The New Gamboa Tables: A Critique

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Abstract

The tables produced by Vocational Econometrics, Inc. (VEI) purporting to show worklife expectancies for persons with work disabilities are based on meaningless statistics (population averages estimated by an error-ridden proxy). The tables contain gross heterogeneity bias, sample selection bias and specification error bias. These problems render the tables unreliable for their intended use of estimating the worklife expectancy for persons with disabilities. The purpose of this paper is to describe these problems.

The New Gamboa Tables: A Critique

I. Introduction

Vocational Econometrics and Anthony M. Gamboa, Jr. of Vocational Economics, Inc. produce tables purporting to show the worklife expectancies for persons with disabilities. The latest version of the tables referenced in this paper were published in 2002 (Gamboa, 2002), hereinafter, "the Gamboa tables,"or simply the "Tables." These tables are typically invoked in, and only in, litigation to support an opinion rendered on the duration of the remaining length of working life of individuals who have suffered an injury but who are either expected to return to work in the near future or who never missed any work due to the injury. Unfortunately, data problems and a variety of biases render these tables invalid for their intended use. The purpose of this paper is to describe these data problems and biases. Part II describes the way the Gamboa tables define the class of non-severely and severely work disabled persons. Part III then discusses problems with this identifying procedure arising from inadequacies in the Current Population Survey data used to identify the disabled. It also describes how, due to these data problems, the estimate of the probability of employment (hereinafter, "PE") from which the worklife tables are derived is biased. Part IV of the paper rigorously defines this bias with specification error analysis. The final section of the paper then describes some of the additional consequences of these problems and other problems with the Tables.

II. The Definition of Disability Categories Used in Constructing the Gamboa Tables

The meanings of the term "disability" and such related terms as "impairment" and "functional limitation" are discussed in the introductory sections of U.S. Bureau of the Census (1989) and McNeil (1993). In the former publication, the measure of work disability in the March Current Population Survey (CPS) is defined. This definition was later revised to include

condition 7 in the list below. The Gamboa Tables are based on the following definition of work disability – A person aged 16 to 64 is considered to have a work disability if one or more of the following conditions is met:

1. Is identified by a question in the March Supplement to the CPS that asks "(Do you/Does anyone in this household) have a health problem or disability that prevents (you/them) from working or which limits the kind or amount of work (you/they) can do?"

2. Is identified by a question in the March Supplement that asks "Is there anyone in this household who ever retired or left a job for health reasons?"

3. Did not work in the survey week because of a long-term physical or mental illness or disability that prevents the performance of any kind of work (based on the "main activity last week" question on the basic CPS questionnaire).

4. Did not work at all in the previous year because of illness or disability (based on the "reason did not work last year" question on the March Supplement).

5. Is under 65 years of age and covered by Medicare.

6. Is under 65 years of age and a recipient of Supplemental Security Income (SSI).

7. Received veteran's disability compensation in the previous year.[1]

A person answering "yes" to any of the questions 1-7 is considered to have a work disability. A person meeting conditions 1, 2 or 7, but not any of conditions 3 – 6, is defined as having a non-severe work disability, whereas someone answering "yes" to any of the questions 3-6 is considered to have a severe work disability.

III. Data Problems and Flaws in the Probability of Employment (PE) Estimator

The estimator of PE, the employment probability, used by the Gamboa tables is flawed because (a) there are serious flaws in the CPS data when used to measure disability, (b) it ignores impairment-specific heterogeneity, (c) it lacks exogeneity and (d) it does not allow for transitions into or out of the state of being work disabled. These problems are explained in turn.

*Flaws in the CPS Data Measuring Disability***.** The data used to produce the Tables are not gathered by studying the longitudinal work histories of a sample of people who suffered a permanent disability caused by specific impairments or functional limitations. The Tables do not rely on such straightforward data because the CPS does not collect it. Rather, those with impairments can only be indirectly identified and there is no work history of even the limited kind found in the increment-decrement worklife tables. As noted above, for the non-severely disabled (NSD), the proxy is based on the three questions: (a) "Do you have a health problem or disability which prevents working or which limits the kind or amount of work?" (b) "Have you ever retired or left a job for health reasons?" (c) "Do you receive Veterans' payments for disability?" and on (d) the condition of being not “severely disabled” as that term is defined by a person answering “yes” to any of questions 3-6 listed in Section II above. CPS data are then used to determine the PE of those classified as NSD and severely disabled (SD).

