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Daubert, Disability, and Worklife Expectancies

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Daubert, Disability, and Worklife Expectancies

By David S. Gibson¹

Expert vocational and economic testimony concerning loss of earning capacity in cases of partial disability necessarily involves merging the experts' experiences with various studies and statistics in an inexact science. Through its decisions in *Daubert v. Merrell Dow Pharmaceuticals* (1993) and *Kumho Tire v. Patrick Carmichael* (1999), the United States Supreme Court made it clear that this testimony must have sound scientific foundations.

Quantifying lifetime expected earnings pre- or post-injury requires exploration of two key factors: the plaintiff's expected annual earnings and his or her worklife expectancy. Sources to develop scientifically sound estimates for annual earnings are abundant, but very few published statistics exist for worklife expectancies.² Moreover, there is only one source of worklife expectancies for persons with a partial work disability: *The New Worklife Expectancy Tables* (Gamboa 1998). Derived from government statistics, these tables establish average worklife expectancies categorized by age, gender, level of education, and work disability status. The subcategories for work disability are Not Disabled, Not Severely Disabled, Average Disabled,³ and Severely Disabled.

As this article demonstrates, *The New Worklife Expectancy Tables* (hereinafter, "The Tables") is the only disability-gauged data source available and clearly meets the *Daubert* criteria. Use of The Tables offers a scientific basis from which an expert can mold an opinion. As with any statistic, these worklife expectancies reflect an average for the measured population. It is up to the expert, using his or her experience and research on the disabled population, to apply and adjust the statistic to meet the specific circumstances of the individual plaintiff.

¹ Mr. Gibson is President of Vocational Econometrics, Inc., the publisher of *The New Worklife Expectancy Tables*. The author wishes to thank John McNeil of the Bureau of the Census for his work in developing employment statistics for persons with a disability and for his insight and suggestions for preparing this article. In addition, Gwen Holland, Ronald Missun, and Andrew Gluck of Vocational Economics all made significant contributions.

² *Life and Worklife Expectancies* (Richards & Abele 1999) discusses various methods for computing worklife expectancies and references the known published statistics.

³ Average Disabled results from combining the employment experience of Not Severely Disabled and Severely Disabled persons. For purposes of this article, we will focus only on the Not Severely Disabled and Severely Disabled categories, recognizing that all analyses also impact Average Disabled.

The precision of predictive statistics can be gauged only against the population from which they are drawn. When applying these statistics to an individual, the user must determine how the individual matches the population, and adjust the statistic if and where necessary. The Tables offer the best scientific basis from which an expert can mold a worklife expectancy for a person with a partial work disability. Any attempt to define the worklife of an individual with a permanent partial work disability is flawed to the degree that it fails to consider the underlying work disability data presented and summarized in The Tables.

In the Fall 1999 issue of the *Journal of Forensic Economics*, Gary R. Skoog and David C. Toppino offer a critical analysis of The Tables. Skoog and Toppino (hereinafter, “S&T”) opine that use of The Tables is inadmissible under *Daubert*. They go on to suggest that The Tables are improperly defined and derived from unreliable data (The Current Population Survey). S&T review several areas of potential bias in The Tables, but fail to offer any substantive statistical evidence to support their theories. As Sir Arthur Conan Doyle wrote in *The Adventures of Sherlock Holmes*, “It is a capital mistake to theorize before one has data.”

The remainder of this article reviews and rebuts the claims postulated by S&T. In the process of our rebuttal, we proffer new research that supports the data and development of The Tables.

Disability and the Current Population Survey

The Current Population Survey (CPS) is the source of the probabilities of participation and employment for The Tables, which use the LPE model⁴ to compute worklife expectancies (Brookshire & Cobb, 1983). A pivotal criticism of S&T is that the CPS was never intended as a tool to measure the existence or impact of disability. Consequently, they contend that the survey data and The Tables are corrupted. S&T are incorrect. As an alternative, S&T discuss the Survey of Income and Program Participation (SIPP).

Purpose of the Current Population Survey

Conducted monthly by the Bureau of the Census, the CPS is used for a wide variety of purposes within the Federal government. According to a joint web site maintained by the Bureau of Labor Statistics and Bureau of the Census,

The CPS is the *primary* source of information on the labor force characteristics of the U.S. population. The sample is *scientifically* selected to represent the civilian noninstitutional population.⁵

⁴ The LPE model computes worklife expectancy by summing the joint probabilities of Life, Participation, and Employment. The tables summed these probabilities from the stated age through the age of 75.

⁵ www.bls.census.gov/cps/overmain.htm (emphasis added)

Although disability is not specifically included in the above, neither is determination of unemployment rates, even though the CPS is the official source for these data. In addition, state and local governments and private agencies rely upon it to develop numerous reports, studies, and decision-making aids, none of which is specifically included as a purpose for the CPS. The CPS interviewers' manuals list several specific uses:⁶

- Development of government policies based on unemployment levels
- Allocation of billions of dollars to states and local areas stricken by high unemployment
- Determination of Veterans Administration employment services
- Determination of job programs with each state
- Calculation of the percentage of Americans living in poverty
- The tracing of migration of Americans from one part of the country to another
- Plant logistic decisions by private industry

We note another significant use of the CPS in forensic economics – the worklife expectancy tables from the Department of Labor (1986). Interestingly, S&T seem to give these tables implicit approval through their description of them as the “now classic BLS Bulletin 2254” even though the explicit purpose of the CPS is not for the development of worklife expectancies.

In March of each year, the CPS is expanded to collect more information on income sources for the average American. The stated purpose for the supplement is as follows:

The annual Demographic Survey or March CPS supplement is the primary source of detailed information on income and work experience in the United States. . . . The labor force and work experience data from this survey are used to profile the U.S. labor market and to make employment projections.⁷

This supplement forms the basis for the rates of participation and employment used in The Tables through expanded questions that specifically address work disability. These questions were *explicitly* added to screen for work disability and to identify potential recipients of disability income. This is documented in the Census publication, *Labor Force Status and Other Characteristics of Persons With a Work Disability: 1982*, as indicated in the following quotes (U.S. Bureau of the Census 1983 pp. 1-3):

Recent changes to the questionnaire used in the March Income Supplement to the Current Population Survey (CPS) make it possible for the March CPS to be used as a source of information on the labor force status and other characteristics of noninstitutional persons with a work disability (Persons in institutions are excluded from the CPS sample universe.) The redesign of the March Income Supplement was undertaken after test results suggested

⁶ www.bls.census.gov/cps/intmanal.htm and www.bls.census.gov/cps/ads/1995/sintrins.htm

⁷ www.bls.census.gov/cps/ads/adsdes.htm

that the reporting of income could be improved by the use of a screening technique in which detailed questions about particular income types are asked only of those persons who have been identified as likely to have received the income type. The purpose of adding questions about disability status was to identify those persons who should be asked about their receipt of disability income.

Although the direct questions about disability status are new (the present wording was adopted in March 1981), the CPS questionnaire has always provided information which could be used as a partial and indirect measure of disability status.

