.269 x 0.067 and represents the joint conditional probability that the man would have had earnings in 2009. The column labeled "2009 Earn" shows $25,000 in earnings for the man if he works in 2009. Since 2009 is not discounted, the present value of the man's loss for 2009 is shown as $25,000 x 0.260, or $6,503. Since only one year of loss is included as of 2009, the Cumulative loss through 2009 is projected at $6,503.

For the year 2010, the number of survivors from 100,000 born has dropped from 79,213 to 77,800, meaning that the average probability that any one person in the life table will still be alive at the end of 2010 is 77,800/79,213 = 0.9822, or 98.22%. P and E values remain constant at 26.9% and 96.7% so that the combined worklife probability for the year 2010 has now dropped to 0.255 (0.9822 x 0.269 x 0.967 = 0.255). The reduction in PV Loss from $6,503 to $6,262, however is only partly based on the reduced probability of survival. $25,000 x 0.255 = $6,375. When $6,375 is reduced by discounting at 2.0% per year, the figure falls to $6,260. The Cumulative loss for 2009 plus 2010 is now equal to $6,503 + $6,260 = $12,765.

For the year 2011, the number of survivors from 100,000 born has dropped to 76,296. That number is divided by 79,213 (not 77,800) to determine that the average probability that a person alive at the age of 65.0 at the end of 2008 would still be alive at the end of 2011 is now 0.9632, or 96.32%. P and E values remain the same, but the worklife probability has now fallen to 0.251 and the resultant $25,000 x 0.251 = $6,275 is now reduced for two years of discounting at 2.0% to a PV Loss value of $6,020 and a Cumulative loss for the first three years of $18,785. The same process continues every year through the year in which, if he was still alive, the man would reach age 100, at which point his total present value of earnings loss = $93,930.

Observation #1. It should be noted that even though the man's probability of survival has dropped to 1.59% at age 100, the present value increment to his loss is still $52 for the year 2044. Looking at the number of survivors at age 100, one can project that some of them would still be participants in the labor market and still be employed at ages 101, 102, 103 and so forth. By age 110, the values would have become vanishingly small, but purists would argue for using age 110 as an ending point, not age 100. The Center for Disease Control will, upon request, provide survivor numbers out to age 110. This would result in the Cumulative Value (present value) rising slightly above $94,000.

Observation #2. The realism of the underlying assumption that a 100 year old man with a bachelor's degree would have a 26.9% chance of being in the labor market can be called into serious question. This is a result of the fact that the BLS does not provide age-specific participation rates for persons over the age of 65. A participation rate of 26.9% is a weighted average based on all males with Bachelor's degrees who are older than 65. This percentage is too small for the age category 65-69 and much too large for the age category 95-100. Without specific data, however, the amount of distortion by age cohort in the BLS table cannot be determined. However, without year-to-year participation data, it is not possible to determine the amount by which this assumption results in an overstatement or understatement of the result relative to an ideal world in which the data was sufficient to allow accurate year-to-year participation rates to be calculated. It should also be noted that averaging participation rates for persons 65 and older for a period four year prior to 2008 would not solve the problem that data for persons in the smaller age categories is needed, but not available.

Constructing a Markov process table is much more complex than what is shown here for an LPE table and no such effort will be made in this appendix or this paper.

Table 4
LPE Table for 65 Year Old Injury Victim Earning $25,000 as of December 31, 2008 (2.0% Net Discount Rate)

Year	Age	# Alive	%Alive(L)	%Part(P)	%Empl(E)	WorkProb	2009 Earn	PV Loss	Cumulative
2009	65	79213	1.0000	0.269	0.967	0.260	$25,000	$6,503	$6,503
2010	66	77800	0.9822	0.269	0.967	0.255	$25,000	$6,262	$12,765
2011	67	76296	0.9632	0.269	0.967	0.251	$25,000	$6,020	$18,785
2012	68	74694	0.9430	0.269	0.967	0.245	$25,000	$5,778	$24,564
2013	69	72987	0.9214	0.269	0.967	0.240	$25,000	$5,536	$30,099
2014	70	71168	0.8984	0.269	0.967	0.234	$25,000	$5,292	$35,391
2015	71	69242	0.8741	0.269	0.967	0.227	$25,000	$5,048	$40,439
2016	72	67209	0.8485	0.269	0.967	0.221	$25,000	$4,803	$45,242
2017	73	65056	0.8213	0.269	0.967	0.214	$25,000	$4,558	$49,801
2018	74	62767	0.7924	0.269	0.967	0.206	$25,000	$4,312	$54,112
2019	75	60336	0.7617	0.269	0.967	0.198	$25,000	$4,063	$58,176
2020	76	57777	0.7294	0.269	0.967	0.190	$25,000	$3,815	$61,991
2021	77	55109	0.6957	0.269	0.967	0.181	$25,000	$3,567	$65,558
2022	78	52336	0.6607	0.269	0.967	0.172	$25,000	$3,321	$68,879
2023	79	49453	0.6243	0.269	0.967	0.162	$25,000	$3,077	$71,956
2024	80	46461	0.5865	0.269	0.967	0.153	$25,000	$2,834	$74,790
2025	81	43369	0.5475	0.269	0.967	0.142	$25,000	$2,594	$77,384
2026	82	40204	0.5075	0.269	0.967	0.132	$25,000	$2,357	$79,741
2027	83	37000	0.4671	0.269	0.967	0.122	$25,000	$2,127	$81,868
2028	84	33796	0.4266	0.269	0.967	0.111	$25,000	$1,905	$83,772
2029	85	30619	0.3865	0.269	0.967	0.101	$25,000	$1,692	$85,464
2030	86	27481	0.3469	0.269	0.967	0.090	$25,000	$1,489	$86,952
2031	87	24413	0.3082	0.269	0.967	0.080	$25,000	$1,296	$88,249
2032	88	21447	0.2708	0.269	0.967	0.070	$25,000	$1,117	$89,365
2033	89	18616	0.2350	0.269	0.967	0.061	$25,000	$950	$90,316
2034	90	15948	0.2013	0.269	0.967	0.052	$25,000	$798	$91,114
2035	91	13470	0.1700	0.269	0.967	0.044	$25,000	$661	$91,774
2036	92	11204	0.1414	0.269	0.967	0.037	$25,000	$539	$92,313
2037	93	9166	0.1157	0.269	0.967	0.030	$25,000	$432	$92,746
2038	94	7366	0.0930	0.269	0.967	0.024	$25,000	$341	$93,086
2039	95	5808	0.0733	0.269	0.967	0.019	$25,000	$263	$93,349
2040	96	4486	0.0566	0.269	0.967	0.015	$25,000	$199	$93,549
2041	97	3389	0.0428	0.269	0.967	0.011	$25,000	$148	$93,696
2042	98	2501	0.0316	0.269	0.967	0.008	$25,000	$107	$93,803
2043	99	1800	0.0227	0.269	0.967	0.006	$25,000	$75	$93,878
2044	100	1261	0.0159	0.269	0.967	0.004	$25,000	$52	$93,930