This proxy variable/estimation strategy is based on a self-fulfilling, circular definition which causes the selection of a biased sample of those with non-severe impairments. Because those with a non-severe disability are largely defined as a group with some kind of work problem, this group, other things equal, would be expected to work less. In other words, the very definition of those with a non-severe disability introduces a correlation between the outcome - working - and the thing being measured, "non-severe disability." Persons who have some type of impairment who have **not** been having work-related problems tend to be systematically

excluded. The measure selects a biased sample of those who have non-severe impairments because those experiencing past or present limitations would have in part by definition a propensity not to be observed working. The NSD definition bears at best a loose approximation to being in a non-severely impaired state, which is the information we are trying to condition on for post-accident worklife expectancy. The correlation that the NSD proxy has with the object being measured is unknown - a very unsatisfactory state of affairs for testimony which needs to be both valid and reliable. To learn the extent of the error involved in using the NSD proxy, one would need an additional study that would estimate the biases arising from using the proxy. Such studies are used by the Census Bureau to estimate population undercounts, but no study of this kind has been performed to assess the degree of error in the NSD proxy.

The problem of sample selection bias can be illustrated by an analogy. Suppose a researcher wishes to compute the average number of days that asthmatics spend in the hospital with asthma-induced problems. The researcher could gather a random sample that is representative of all asthmatics, total the number of days the members of the sample spent in the hospital for asthma problems and divide by the number in the sample. However, suppose the researcher decides to examine hospital records for asthma-related admissions. Then he adds the number of hospital days for the persons identified and divides by the number of such persons. The researcher's second method would result in an upwardly biased estimate of days asthmatics spend in the hospital because those never admitted to the hospital are not represented in the sample. Similarly, by the very process of how the NSD sample is selected for construction of the Gamboa tables, the probability of employment for the persons with non-severe impairments is underestimated because the sample is drawn mostly from those who have work-related problems.[2]

The problem of sample selection bias is aggravated by the likelihood that some persons with impairments are mis-classified as non-disabled in the data. This is a point made by Bureau of Labor Statistics economists Thomas W. Hale (2001), Harvey Hamel (quoted in Skoog and Toppino (1999)), and by Philip Rones (1981). All of those with an impairment who do not perceive that they have such work limitations are mis-classified as non-disabled by the VEI/Census definition and excluded for the NSD sample. Such a mis-classification is likely for some of those persons who have a physical impairment and have a job because such persons when seeing the phrase "prevents you from working" in the question may answer the question "no" because they do not regard themselves as having a work disability or limitation. If such persons could be properly reclassified as NSD, the PE of this group would be increased. But the information to prepare such a reclassification is not available. The original purpose of having the question about work limitations was to identify persons who might be recipients of transfer payments related to disability, not to study the labor market success or lack thereof of persons with impairments. As noted by Hale (2001), speaking of the CPS, "Neither the work limitation nor the income questions were designed to identify the population with disabilities, nor were they tested to determine if they do so. ... The work limitation and income questions in the March income supplement might identify a subset of the disability population (an untested empirical proposition), but they are not likely to capture the larger population with disabilities." (p. 39)

Ignoring gross impairment-specific heterogeneity. The impairment of a particular injured person bears little or no vocational or economic relation to hundreds of other impairments, all of which are lumped and estimated together. As noted by Skoog and Toppino (1999, p. 243), "From a vocational standpoint, the greatest contraindicatations in the use of the CPS data to estimate impaired worklife includes the survey's significant failure to identify the type of disability.... *The methodology used to create these Tables inappropriately assumes that a yes for*

CPS categories 3, 4, 5 and 6 demonstrate severe disability. (Authors' italics.) These broad groups presumably include individuals without any remaining worklife expectancy (totally disabled) and others who may be temporarily disabled without any predictable reduction in worklife. This depicts a major problem for the valid and reliable use of the Tables as the CPS data are aggregated while individual injuries are client-specific, and there is no good way to "tailor" the Tables even with the new severe and non-severe groupings. "[3] Needless to say, the same heterogeneity occurs within the categories 1, 2 and 7 defining non-severe disability as well.