Thus, the S&T contention that the CPS was not intended to identify work disability is clearly wrong. S&T expand their criticism to claim that persons identified through questions to screen disability income do not form an appropriate sample to measure rates of participation and employment. However, *Labor Force Status: 1982* also addresses this issue, contradicting S&T (U.S. Bureau of the Census 1983 p. 1):

One of the issues that this country has tried to address through the Federal statistical system is the extent to which persons with a disability are able to participate in the labor force. Programs and policies have been established to discourage discrimination and encourage training and rehabilitation, but the success of these programs and policies cannot be measured without some type of statistical monitoring system. Statistics on persons with a disability are obtained from two sources: program statistics and household surveys. While the former source is critical for certain purposes, the basic unit in a statistical monitoring system must be household surveys. Only through household surveys is it possible to obtain estimates of the number of persons with a disability and learn how their situation changes over time.

Finally, the Census publication, *Labor Force Status and Other Characteristics of Persons With a Work Disability: 1981 to 1988*, expands on the reasoning behind these questions (U.S. Bureau of the Census 1989 p. 1):

According to Saad Nagi, a major figure in the development of survey data on persons with disabilities, a person has a disability if he or she has a limitation in the ability to perform one or more of the life activities expected of an individual within a social environment. The primary way this basic concept is operationalized in the March CPS is to ask whether any household member has a health problem or disability which prevents them from working or which limits the kind or amount of work they can do.

The Census Bureau web site contains a page dedicated to disability data.⁸ This site notes three sources for disability statistics for the United States workforce: CPS, SIPP, and the decennial census. Here, it notes that the sources range from limited (decennial census) to most expansive (SIPP). Most importantly, the site notes that the CPS focuses on work disability – the pivotal measure for disability-specific worklife expectancy computations. (See “SIPP As Source of Participation and Employment Rates” later in this article for further discussion of the type of disability measured by the CPS and SIPP.)

⁸ www.census.gov/hhes/www/disable/intro.html

External Validation

Other worklife tables exist, but do not distinguish by disability status. Still, they offer some measures to validate the basis for The Tables. Table 1 presents a rough comparison of the Not Disabled worklife expectancies from The Tables to the “All Persons” worklife expectancies of two widely used sources.

Table 1 Comparison to Other Tables

Age	All Males			All Females		
	Gamboa	BLS	Ciecka	Gamboa	BLS	Ciecka
25	33.9	33.5	32.9	28.5	24.8	27.3
50	12.8	12.3	11.7	10.2	9.8	10.1

In Table 1, “Gamboa” presents the worklife as published in The Tables. “BLS” provides the worklife from the Department of Labor, Bureau of Labor Statistics tables (1986). “Ciecka” presents the tables developed by Ciecka, Donley, and Goldman (1995) which update the BLS tables using data that are more current. The worklife expectancies presented in The Tables exclude persons with work disabilities, causing an expected increase over the BLS and Ciecka (both of which cover all active persons, including those with work disabilities). This is somewhat offset by the fact the BLS and Ciecka exclude an adjustment for probable unemployment, which The Tables incorporate. Thus, there are small differences for male worklife expectancies. Note that both Gamboa and Ciecka show substantially higher statistics for females at the age of 25 than that shown in the BLS tables. This is explained by the continuing increasing presence of women in the workforce since 1979-1980, the data collection years of the BLS tables.

These statistics confirm that the Not Disabled category is substantiated by other published sources. Thus, the overall database and underlying computations may be assumed to be sound. The remainder of this paper will concentrate on validating the portion of the database concerning those with a work disability.

Current Population Survey Limitations

S&T refer to a 1994 letter written by Harvey Hamel, a senior supervisory economist at the Bureau of Labor Statistics, criticizing the disability data in the CPS. S&T offer his comments as further evidence that the CPS is invalid for the purposes of worklife expectancy computation.

However, S&T confuse the issues. They go to some length to detail Dr. Hamel’s criticism of the *monthly* survey, without recognition that The Tables use the March supplement, not the standard monthly survey. This is also the supplement, otherwise known as the March Income Supplement discussed earlier, that the Bureau of the Census used in its *Labor Force Status and Other Characteristics of Persons With a Work Disability* publications.

On the March supplement, Dr. Hamel notes that the data “. . . would not provide overall estimates of the disabled population or workforce.” This noted limitation is consistent

with what is noted in *Labor Force Status and Other Characteristics of Persons With a Work Disability: 1981 to 1988* (U.S. Bureau of the Census 1989 p. 1, emphasis added):

CPS data are not the best source for *prevalence* estimates. Their importance lies in the fact that they provide a reasonably consistent set of timeseries data on the labor force activity and earnings status of persons with a work disability.

Note that this caveat for use of the data is that the CPS should not be used to measure the size (prevalence) of the disabled population. Hamel notes that this arises from the fact that the CPS does not attempt to measure persons with a non-work disability. As discussed in the section titled, “SIPP As Source of Participation and Employment Rates,” the SIPP is a better tool for measuring prevalence of the overall disabled population since its criteria are based upon the ADA definition of disability – one much broader than work disability.

The Tables do not use the CPS for prevalence measures, but for descriptive statistics of the work-disabled population. Thus, the caveat does not limit the worklife expectancy estimates. We should note that the Hamel letter is quoted out of context. S&T provide several references to other documents from the Bureau of Census and Department of Labor, implying that these agencies have discredited use of the CPS for development of work-disabled worklife expectancies. This is incorrect. There is no government article, statement, or publication indicating such. In fact John McNeil (2001), author of many of these publications, has stated that he sees no reason why the CPS should not be used to compute such statistics. Moreover, the agencies have developed analyses of the work-disabled population and worklife tables using CPS data, including papers as recent as 2000.⁹

Sample Size

To determine the appropriate source for participation and employment used by The Tables, one must be conscious of the sample size of the underlying survey. The Tables used the categories shown in Table 2 to compute worklife expectancies according to the LPE model. As a result, the computations require 144 distinct cells for capturing these rates.

When the data are classified to this level of detail, sample sizes for many of the cells have the potential to be quite small. Specifically, sample sizes for college graduates with severe disability have the potential to be so small that the data become unreliable. In order to accommodate this challenge, the source of the data must have a large overall sample size. The Current Population Survey and the decennial census are the only sources that meet this restriction. Of these, only the CPS offers the detailed questions and the recency adequate for The Tables. Moreover multiple-year groupings of the data help reduce the problems of a small sample size.

⁹ “Employment and Earnings of Individuals 18 to 64 by Disability Status: Data from the March 2000 Current Population Survey” (McNeil 2000) explores the participation and employment rates using the criteria detailed in “CPS Disability Criteria”. In work funded by the Department of Education, National Institute on Disability and Rehabilitation Research, researchers at Cornell University have published multiple papers using the March CPS, including Burkhauser (2000) and Houtenville (2000).

Table 2: Categories for Participation and Employment Rates

Category	Quantity	Sub-Categories
Gender	2	Male, Female
Disability	3	Not Disabled, Not Severely Disabled, Severely Disabled
Education	4	Less Than High School, High School, 1-3 Years of College, College Degree
Age	6	16-24, 25-34, 35-44, 45-54, 55-64, 65-74

SIPP As Source of Participation and Employment Rates

In addition to their attack on use of the Current Population Survey as a data source for The Tables, S&T offer the Survey on Income and Program Participation as a better source. In its web site, the Bureau of the Census offers the following as the purpose of the SIPP:

Purpose: to collect source and amount of income, labor force information, program participation and eligibility data, and general demographic characteristics to measure the effectiveness of existing federal, state, and local programs; to estimate future costs and coverage for government programs, such as food stamps; and to provide improved statistics on the distribution of income in the country.¹⁰

SIPP's purposes, like those of ISDP, are to improve the measurement of the economic situation of persons, families, and households in the United States, and to provide a tool for managing and evaluating government transfer and service programs.¹¹

An interesting observation is that S&T criticize the CPS for use in development of The Tables because it does not have an explicitly stated purpose of measuring the disabled population. However, their proffered source, the SIPP, is noticeably devoid of the same purpose.