Lack of exogeneity. The theoretical dependent or explained variable (PE) is the population average of those with plaintiff's exogenous socioeconomic explanatory characteristics (gender, education, age, and post-injury condition or impairment) that are components of a vector X . The X vector must be exogenous for this relation to be estimated by any kind of regression technique, including probit and logit, of which the simple averaging used by VEI is a special case. Exogeneity means that there exists a structural economic equation, $y = f(X,\beta) + u$ or $y = g(X,\beta,u)$, with β a vector of parameters to be estimated, connecting PE with X such that $E(u|X) = 0$. To validly estimate and report a worklife table requires that the X be exogenous. If there is any nonzero correlation between u and any component of X, exogeneity fails, the estimated worklife table cannot be estimated by a regression technique like averaging, and the reported tables cannot be given a structural or causal interpretation.

Let us understand why exogeneity fails. If impairment in the equation were medically determined or clinically determined by an outside investigator, we might expect there to be no correlation between u and this component of X, since such correlation is in practice likely caused by feedback relation - another structural equation in which PE is the independent variable and impairment is the dependant variable. This is the old Cowles Commission simultaneous

equations structure versus reduced form distinction (Koopmans, 1950; Hood and Koopmans, 1953) that has been part of generally accepted econometrics for over 50 years.[4] That other (feedback) equation would arise if a person decides to declare himself disabled or "limited" in his response to CPS variable DIS-HP (criterion 1, "prevents or limits") or CPS variable DIS-CS (criterion 2, "left a job for health reasons") as a result of his decision to take himself out of the labor market (choosing his PE value to be 0) in order to collect disability or workmen's' compensation. The economic incentives to declare disability are a function of the relative rewards of work and leisure, notably the opportunity cost of leisure or the reservation wage. There is ample evidence to suggest randomness in winning the social security disability lottery - over 50% of such disability claims are originally denied. The applicant then hires a lawyer who negotiates the system and appears before an Administrative Law Judge if necessary. There are also incentives to declare oneself as disabled so as to rationalize the decision to drop out of the labor market for whatever reason. Economic theory and common sense imply that impairment would raise the cost of working (it becomes harder, more difficult, more unpleasant to work in this state) and simultaneously lower productivity and with it wages and favorable job offers. Despite the ADA, workplace accommodation has its costs, many employers are small enough not to be subject to it, and the incidence-of-taxation literature suggests that its (implicit) taxation costs will be spread between employer and employee rather than borne entirely by either demanders or suppliers. Thus, endogeneity is to be expected on many theoretical grounds; and the burden of proof is on those who assume the contrary.[5]

Figure 1 is a Venn diagram that provides a visual representation of the flaws in the VEI estimator of PE. The entire US population is the universal set S. I denotes the set of impaired but not severely impaired people, and NSD is the set of individuals classified as not severely disabled with the VEI definition of Section II. The average PE from the set I is the proper

measure of the employment probability for those with non-severe impairments. However, VEI does not have any people in the horizontally shaded region ($I \cap NSD'$ where the prime notation indicates complementation) in its sample; this is the sample selection problem. These excluded individuals are those that are impaired but do not meet VEI's definition of not severely disabled because they do not report work-related disability problems. Inclusion of such individuals would increase PE. The vertically shaded region ($NSD \cap I'$) represents those who are not impaired but erroneously are part of the NSD group. This is the lack of exogeneity problem. The people in this group have very low PE, and excluding them would raise the PE calculated by VEI. The elements that I and NSD have in common (*i.e.*, $I \cap NSD$) are part of the set that VEI would correctly want to sample, but the circularity of the VEI disability definition implies that people in this set have low employment, thereby driving down VEI's estimate of PE.

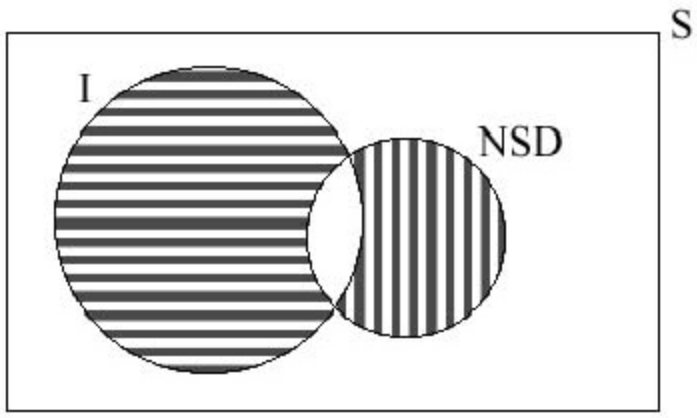

Figure 1

The never-improving not severely disabled and the forever non-disabled. The Gamboa tables assume the same health state will be maintained until death -- once healthy, always

healthy, and once non-severely disabled, always non-severely disabled,. Frank Corcione (1995) has previously pointed out this static assumption for the tables showing the worklife expectancy for the non-disabled. Use of the tables implies the plaintiff will have a disability-free future (had a tort not occurred), whereas the legal obligation is to put the plaintiff back in the position enjoyed just prior to the accident or incident causing a disability. The plaintiff could have become disabled tomorrow from other reasons; and, to the extent some or most of these reasons would not have been compensable, these possibilities of disability must be allowed for and not ignored.[6] Indeed, avoiding the fixing of health states is a strong reason for using worklife tables based on the increment-decrement methodology, which allows as a matter of logic for peoples' participation (and implicitly, also disability) states to change.

In regard to the non-severely disabled, when Gibson (2001) analyzes status transitions in his Table 7, he finds that people do in fact get better on occasion. Transitions to better health states creates a problem for the Tables because such improvements are inconsistent with its model. In contrast, the Markov model methodology used in producing worklife tables for the last 20 years would need only an expansion of its definition of "state" to accommodate disability analysis. Transition into and out of joint active/inactive and severely disabled/non-severely disabled/not disabled states needs to be investigated.. This would of course allow the valuable initial status information of active/inactive mentioned in Skoog and Toppino (1999) to be incorporated. Owing to sample size considerations, and the fact that not all of the theoretical formulae have been published, these extensions are non-trivial, but have been taken up elsewhere (Skoog, 2002).

IV. Specification Error Analysis of Bias

Applied work in economics uses a technique termed specification error analysis to

perform thought experiments to assess empirical work. Originally developed by Henri Theil (1957) to apply to left out or missing variables in regression analysis, the method has been extended to other settings, including into asymptotic distribution theory (Kiefer and Skoog, 1984). It is a mode of analysis that may be characterized as follows: the true or correct model is specified, the model as estimated (for whatever reasons, incorporating data limitations, oversight of explanatory variables, etc.) is written down, and the theoretical relationship between the two, including often unobservable statistical parameters, is derived. Then bias is assessed from this latter equation, including beliefs, often based on economic theory, about the unobservable relations -- termed "auxiliary regressions"

Here are elements of such a specification error analysis applied to the Gamboa tables. Define the following terms:

I = those individuals with "true" non-severe impairments, caused by torts, reflecting appropriate vocational/economic considerations, as defined in Section III.[7] One would estimate the employment probability in this class if we could, but we lack the data.

E = those individuals in the "employed" state.

U = those individuals in the "unemployed" state.

NSD = those individuals classified as non-severely disabled (as defined in Section III) per the VEI/Census seven-question definition of Section II - responding "yes" to at least one of the questions 1, 2, or 7, and "no" to all of questions 3, 4, 5, and 6.

SD = those individuals classified as severely disabled per the VEI/Census seven-question set, answering “yes” to one or more of the questions 3, 4, 5 or 6.