SIPP Measurement of Disability

The key difference between disability as measured by the SIPP and as measured by the CPS lies in the intent of the classification. SIPP disability questions are directed at measuring functional limitation in all major life activities – the definition of disability used by the Americans with Disabilities Act (ADA). CPS, on the other hand, focuses on *work* disability, using the questions detailed in the “CPS Disability Criteria” section. This CPS focus is highlighted in *Labor Force Status and Other Characteristics of Persons With a Work Disability: 1981 to 1988* as follows (U.S. Bureau of the Census 1989 p. 1):

¹⁰ www.sipp.census.gov/sipp/sippov98.htm

¹¹ www.sipp.census.gov/sipp/chap1-3.htm

Users of this report should be aware that some of the persons who do not have a work disability do have impairments, functional limitations, or disabilities in life activities other than work.

It is this distinction that is most important when the data are to be used to predict the probabilities of participation and employment for disabled worklife expectancies. After all, what is more germane to measuring employment of persons with disability than *work* disability? A disability that limits a person's social or family activities, but not the ability to work, is of no importance for assessing worklife expectancy.

This is not to say that the SIPP does not contain measures of work disability. In fact, one key question is almost identical in the two surveys. In the SIPP (U.S. Bureau of the Census 1993), is the following question:

Does ... have a physical, mental, or other health condition which limits the kind or amount of work ... can do?¹²

This mirrors a CPS criteria detailed in a subsequent section, "CPS Disability Criteria." However, the CPS offers other criteria also directed toward work disability not in the SIPP. In addition, the criteria used to segregate SIPP disability status by level of severity cross the boundaries outside of work disability into ADA disability, making the segregation blurred at best.

SIPP Limitations

In a recent article titled, "Employment, Earnings, and Disability," McNeil (2000) points out various problems with the SIPP that would impact its usefulness in determining rates of employment for The Tables. These problems include the following:

- Many SIPP disability measures lack reliability. (Interestingly, McNeil notes that the core work disability question, which mirrors that in the CPS, has high reliability.)
- As a longitudinal survey, the SIPP is more prone to attrition and time-in-sample bias.
- Changes in the 1996 panel impair comparability with earlier panels.

The final point is significant for obtaining a sample of sufficient size. As discussed in "Sample Size," the data source needs to be quite large to meet the many cross-sectional cells used to compute The Tables. Through use of six years of CPS data (see "Use of 6-

¹² Section 5 – Topical Modules, Check Item T3, 1b of questionnaire

Year Average”), this obstacle is overcome. The sample size of the SIPP is much smaller,¹³ making a similar approach impossible.¹⁴

CPS Disability Criteria

Table 3 presents the criteria used by the Bureau of Census (1999) to screen for work disability and to classify persons with either a severe or not severe disability. The table uses the exact questions used in the 1999 March Supplement and identifies the variables to extract from the published resulting database (1999).

Respondents are assigned to a disability category as follows:

- Severely Disabled - respondent meets any of the last four criteria
- Not Severely Disabled - respondent does not meet any of the last four but does meet one of the first three
- Not Disabled - respondent meets none of the seven criteria

¹³ The 1996 SIPP panel contained 37,000 households, while CPS samples approximately 64,000.

¹⁴ In another constraint on comparability, one must note that the 1990 SIPP panel included over-sampling for program participants. Although weights existed in the SIPP to correct for the over-sampling when examining the population as a whole, these weights would not be able to correct the bias when looking only at the disabled population, which is likely to have a disproportionate representation among program participants.

Using these categories, combined with the age, gender, and education brackets defined in Table 2, the Bureau of the Census cross-tabulates the rates of participation and employment for civilian workers, as published in its web site.¹⁵

Table 3 CPS Disability Criteria

Disab. Level	Question Number	Question	CPS Variable	Depend.
Not Severe	59A	(Do you/Does anyone in this household) have a health problem or disability which prevents (you/them) from working or which limits the kind or amount of work (you/they) can do?	DIS-HP=1 (Yes)	
Not Severe	60A	(Did you/Is there anyone in this household who) ever (retire or leave/retired or left) a job for health reasons?	DIS-CS=1 (Yes)	
Not Severe	60C8	What type of Veterans' payments did (name/you) receive?	VET-TYP1=1 (Disability)	
Severe	32	What was the main reason (you/he/she) did not work in 1998?	RSNNOTW=1 (Ill or Disabled)	
Severe	See Note ¹⁶	Major labor force recode <out of labor force due to disability for at least six months>	PEMLR=6 (Not in LF-Disabled)	See Note ¹⁶
Severe	SHI13	At any time in 1998, (were you/was anyone in this household) covered by Medicare?	MCARE=1 (Yes)	Under 65
Severe	57A	During 1998 did (anyone in this household receive:/you receive:) any SSI payments, that is, Supplemental Security Income?	SSI-YN=1 (Yes)	Under 65

The Bureau of the Census has never published detailed information on the relationship between the criteria or their individual rates of employment. Using the data set published by Census (1999), one can create such detail, as shown in Table 4.

This table is complex and bears some explanation. It summarizes data for all civilian males between the ages of 25 and 64 with a work disability from the March 1999 CPS. (Substituting another year, a different age group, or females would all provide essentially the same results for purposes of our analysis.) A detailed row exists for each of the seven criteria, with a summary row for each of the three aggregate disability types. The last four detailed criteria comprise the test for severe disability.

¹⁵ <http://www.census.gov/hhes/www/disable/disabcps.html>

¹⁶ PEMLR is a recoded variable in the March Supplement that derives from multiple questions in the standard monthly survey. If respondents indicate in question WK that they did not work in the previous week due to disability or that they are unable to work, they are asked question DIS, DIS1, or DIS2. *The essence of all three of these questions is to determine if the disability will prevent employment for the next six months.* If that response is positive, PEMLR in the March Supplement is set to 6, the value used to select the respondent for work disability.

Table 4 1999 Criteria: Employment and Cross-Relationships¹⁷

Criterion	Variable	Wtd. N (000)	Criterion PE	Other Severe		Other Non-Sev.		Criterion Only	
				%	PE	%	PE	%	PE
Health Problem	DIS-HP	5,837	0.24	70%	0.04	11%	0.53	19%	0.77
Left/Retired for Health	DIS-CS	2,954	0.21	70%	0.03	19%	0.51	12%	0.78
Veterans' Disability	VET-TYP1	738	0.64	26%	0.02	18%	0.71	55%	0.91
No Work Prior Year	RSNNOTW	3,923	0.03	86%	0.01	9%	0.11	5%	0.22
Out of LF - Disability	PEMLR	3,541	-	88%	-	9%	-	3%	-
Medicare/Under 65	MCARE	2,218	0.09	79%	0.03	10%	0.26	11%	0.39
SSI/Under 65	SSI	1,356	0.10	90%	0.04	7%	0.47	3%	0.79
All Not Severe		2,525	0.73						
All Severe		5,108	0.07						
All Disabled		7,633	0.29						

The first two columns provide the criterion and its related variable from Table 2. The next column contains the estimated population that meet the respective criterion. "Criterion PE" represents the fraction of the respective criterion that is employed.