ND = those individuals classified as not disabled per the VEI/Census 7 question set, answering "no" to all of the questions 1, 2, 3, 4, 5 ,6 and 7.

P(E|I) = the theoretical or population mean (or average) of interest to VEI, and, arguendo, here: the probability that one in the impairment class under study is employed.

P(E|NSD) = the theoretical or population mean or average of the VEI estimator.

Let N(X) denote the count of objects in a set X. Then the best estimator, given that CPS respondents could be correctly classified into I or its complement, would be $N(E \cap I)/N(I)$, the ratio of the count of those impaired (in I) who are employed to the total number of impaired. The VEI estimator is $N(E \cap NSD)/N(NSD)$, the ratio of those in the NSD classification who are employed to the total NSD. If P(E|I) = P(E|NSD), the VEI estimator whose mean is approximately the right hand side, will equal on average the correct population parameter. This treats the CPS as a random sample; it is in reality a stratified sample, since each person in the U.S. does not have an equal probability of inclusion. Nevertheless, the approximation is good enough for present purposes, and the points made here do not depend on whether "weights" are used. Auxiliary parameters of interest are:

P(NSD|I) = the probability that one in the (non-severely) impaired class is correctly classified by the VEI/Census definitional scheme as NSD; we call this a "coverage weight" below.

P(ND|I) = the probability that one in the non-severely impaired class is incorrectly classified by the VEI/Census definitional scheme as ND, not disabled

P(SD|I) = the probability that one in the non-severely impaired class, I, is incorrectly classified by the VEI/Census definitional scheme as SD, severely disabled

Evidently P(NSD|I) + P(ND|I) + P(SD|I) = 1, since everybody is classified into one of these three mutually exclusive groups, and P(I|I) = 1. By the laws of conditional probability, using the fact above that the three disability classifications form a disjoint union over the entire probability space S *i.e.*, (NSD $\cup$ SD $\cup$ ND) = S, the universal set, that (E$\cap$ S) = E, and that a probability is an additive measure over disjoint unions on the right hand side, we can write equation (1):

(1) $$P(E|I)=P[(E\cap NSD)|I]+P[(E\cap ND)|I]+P[(E\cap SD)|I]$$

We now make and analyze two assumptions: (A) P(SD|I) = 0; and (B) NSD$\subseteq$ I. (A) assumes that those classified by the VEI/Census definition as severely disabled are, in truth, not in the moderately impaired class of our injured worker in I. This is reasonable unless the moderately impaired worker is committing a fraud on Social Security or has been or will be out of work for a long time. (B) assumes that those workers who claim a work limitation or who have left a job for health reasons actually have an impairment so that they belong in I, although that impairment may not necessarily be the reason for their not participating in the labor force or for not having a job. In terms of Figure 1, the vertically striped area is assumed not to exist, which eliminates the exogeneity problem – a very favorable assumption for the Gamboa tables. Even with this assumption, there is bias as is shown below.

The first term on the right hand side of (1) is by definition $P(E\cap NSD\cap I)/P(I)$ which may be re-written $P(E\cap NSD)/P(NSD)$ times $P(NSD\cap I)/P(I)$ using the fact that NSD is contained in I to omit the I in the first term. Then by definition of conditional probability, this

product is P(E|NSD) times P(NSD|I). The first term is the population parameter that the VEI estimator is unbiasedly and consistently estimating while the second parameter is the coverage weight or probability that a truly impaired person in I is correctly classified as NSD.

The second term on the right hand side of (1) may similarly be rewritten as $P(E \cap ND \cap I)/P(ND \cap I)$ times $P(ND \cap I)/P(I)$, which we re-write $P[E|(ND \cap I)]$ times P(ND|I). Now the first term $P[E|(ND \cap I)]$ is the probability of employment of a truly moderately impaired (I) person who answered "no" to all of the questions 1, 2, or 7 (the order of [14], p. 9), and so is misclassified as ND. Here we need to closely examine these questions to determine the magnitude of this probability relative to $P[E|(NSD \cap I)]$. We know from Gibson (2001) that the not severely disabled Veterans are employed almost as much as the non-disabled, so, if the "no" came from only the Veterans category, the inequality (2) below, follows. It is more likely the "no" was caused by CPS variable DIS-HP (question 1 in Part II above), the health problem, or DIS-CS (question 2 of Part II above), left a job/retired. The facts that the questioning line includes the words "prevents from working" or "limits in work" and that these cues are denied suggests that the CPS respondent is working and does not see himself as disabled from working. Put differently, these people will be working with a very high probability - for, if they weren't working, since they are impaired, they would be surely be citing their disability. Thus we expect the inequality

(2) $P[E|(ND \cap I)] > P[E|(NSD \cap I)]$

to hold. This inequality determines, in part, the extent of the bias given in (6) below. In words, it captures the differential employment percentage, the extent to which the impaired who are missed by the VEI estimation will be employed over those who are not missed and thus sampled.

The third term on the right hand side of (1) may, as above,be rewritten as $P(E \cap SD \cap I)/P(SD \cap I)$ times $P(SD \cap I)/P(I)$ when $(SD \cap I)$ is nonempty; however under our assumption A), the latter set is empty, so that this probability is zero.

We elaborate on the reasons for our assumption A), which we interpret as the statement that few, or no one, with a non-severe impairment in I will be incorrectly classified as having a severe disability SD. Recall that one is deemed SD if one was unemployed currently and for an expected 6 months to come, or was on SSDI or SSI - in none of these cases, except for fraud, reporting error, or transitioning off Medicare, would one be employed. Only those unemployed for the entire last year due to disability or health problems could currently be employed. With the great overlap in these four categories reported in Gibson (2001) combined with the chart cited in Skoog and Toppino (1999) showing characteristics of the SSDI recipients - only 4.4% result from injuries, while 18.9% are from mental illness, 22.9% from musculo-skeletal system problems not the result of injury, 10.1% from neoplasms like cancer, 7.4% from nervous system disorders, we certainly expect few, or none, in our I class of moderate tort-related impairment to be misclassified here as SD. For these reasons we expect P(SD|I) = 0 or very close to it. These same reasons may well also suggest that P[E|(SD ∩ I)] is small even if the conditioning event is not empty, since those misclassified to SD have little chance to be found employed. We indicate this by a "small" in (3) below. In addition, by assumption (A) above, the set (SD ∩ I) is empty, so that from assumption A), the set (E ∩ SD ∩ I) is empty, and therefore P[(E ∩ SD)| I)] = 0, implying that the last term in (3) below is 0.

Collecting results so far, we have:

(3) $P(E|I)=P[E|(NSD \cap I)]P(NSD|I)+P[E|(ND \cap I)]P(ND|I)+P[E|(SD \cap I)]P(SD|I)$

correct parameter	VEI parameter	coverage weight	higher than VEI parameter	mis-coverage weight	small or 0	small or 0

Now using assumption (B) the miscoverage weight must equal 1 - P(NSD|I); call this 1-w, so that P(NSD|I) = w the probability of correct classification. Then equation (3) reads, in shorthand, and dropping the terms that are small or 0:

(4) Correct parameter = w (VEI parameter) + (1 – w) $P[E|(ND \cap I)]$.

Omitting "parameter" in "VEI parameter" for clarity, and adding and subtracting (1-w) times VEI (parameter) on the right-side of (4), we have

(5) Correct parameter = VEI + (1 – w)$\{ P[E|(ND \cap I)] - \text{VEI} \}$

or, grouping VEI and moving to the left hand side,

(6) Bias = Correct parameter – VEI = (1 – w)$\{ P[E|(ND \cap I)] - \text{VEI} \} > 0$,

establishing the theoretical size and sources of downward bias of the VEI estimator. The result, while stated in terms of the underlying populations, evidently holds in finite samples for the commonly used sampling theory estimators (maximum likelihood, Bernoulli, or method of moments, they are all equivalent in this situation). In plain English, the bias will be greater, the poorer the coverage probability and the greater the "differential employment probability" of those missed in the coverage.