Next, two columns (% and PE) are presented for "Other Severe." These columns represent the percentage of the criterion sample that also meets the test for severe disability and the related PE. For example, 70% of those qualifying as disabled using the "Health Problem" criterion also meet one of the four criteria for Severely Disabled. These people have a rate of employment of only .04, as compared with the overall criterion PE of .24. When working with a criterion for severe disability, these rates refer to people that also satisfy one of the other three criteria for severe disability. Using "Out of LF – Disability," we see that 88% of respondents meeting this criterion also met one of the other three severe disability criteria.

A similar procedure carries to the next two columns of Table 4 for "Other Non-Severe." These columns depict the percentages and employment rates for persons who did not satisfy one of the severe criteria, but who do satisfy one of the non-severe criteria. For our "Health Problem" criterion, this reveals that 11% of those qualifying did not meet any of the severe criteria but do meet one of the other two non-severe criteria with a rate of employment of .53. For the "Out of LF – Disability" example, 9% of those qualifying did not meet one of the other three severe criteria but do meet one of the three non-severe criteria.

The final two columns of Table 4 represent the percentage of criterion qualifiers and related rate of employment for those that qualified on the indicated criterion only – not on

¹⁷ Note that the employment rates in this table and in The Tables all assign a 1/0 variable to respondents based upon whether they are working or not. They do not differentiate by the amount of work done. That is, a person working four hours per week is given equal weight in computing the rates of participation and employment as a respondent working seventy hours per week. As a potential source for a future paper, the CPS can be used to show that work-disabled persons, on average, work fewer hours and are more likely to have part-time jobs (less than 35 hours per week) than their nondisabled counterparts.

any of the other six. A notable outlier here is “Veterans’ Disability” with 55% of the respondents who enjoy an employment rate of .91, commensurate with the nondisabled population (and well above the average Not Severely Disabled rate of .73). Only 44% of these respondents report a work disability using one of the other six criteria, and only 38% report a work disability using the core (health problem) question. Thus, this one criterion may somewhat overstate the male Not Severely Disabled rate.¹⁸ See also the discussion of this criteria in “Veterans’ Disability.”

Overall, Table 4 may be assessed in the sections contained in the drawn boxes. The upper-middle and upper-right boxes represent those persons classified as Not Severely Disabled. The overall rate of employment for this group is .73, which is mostly driven by the “Health Problem” and “Left/Retired for Health” criteria. Note that the majority of persons that qualified for these criteria were classified as Severely Disabled due to their responses to the other four questions (shown in the upper-left section).

All of the remaining sections comprise the Severely Disabled classification. Note that the lower-left section demonstrates that the vast majority of persons meeting one of the four key criteria also satisfy one of the other three. People in this section also demonstrate the lowest employment rate, perhaps deserving of their own “Catastrophically Disabled” classification.

Source of Criteria

The U.S. Department of Commerce, Bureau of the Census, developed the definition detailed in Table 2 for use in the Current Population Survey and began using it in the March Supplement survey in 1981. As early as 1983, the Bureau of the Census began publishing data based on this definition. The publication, *Labor Force Status and Other Characteristics of Persons With a Work Disability*, was updated in a 1989 publication of the same name (U.S. Bureau of the Census 1983, 1989).

S&T maintain that the author of *The Tables of Vocational Econometrics*, the publisher, developed these criteria (pages 244-245). As detailed in the preceding paragraph, neither charge is accurate. The Bureau of the Census developed the definition and continues to apply it on an annual basis to generate the cross-tabulations discussed earlier. In fact, “Employment and Earnings of Individuals 18 to 64 by Disability Status: Data from the March 2000 Current Population Survey” (McNeil 2000) uses these criteria for measuring work disability as recently as November of 2000.

¹⁸ If this criterion were excluded, the overall PE rate for males with a non-severe work disability would drop from .73 to .71. The female population has a dramatically lower rate of Veterans’ Disability. For males, 10% of the work-disabled population receive Veterans’ Disability, while the respective number for females is only 1%.

Impact of PEMLR Variable

As detailed in footnote 16, one of the criteria for severe disability is based upon the respondent's being out of the labor force at the time of survey and for a minimum of another six months (when PEMLR=6). S&T criticize this variable as follows (1999 page 242):

. . . could conceivably include individuals who have sustained relatively minor or non-permanent, yet prolonged or recurrent injuries or illnesses, that are nonetheless medically considered temporary in nature.

. . . Inclusion of this response segment in the Table's severely disabled category would appear to substantially skew worklife expectancy downward for those individuals whose inclusion overstates the persistence of time out of the labor force.

The claim of substantial distortion is speculative, with no supporting statistical evidence. However, Table 4 provides statistical evidence to the contrary. S&T's assertion implies that a significant portion of persons qualifying under the PEMLR criterion are not actually severely disabled. Yet, Table 4 shows that the overwhelming majority of them (88%) qualify as Severely Disabled using one of the other three criteria. Another 9% would otherwise qualify as Not Severely Disabled, and only 3% fail to meet any of the other criteria.

S&T also criticize the PEMLR criterion for including respondents who are only "temporarily" disabled. This is a recurrent suggestion in the S&T paper, which is reviewed in a separate section of this article, "Temporary in Nature."

Health Problem Vague

A key criteria in screening for work disability is the question identified by the DIS-HP variable: "(Do you/Does anyone in this household) have a health problem or disability which prevents (you/them) from working or which limits the kind or amount of work (you/they) can do?" S&T go to considerable lengths to attack the validity of this question (1999 p. 245). This is surprising when one considers that an almost identical question is used as the cornerstone for their own preferred data source, the SIPP (see "SIPP As Source of Participation and Employment Rates"), and other key surveys.¹⁹ As discussed in "Purpose of the Current Population Survey," the Bureau of the Census went to considerable lengths to develop this question in keeping with disability theory.

Moreover, Table 4 demonstrates that 81% of those responding positively to this question also responded positively to one of the other six questions (with 70% responding affirmatively to the Severe Disability criteria). Of the remaining 19%, the overall rate of employment is .77 – in line with the overall Not Severely Disabled rate of .73, and well

¹⁹ Similar questions are asked in the National Health Interview Survey, conducted by the U.S. Bureau of the Census for the U.S. Department of Health and Human Services, and the Panel Survey of Income Dynamics, conducted at the Survey Research Center, Institute for Social Research, University of Michigan.

below the Not Disabled rate. If the question were as ambiguous as implied by S&T, one would not expect such consistency in responses or probability of employment.

Finally, S&T refer to Table 30 of *Americans With Disabilities: 1991-1992* (McNeil 1993) in support of their criticism of this criterion. An inspection of the table, however, reveals a simple listing of the types of disabilities included, with no reference to employment rates or any support for how these rates may be distorted by the listed disabilities.

Veterans' Disability

In their review of the CPS criteria, S&T note that the Veterans' Disability criterion applies only to 1997 and later (page 242). This is incorrect. However, S&T's confusion is understandable. The Tables first listed this criterion in its 1998 version, when The Tables' author first became aware of its use in the Census cross-tabulations. The segregation by Census, however, dates back to 1988. Before that time, the DIS-CS criteria was worded: "Is there anyone in this household who has a service-connected disability or who ever retired or left a job for health reasons?" In 1988 this question was changed to its current version: "(Did you/Is there anyone in this household who) ever (retire or leave/retired or left) a job for health reasons?" At the same time, the Veterans' Disability question was added. (See Table 3 for detail.) Both the 1995 and 1998 versions of the table have used these seven criteria, although it was documented only in the 1998 version.