There are three special cases where the VEI estimator correctly produces the sampling estimator, and the population analogues hold of course as well: (i) When w = P(NSD|I) = 1, there is no misclassification of I; (ii) $P[E|(ND \cap I)] = P[E|(NSD \cap I)]$ *i.e.*, what is stated as an

inequality in (2) is actually an equality; (iii) $P[E|(NSD \cap I)] = P[E|(ND \cap I)] = P[E|(SD \cap I)]$, requiring no SD assumption, *i.e*., the very unlikely situation in which the employment probability is invariant to whether an impaired person is correctly classified or incorrectly classified as not disabled or severely disabled. We expect none to be met in practice for the reasons indicated above. It is nevertheless useful to know the conditions under which the VEI estimator returns on average the correct population estimate, since in this case debate would then be over only heterogeneity and exogeneity.

V. Other Problems and Points

a. The "External Validation" of the Gamboa Tables

The creators of the Gamboa tables often argue that their tables must be reasonably accurate because their worklife tables for the non-disabled are similar to those in other tables. Since the Gamboa tables include unemployment in their definition, unlike the standard BLS tables, Ciecka, Donley, and Goldman (CDG), and others, its entries need to be adjusted upwards from the start. This widens the gap between the Gamboa tables for the non-disabled and those published for the population at large. Next, the VEI tables assume one will never move from the non-disabled pre-accident state in that table construction. Correction of this error would move the difference in the tables in the opposite direction. The Gamboa tables ignore crucial initial state information, so that the seldom used "all men" and "all women" columns of the CDG or BLS tables are needed for comparison. In light of all of these considerations what remains is an "apples and oranges comparison" constituting no real external validation.

b. The Small Difference Between the Overall Population and the NSD Population

Using SIPP data and definitions and adjusting to incorporate a legally relevant overall population instead of the never-to-be-disabled benchmark, non-severe disability would amount

to a lowering of worklife expectancy by less than 2.8% - not much effect. In the same vein, the gap between the Tables (for the NSD) and the CDG tables is closed considerably by adjusting for the different treatment of unemployment and different termination age. For example, suppose unemployment is removed from the VEI tables; and the CDG worklife expectancies are calculated under the assumption that labor force activity only occurs to age 74, as is the case with the VEI tables. Then, the resulting VEI not-severely-disabled worklife expectancy and CDG worklife expectancy for males age 25 would be approximately 31.4 years and 32.4 years, respectively. At age 50, the worklife expectancies would be 10.4 years and 11.0 years, respectively. In addition, we cite two key numbers from John McNeil (2000): (1) For both sexes combined, the employment rate for the non-disabled population was 84.4% (Table B5); and, (2) the employment rate for the non-severely disabled rate was 82.0% (Table B4); both numbers are for individuals 21 to 64 years old, in 1997 using the SIPP definitions and the SIPP sampling methodology. The latter proceeds from a more objective, more exogenous impairment definition and uses the entire sample rather than a self-selected subsample for inference. The SIPP definition is consistent with the Americans for Disabilities Act, and includes follow-up questions that the CPS definition lacks. For example, if a person has a SIPP work disability, a condition of a physical, mental or other health condition limiting the kind or amount of work, a follow-up question asks if the person was prevented from working at a job or business. If so, the person qualifies as severely disabled. In the CPS, "prevented" is mixed together with “limited,” rendering its interpretation practically meaningless. Thus an LPE based disability table would produce non-severely disabled work lives 97.2% of the never-to-be-disabled work lives.[8] Correcting the latter to reflect the lack of disability in only the initial condition would narrow the gap further, and there would not be much of a national debate over a mere 2%.