Temporary in Nature

Throughout their article, S&T postulate that the persons qualifying under the CPS criteria are likely to be only temporarily disabled. They conclude that this distorts the extracted probabilities of participation and employment, impugning the validity of The Tables. Obviously, all forensic cases for lifetime lost earnings should involve permanent disability. Thus, we assume that The Tables are being applied only to such cases. For the existence of temporary disability within the CPS employment rates to distort this analysis, one must also assume that persons with temporary disability have a significantly different rate of employment during the disability period than persons with permanent disability.

Again, their claims, assumptions, and conclusions are purely speculative with no statistical support offered. The following discussion presents statistical evidence contradicting their assertions. To test the temporary nature of disability, we joined consecutive years from the March Supplement. For limited longitudinal applications, the CPS repeat-samples a target percentage of their survey in consecutive years. Using the procedures outlined in the March Supplement manual (U.S. Bureau of the Census 1999), and expanded upon in an article by Ciecka, Donley, and Goldman (1995), we joined survey years by household identification, gender, race, veteran status, and age. Using the matched years of 96-97, 97-98, and 98-99 provides samples of 49,429 persons between the ages of 25 and 49, and 15,084 persons between the ages of 50 and 59, responding in both the base and following year.

The next several pages analyze the potential impact of temporary disability using three different cross-tabulations of our longitudinal sample.

Employment Transition

Table 5 summarizes the employment transition from the base year to the following year by work disability status (as reported in the base year). Here, “n Employed” shows the sample size that was employed in the base year for each respective disability status. “Employed to Not” shows the percentage of those persons who were not employed in the following year. Next, “n Not Employed” provides the sample size that was not employed in the base period. Finally, “Not Emp. To Employed” shows the percentage of those who were employed in the next year. Here, some caution must be exercised in analyzing the results, in that they were extracted from years of increasing economic prosperity – each year with successively higher employment levels.

Disability Status	n Employed	Employed to Not	n Not Employed	Not Emp. To Employed
Age Group: 25 - 49				
Not Disabled	39,367	5.2%	6,197	33.3%
Not Severely	1,115	12.9%	430	33.7%
Severely	291	16.8%	2,029	10.7%
Age Group: 50 - 59				
Not Disabled	10,659	6.5%	2,126	19.7%
Not Severely	529	14.4%	310	13.9%
Severely	107	25.2%	1,353	4.3%

The table clearly shows that employed persons classified as Not Severely Disabled are more likely to become not employed²¹ than are those classified as Not Disabled (12.9% vs. 5.2% for 25 – 49 and 14.4% vs. 6.5% for 50 – 59). Further, those classified as Severely Disabled are more likely than those classified as Not Severely Disabled to become not employed. These observations are true for both age groups, and are significant at the 99% confidence level. Those between 25 and 49 who are Not Severely Disabled and Not Disabled who are not employed in the base period share approximately the same likelihood of being employed in the next year. However, for the older age group, those who are Not Severely Disabled are much less likely to be employed. Again, those who are Severely Disabled are significantly worse off in both age groups.

Table 5 supports the claims of many vocational experts that persons with a work disability as defined by the CPS criteria are more likely to leave a job and less likely to find a job than their counterparts without disability. Further, those with a severe work disability are more profoundly affected than those with a not severe disability. Aging exacerbates these

²⁰ Table 5, Table 6, and Table 7 use all repeat-sampled individuals between the ages of 25 and 59 from the 1996-1999 March Supplements.

²¹ Here, we use the term “not employed” rather than “unemployed,” in that this is the percentage of the entire population, not just those participating in the labor force, who are without jobs.

phenomena. These findings would not occur if the work-disabled population is, as suggested by S&T, comprised significantly of persons with temporary disability.

Transitional Employment Rates

Table 6 takes this a step further, presenting the rates of employment and unemployment in both the base and next years for each disability category. Here, the same note of caution should be aired concerning the underlying prosperous economy.

Table 6 Transitional Employment/Unemployment²²

Disability Status	Base Year PE	Next Year PE	Base Unemp.	Next Unemp.
<i>Age Group: 25-49</i>				
Not Disabled	0.86	0.86	3.5%	3.0%
Not Severely	0.72	0.72	9.2%	6.8%
Severely	0.13	0.20	22.4%	13.6%
<i>Age Group: 50-59</i>				
Not Disabled	0.83	0.81	3.0%	2.4%
Not Severely	0.63	0.59	8.0%	6.2%
Severely	0.07	0.09	11.6%	8.6%

Given the favorable economy, one might expect increasing rates of employment (PE) for all categories. In addition, as the economy approaches full employment, one might also expect employment opportunities for persons with a work disability to increase at a disproportionately higher rate.²³ Here we see employment levels flat or falling for those in the Not Disabled and Not Severely Disabled categories and increasing substantially for those who are Severely Disabled. With unemployment (the percentage of labor market participants without jobs), we find levels falling for all categories, more substantially for those with a disability.

Despite improved employment and unemployment statistics for persons with a work-disability, Table 6 still does not provide support for S&T's temporary employment hypothesis. Even one year after initial classification as work-disabled those who are Not Severely Disabled continue to show steady employment levels. Those who are Severely Disabled show some improvement, but remain at a level that is merely a fraction of the Not Severely Disabled levels, let alone the levels for those who are Not Disabled.

²² See footnote 20.

²³ Here, the assumption is that as the economy approaches full employment, employers lower their resistance to and increase their accommodation of work-disabled persons. Thus, persons with a work disability should enjoy a higher employment percentage increase from the robust economy than those without a disability.

Status Transition

Finally, Table 7 explores the rates of participation and employment within the disability status categories for those that report a change in status from the base period to the next period.

Table 7 Employment Rates by Status Transition²⁴

	Not Disabled		Not Severely		Severely	
	Base Period	Next Period	Base Period	Next Period	Base Period	Next Period
Sample Size	58,349		2,384		3,780	
Overall PE	0.86	0.85	0.69	0.68	0.11	0.16
Improved			0.72	0.76	0.27	0.48
Same	0.86	0.87	0.75	0.74	0.06	0.06
Worse	0.67	0.48	0.37	0.12		

This table presents two columns for each of the Not Disabled, Not Severely Disabled, and Severely Disabled base-year categories, showing the participation and employment rate (PE) for both the base and next year.²⁵ The first row provides the sample size, which remains constant for both years. The next row provides the overall PE rates, similar to those provided in Table 6. The “Improved” row presents the PE rates for those reporting an improved disability status in the next year. (Persons in the Not Disabled category have no possibility for improvement.) The “Same” row shows the PE rates for those reporting the same status in the next year. Finally, the “Worse” row provides the rates for those reporting deterioration in status in the next year. (Persons in the Severely Disabled category have no opportunity for deterioration.)

Why do the disability statuses change? Let us assume three possible sources. First, the status may actually improve or deteriorate from one year to the next (changes are accurately reported). Second, the person answering the CPS questions for the household may change, causing variance in answers to the same questions in two consecutive years. Finally, the respondent can simply provide the wrong answer in one of the years. The last two reasons are obviously reporting errors, but as discussed below, the impact is minimal.

First, consider the Not Disabled category. Note that the respondents that report a deteriorated status in the subsequent year already demonstrate an impaired PE rate in the base year – a rate that is similar to the Not Severely Disabled level. This suggests that a significant portion of this transition group is likely subject to one of the reporting errors in the first year, and they actually should have been reported as Not Severely or Severely Disabled in the base period. If this is true of the entire transition group (which is not likely), there is no measurable impact to the overall Not Disabled PE (.86) in the base year.

²⁴ See footnote 20.

²⁵ By “next year,” note that this is restricted to the persons that were also reported in the base year.

Next, consider the Not Severely Disabled group. Here, the persons in the “Improved” row are respondents that are categorized as Not Disabled in the next period. These persons do report improvement between the two periods, but notice that even in the next period when they report no disability criteria, they still report PE rates significantly below the Not Disabled level. This fact suggests that the portion of these respondents that were erroneously classified as disabled in the base year is limited. However, if these persons are only temporarily disabled (the S&T hypothesis), then they make little impact on the overall Not Severely Disabled PE (.72 vs. .69).

Also in the Not Severely Disabled group, note those in the “Worse” category. Here again, observe that even in the base period, the PE rates are dramatically lower than the overall rate (.37 vs. .69). Again, this suggests a large percentage of the transition group should have been reported as Severely Disabled in the base period. In the “Same” row of those who are Not Severely Disabled, note that the PE rate stays constant around .75, compared to the overall PE rate of .69. If we assume all Not Severely Disabled transitions, better and worse, to be reporting errors, one might conclude that the overall effect seems to slightly understate the category PE for permanently disabled from .75 to .69.

The Severely Disabled category shows the greatest divergence between those that remain in the category and those that improve. However, note that even those that improve continue to have a PE rate substantially below the Not Severely Disabled rate. Of all the categories, Severely Disabled has the greatest potential for error. However, use of this category is limited as discussed in “Severely Disabled.”

Thus, via collective analysis of Table 5 through Table 7, we may conclude that there is potential for some segment of the disabled categories to be only “temporarily” disabled. However, the potential for distortion of the overall rates of participation and employment does not appear to be significant.

Chronic Disability

The next hypothesis offered by S&T (242-243) is that the CPS disability statistics include a significant population of persons with a chronic disability, rather than those disabled by a tort (the expected subject matter for use of The Tables). They speculate, without substantiation, that inclusion of these persons with chronic work disability materially distorts the employment rates of the work-disabled worklife expectancies.

Although a significant number of persons with a chronic disability most likely are in the CPS work-disability categories, one must remember that the CPS (like the SIPP) excludes institutionalized persons. This excluded population most likely holds the largest fraction of persons with chronic disability, persons that are more likely to have no residual earning capacity.

These aside, S&T’s speculation that persons with chronic disability materially distort the work-disabled employment rates of those disabled by torts assumes that one group is inherently different than the other. What is the basis for this conclusion? Once again, they offer no evidence in support. In the absence of indicators to the contrary, one must assume

that two persons with the same work disability, but from different causes, have equal probabilities of employment. Thus, we fail to find evidence of S&T's claimed distortion.

Severely Disabled

Worklife expectancies for the Severely Disabled are quite low, approaching zero due to the high concentration of persons with no residual work capacity in this category. On page 241 of their article, S&T note that a 47-year-old female with a college degree has a worklife of 2.0 years. They attack the values, questioning why one would assign a worklife expectancy of marginal duration to somebody who obviously has no capacity for work. The answer is, one typically would not.

Severely Disabled is computed and presented as a category in The Tables mostly as a means to segregate those with catastrophic disabilities from those with true residual capacity. In other words, by isolating those classified as Severely Disabled from the work-disabled population, the remaining category of Not Severely Disabled is created – one that provides great value in gauging the worklife expectancy of persons with a permanent *partial* work disability.

The Severely Disabled category should not be used for every plaintiff that seems to qualify. It is an average for a population that requires expert interpretation to apply to an individual. An expert who believes the plaintiff is totally disabled should certainly use a worklife expectancy of zero, not the marginal average worklife expectancy printed in The Tables. This is not to say that the Severely Disabled category has no use. In some cases, where the expert believes that limited residual work capacity exists, he or she may appropriately apply the statistic.

Impact of Work Disability

In their review of The Tables, S&T make several comments to the effect that once a person with a permanent work disability finds employment that accommodates that disability, there is no diminution in worklife. For example, on page 243 they note, "In such cases, there may be no worklife impairment for jobs within the medical work restrictions." On page 244, they discuss impairment to a physical laborer noting, "For a light-duty job, the subject is, in most cases, not disabled whereas he was disabled with respect to the heavier construction job."

S&T do not seem to understand the impact of permanent work disability or the modern labor market. Employers and employees no longer form lifetime relationships where the employee stays with a single employer for the duration of his or her career – whether they are disabled or not. According to the Bureau of Labor Statistics, the average U.S. worker has more than nine employers just between the ages of 18 and 34 (2000), let alone further shifts after the age of 34. As shown in Table 5, persons with a work disability, Not Severe and Severe, are more likely to become unemployed. Moreover, they are less likely to find employment once unemployed. These conditions become more profound with age.

As discussed in the surrounding narrative, Table 5 supports these conclusions using data from 1996 through 1999. In earlier research, Yelin (1996) came to the same conclusions using data from the 1993 to 1995 CPS. This was expanded in another article by Yelin and Trupin (1997). Trupin and Yelin reconfirmed this in another article using data from the 1996 California Work and Health Survey (1999).

Even if persons with a work disability find employment that accommodates their disabilities, they face on-going struggles to cope with their disabilities. These struggles intensify with age, continuously making it more difficult to compete with their counterparts without disability. This is consistent with the tables presented here.

Use of 6-Year Average

To compute the worklife expectancies in The Tables, PE rates were extracted from the March Supplement for 1992 through 1997. These six years were averaged by weighting the individual rates of participation and employment by the estimated population size in each year. Use of a six-year weighted average provides two benefits:

- Individual cells with small sample sizes are aggregated, making the statistic more robust.
- Economic cycles are averaged, limiting distortion by using a single favorable or unfavorable employment market as a predictor of future expectancies.

Use of joining multiple years of the CPS is supported in “Roundtable on Earnings and Work Experience of Disabled Workers - Data for Assessment” (McNeil 2000). Here, McNeil points out that such a combination is not possible with SIPP data because of non-comparability between years.

S&T reviewed the data for the six years and tested for a trend in employment rates. Not surprisingly (in years of increasing economic prosperity), they found a time factor with statistical significance. What is surprising is they claim this to be a trend that invalidates the data, maintaining that the years must display a constant mean to be usable.

It is ironic that in the only place in their paper where S&T attempt statistical testing, it is inappropriate. To use six data points from an increasingly prosperous economy and claim that the results constitute a trend, as opposed to a cycle, defies logic. Six years are certainly insufficient to differentiate between the two. To point out that the cyclical data cannot be used implies one of two remedies:

- The Tables should use only the most recent data. This would suggest that if The Tables were developed in a year with an unusually favorable economy, that economy should be used to predict all the remaining years of a person’s worklife.
- The Tables should include a trend prediction. Again, in favorable economic times, this might have the current conditions continuing *ad infinitum*, potentially projecting 101% employment at a future date.

Obviously, the statistical test and resulting conclusions are both inappropriate. In fact, one might wonder how our current unprecedented long period of economic prosperity should be handled if a new version of The Tables were generated now. Is six years of sufficient length to average less prosperous times into the predictive worklife expectancies?

Adjustment to Specific Case

Much of the S&T article centers around the fact that the worklife expectancies are derived from *average* rates of participation and employment from the various disability category populations. Their consternation seems to stem from a need for a precise formula to apply these population statistics to an individual plaintiff. This is the same quandary vocational and economic experts must face when applying any statistic, not just worklife expectancies, to predict a lifetime earning stream to an individual. Indeed, as noted by Marcia Angell in *Science on Trial* (1997, p. 115):

Courtroom trials are not about populations, they are about individuals. . . . We have no basis, at least in the current state of knowledge, for making a judgment about a particular woman. We therefore *must* appeal to epidemiological data – that is, studies of populations.

The United States Supreme Court recognized this years ago, in their decision in *Jones and Laughlin Steel v. Pfeifer* (1983):

By its very nature the calculation of an award for lost earnings must be a rough approximation. Because the lost stream can never be predicted with complete confidence, any lump sum represents only a “rough and ready” effort to put the plaintiff in the position he would have been in had he not been injured.

No statistic, no matter how fine-tuned, can provide an exact predictor of an individual’s future. This is as true of worklife expectancies as it is of various measures of annual earnings and age-earnings profiles. The expert must use available statistics about populations and mold them to meet the specifics of his or her case.

On page 241 of their article, S&T seem to assert that without a set formula for adjusting the average to meet an individual, The Tables are invalid. Why do experts exist? If one could derive worklife expectancies in sufficient detail that each individual can be assigned a statistic to accurately predict his or her future, we can certainly eliminate the need for expert testimony! Averages from various populations have long been accepted as a means for prediction – life expectancy, earnings, and others. The Tables offer the best scientific basis from which to mold an opinion. To throw them out simply because they result from the average of a population, suggests that the expert should base his or her opinion on mere speculation with no statistical starting point.

Active / Inactive

As discussed earlier, The Tables are computed using an LPE model – summing the joint probabilities of life, participation, and employment through the age of 74. Earlier worklife tables from the Department of Labor (1986) and others were segregated by the person’s labor market active/inactive status using an “increment/decrement” model. (These tables did not distinguish for work disability.) S&T criticize The Tables for not accounting for the person’s current labor market activity – essentially proposing that The Tables become a hybrid of the two methods.

This is an interesting concept explored by The Tables’ publisher, but deferred due to its complexity and data limitations. Institution of an increment/decrement model requires determination of the probabilities of entry and exit into the labor force at any time in the future. To develop these probabilities, one must use longitudinal data. The Department of Labor achieved this by joining successive periods of the CPS using a similar methodology to that used in our analysis described in “Temporary in Nature.” However, since only a limited number of respondents are contained in successive surveys, this significantly decreases the sample size, which is already strained as described in “Sample Size.”

Even if this hybrid could be developed, the resulting statistics would still be population averages in need of expert interpretation. For example, assume two plaintiffs identical in every way except that Plaintiff A returned to work and Plaintiff B did not. Both were working before their respective accidents. We may safely assume A, being active in the labor market, has a longer activity-based worklife expectancy than B. Does this mean that A has lost less merely because he or she has made more of an effort to mitigate losses than B? Of course not! As with the worklife expectancies reported in The Tables, the expert must examine the residual *capacity* of the plaintiff in determining future expectations.

Meeting *Daubert* Criteria

Thus far, this document has emphasized the validity of The Tables and their underlying data without a direct tie-in to The Supreme Court’s *Daubert* decision on the admissibility of expert testimony. *Daubert*, as enhanced by the subsequent *Kumho* decision, requires that all expert testimony meet the general tests of “relevancy” and “reliability.”

Reliability

With regard to reliability, The Court held that scientific evidence must be “grounded in the methods and procedures of science.” *Daubert* provides four flexible factors to determine if the evidence so qualifies: testing, peer review and publication, error rates and standards controlling the technique’s operation, and general acceptance in the relevant community. As updated by *Kumho*, the court stressed that not all factors may apply with every case, especially in the social sciences. The trial court is left as the gatekeeper using the factors as flexible guidelines to assure the expert employs the same level of intellectual rigor as he or she would outside the courtroom when working in the relevant discipline. With that as the backdrop, the applicability of each of the four factors is discussed below.

Testing

The scientific testing criteria are principally directed at the “hard” sciences (e.g. engineering), and have less significance for vocational and economic testimony, since we are concerned with the future experience of people, which can never be tested or known with absolute certainty. However, data from the CPS are produced and extensively tested by the U.S. Department of Commerce, Bureau of the Census (U.S. Bureau of Labor Statistics 2000). The probabilities of life are drawn from the life tables from the U.S. Department of Health and Human Services, National Center for Health Statistics, which produces and extensively tests the tables.

Peer Review and Publication

Use of the underlying CPS data from the March supplement to measure employment rates of persons with a work disability is the subject of multiple refereed articles, including the following: Burkhauser (2000), Gamboa (1996), Houtenville (2000), McNeil (2000), Trupin (1999), U.S. Bureau of the Census (1983 and 1989), and Yelin (1996 and 1997). Articles explicitly concerning The Tables include Clauretie (1998), Corcione (1995), Gamboa (1989), Gibson (1998), Gluck (1996), and Misra (1992).

The above citations are by no means intended to be exhaustive, merely indicative that the tables and the supporting data have been extensively reviewed in scientific literature. They are listed in the same order as found in the “References” section of this paper.

Error Rates and Standards for Operation

Again, these criteria are primarily intended to apply to the “hard” sciences in conjunction with the testing performed there (e.g., reliability of a bolt securing a heavy sheet of metal). However, one can compute the standard error of a worklife expectancy using the formula for the standard error of a probability:

Equation 1 Standard Error of a Worklife Expectancy

$$S_{lpe} = \sqrt{\sum_{t=x}^{74} \frac{l_t * (1-l_t) * p_t * (1-p_t) * e_t * (1-e_t)}{n_{l_t} * n_{p_t} * n_{e_t}}}$$

Here l , p , and e are the respective probabilities of life, participation, and employment; t represents the age at which the probability is measured; x is the starting age for the plaintiff. Since l , p , and e are probabilities between 0 and 1, the maximum variance for any observation would arise when all three are equal to 0.5. Thus substituting 0.5 for the probabilities, the maximum standard error can be computed as follows:

Equation 2 Maximum Standard Error of a Worklife Expectancy

$$S_{\max} = \sqrt{\sum_{t=x}^{74} \frac{1}{64 * n_{l_t} * n_{p_t} * n_{e_t}}}$$

If we assume an age at which we have only ten observations for all three probabilities,²⁶ the joint probability for that age would be 0.125²⁷ with a standard error of 0.00395, or 3% of the estimate. With the larger sample sizes used for most of the PE rates in The Tables, the significance is even lower. (Using sample sizes of 100 instead of 10, the standard error is 0.00013, or 0.1% of the estimate.)

Thus, statistically measured standard errors of the worklife expectancy statistics are insignificant. The area of greatest potential error is the application of worklife expectancies to an individual case, as discussed in the Relevancy section below.

With regard to standards for controlling the technique's operation, the LPE methodology used to develop the tables was developed by Brookshire and Cobb (1983). It was further refined by Brookshire, Cobb, and Gamboa (1987) to adjust for work disability, and is one of multiple widely accepted methods to compute worklife expectancies discussed in *Life and Worklife Expectancies* (Richards & Abele 1999).

General Acceptance

Forecasting a plaintiff's future earnings stream is not an exact science. As such, there is no single step in the loss computation process that enjoys widespread acceptance in the relevant community. This is certainly true of determining discount rates, projecting earnings growth, defining earning capacity, and computing a worklife expectancy. However, we can explore the acceptance of The Tables and their source data relative to this general uncertainty.

Wide acceptance of use of the CPS data to define disability is documented in the "Peer Review and Publication" section above. The use of several generally accepted methods to compute a statistical worklife is quoted by Richards and Abele (1999), of which the LPE approach used in the tables is one. Finally The Tables themselves have been the subject of many articles (also documented in "Peer Review and Publication" above), lending credence to their overall acceptance.

Relevancy

Earlier in this paper, the "Adjustment to Specific Case" section recognized that the worklife expectancies presented in The Tables are averages for the applicable disability population. It is critical that users of the table apply these statistics to a specific case with "intellectual rigor." That is, experts must not blindly apply a worklife expectancy to a plaintiff without consideration of how it matches the plaintiff's circumstances.

²⁶ This is an extreme example since the sample size to determine the probability of life is quite large.

²⁷ This is the joint probability for a single year: $l * p * e = 0.5 * 0.5 * 0.5 = 0.125$. This same computation would be performed for all of the years from the current age through 74 and summed to reach the worklife expectancy. Similarly, the variance is summed over the same years when computing the standard error of the overall worklife expectancy.

The expert must therefore truly be an expert with experience dealing with persons with work disabilities to understand how a particular plaintiff is similar to or different from the statistic's population. If the plaintiff is unlike the statistical cohort, the worklife should be adjusted, or the analysis of lost earnings should be presented in a range, using two different worklife expectancies.

Odds and Ends

Efficacy of Therapists

On page 250, S&T opine that The Tables do not allow for the efficacy of physical and occupational therapists in easing the transition of a person with a work disability back into the workforce, reducing the loss of worklife expectancy. Similar to their argument on permanency of disability, they ignore the conditions of expert analysis in tort cases. In most cases, the plaintiff has reached a level of "Maximum Medical Improvement" by the time the expert is asked for analysis of lost earnings. If not, it is the role of the expert to gauge his or her projections based upon the plaintiff's reasonably foreseen potential, as defined by healthcare providers.

Race

The 1998 version of The Tables discontinued issuing worklife expectancies by race, as had been done in earlier versions. On page 240 of their article, S&T lament that this ". . . seems to reduce the ability for tailoring as it ignores interactions between race and education." Their comments highlight the reason for dropping the race-specific statistics: many users of The Tables failed to read the warnings that the measures of race were derived for life only, and not for participation and employment.

The Bureau of Census tables providing the rates of participation and employment do not distinguish rates by race - only by age, gender, education, and disability status.²⁸ The life tables published in United States Life Tables 1997 (Anderson 1999) offered race-specific statistics (albeit limited to White, African American, and All Other), but offered no interaction with education or any of the other variables. Hence, S&T's assumption that the former version of The Tables offered worklife expectancies recognizing interactions between race and education is incorrect. All that was lost by excluding race from the 1998 version of The Tables is continued confusion. Moreover, most life insurance companies do not rate their policies by race, recognizing that other factors (gender, education, occupation, environment, etc.) provide the key determinants of risk. Given this, one must ask whether it is appropriate to limit worklife expectancies by this factor.

²⁸ Using the raw data from the CPS, one might recreate the cross-tabulations with the limited racial detail available. However, this would again bring sample sizes for minorities below a reliable level, probably to zero for many of the cells. See "Sample Size" for more information.

Corcione Book Review

In 1995, Frank P. Corcione authored a book review of *The Tables* in which he lists four criticisms. S&T note three of the criticisms, but then make no further reference to them. Thus, it is hard to tell whether they are adopted or discarded. In either event, these criticisms were responded to by Gluck (1996) and Gibson (1998). The fourth criticism concerned use of the six-year CPS average. S&T reject Corcione's suggested testing and substitute their own as discussed in "Use of 6-Year Average."

Impact of ADA

On pages 250-251, S&T take issue with a topic that has little to do with the validity or value of *The Tables*. In both versions of *The Tables* (Gamboa 1995 and 1998), Gamboa noted the increasing dichotomy between the employment rates for persons with and without a work disability – even after enactment of the Americans with Disabilities Act (ADA). *The Tables* make no conclusion about the effectiveness of ADA; they only note that it is too early to measure.

Gamboa, Gibson, and Tierney produced a paper (1996), which tested the significance of the increasing "disability decrement," resulting in R-squared tests approaching 0.90.²⁹ (Adjusted for data through 1999, these tests show levels in excess of 0.90 for both males and females.) These tests have since been confirmed and expanded in a more sophisticated approach in a paper by Burkhauser, Daly, and Houtenville (2000) from Cornell University and the Federal Reserve Bank of San Francisco. Presented at the NASI Conference on Ensuring Health and Income Security for an Aging Workforce, this paper uses the core work disability question identified as "Health Problem" in Table 4. They note (p. 4)

While this single question measure of disability is coarser than a measure based on a more detailed set of self-reported questions like those in the *National Health Interview Survey* or an actual medical examination, we believe it is a reasonable first approximation of the population with disabilities. More importantly, we believe it has consistently measured that population over the period of our analysis.

In addition, another new article, "The Unintended Consequences of the Americans with Disabilities Act" (DeLeire 2000), now adds another confirming voice. Using the SIPP, DeLeire also shows declining employment for persons with disabilities after enactment of the ADA.

Summary

When first published, *The New Worklife Expectancy Tables* (Gamboa 1987) represented a pioneering effort. No other publication defines statistical worklife expectancies for persons with a disability. To this date, they continue to be the only published source.

²⁹ This simple test regressed the disability decrement against the year.

The Tables draw from data defined, collected, summarized, and published by the Bureau of the Census. Questions in the Current Population Survey were developed at great expense and considerable scrutiny to best extract information explicitly about persons with a disability. The validity of this collection process is verified on an on-going basis by the government and various watchdog groups to assure the integrity of the information for use in critical decisions throughout government and private industry.

Skoog and Toppino offer a review of The Tables in what is termed “A Critical Analysis.” Actually, it is only a polemic. The arguments presented are mere red herrings, offering no meaningful statistical support or analyses. They pose various hypotheses, all assuming the most negative light possible against The Tables, but fail in their scientific duty to substantiate a single one. Their intent can only be to offer possible groundwork for a court challenge against the use of The Tables in expert testimony.

This is both unfortunate and ironic, for The Tables provide the only published scientific basis from which to derive worklife expectancies for persons with permanent partial work disabilities. The *Daubert* and *Kumho* decisions dictate use of such a basis for an expert opinion. To suggest that these Supreme Court decisions invalidate The Tables is ludicrous. It implies that experts throw out all statistical measures and base their opinions on gut instinct. Certainly, the measures of worklife expectancy presented by The Table are in need of expert interpretation and application to specific cases. It is this expert interpretation of the data that judges and juries must consider when determining the admissibility and weight of the expert’s testimony.

Red herrings or not, this article goes to great lengths to give the S&T speculation scientific consideration. In the process, it introduces new cross-tabulations from the CPS, further validating The Tables and the premise that persons with a permanent partial work disability suffer a substantial diminution in worklife expectancy. Any attempt to define the worklife of an individual with a permanent partial work disability is flawed to the degree that it fails to consider either the tables or their underlying work disability data. An assignment of a worklife expectancy that ignores either pre-injury or post-injury work disability status is lacking in the level of “intellectual rigor” required by the *Daubert* standard.

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