c. **Molding**

How does the expert "mold" (Gibson, p. 1, 21) the tables using professional judgment, in real world cases? How does he or she decide "this person is 50% of the distance between non-disabled and non-severely disabled" worklife expectancies if the pertinent characteristics of the latter populations are unknown? Gibson (2001) states (p. 2) "The precision of predictive statistics can only be gauged against the population from which they are drawn." Because that population is not known, the precision cannot be known. This is a poor state of affairs for the statistics, which under Daubert would benefit from "known error rates." Given the lack of any guidance about how to "mold," an alternative would be to pick the worklife expectancy that one desires and then solve for the "continuum percentage" between the desired tables. As long as negative weights are permitted, any belief is accommodated. We suspect that the reason this logically equivalent method is not preferred by the creators of the Tables is that use of such an equivalent method would expose a lack of need for the Tables. Because any answer can be obtained if the weights are arbitrary, choosing a "continuum weight" is the mathematical equivalent of choosing the worklife expectancy itself. The "continuum" is thus seen to be pure subterfuge. For a further and more detailed development of these issues, we refer the reader to Ciecka and Skoog (2001).

d. Drinking the Only Water Available, Even If It Is Salty

Gibson (2001) argues (p. 2) that since the only disabled tables are VEI's, they should be used. Indeed, he states that "Any attempt to define the worklife expectancy of a person with a permanent partial disability is flawed to the degree it fails to consider the underlying disability data presented and summarized in The Tables." The fallacy here is obvious. While Milton Friedman held that it takes a theory to beat a theory, we also know that having no empirical work is better than having bad empirical work. The point behind the Daubert mandated "gate keeping"

role for federal judges is that expert testimony needs to be based on good science. Rule 403 allows for the exclusion of evidence based on factors such as risk of unfair prejudice, confusion of issues, misleading the jury, or a waste of time. All are reasons to exclude the Tables. Years of worklife expectancy loss from horribly measured data that compute with bias a meaningless population average confuses issues, prejudices the jury, and is a waste of time. It is classic junk science as Peter Huber used the term. The recently amended Federal Rule of Evidence 702 requires that expert testimony be based on sufficient facts or data, the product of reliable principles and methods, and that the witness has applied the principles and methods reliably to the facts of the case. No one questions that the survey data of the CPS was reliably gathered and is representative of the U.S. economy. Caragonne (2001) has listed the many requirements that survey data must possess to be relied upon. Skoog and Toppino do not question the CPS as a valid survey, but it does not follow that those data can be given any interpretation whatsoever. Rule 702 puts its finger on the problem -- it is the application of reliable methods to the data that is at issue here.

The alternative to use of the Tables is really quite simple. If an injured plaintiff has impairments that will cause his or her worklife expectancy to be significantly diminished, then a vocational expert should be hired to explain those facts as they pertain to this particular plaintiff. If the worklife discrepancy becomes close to average with the selection of a post accident occupation, the alternative is to use the CDG worklife expectancy and refrain from claiming an unsubstantiated reduced worklife expectancy with irrelevant statistics.

VI. The Census Disability Tables and Other Uses of CPS Disability Data

The Census Bureau produces four sets of tables which produce cross-tabulations of those with a work disability, with a severe work disability, and in Table 1 only, with a non-severe

work disability at http://www.census.gov/hhes/www/disable/disabcps.html. Only persons with a work disability are considered in Table 1, where those with severe, not severe, and any disability are tabulated by education level. Table 2 calculates those employed, unemployed and not in the labor force, by education level, for those with any disability and with a severe disability. This table provides the raw probability of employment (PE) ratios used in the VEI tables, although additional calculations would be needed to determine the PE ratios for those with a not severe disability. Table 3 performs cross tabulations on mean income against education level and disability; again there is no separate breakout for non severe disability. All workers and those working full time are calculated separately; unlike previous tables, standard errors are reported. Table 4 offers calculations for those in the 65 to 74 age group only and provides finer educational details than in Tables 1 and 2.

Recently the Census Bureau, at
http://www.census.gov/hhes/www/disable/cps/cpstableexplanation.pdf,
posted a six page document which reflects many of the points made in this paper, the earlier Skoog-Toppino papers and the Hale paper. According to the Census Bureau, the questions underlying the CPS "were not designed or tested with the intent of measuring disability, and thus the reliability and validity of the estimates generated from these quantities is unknown." A footnote placed at the end of this sentence elaborates as follows: "Researchers who design survey questions like to know the reliability and validity properties of their questions. There are several kinds of reliability and validity. In general terms, reliability means a survey question elicits the same response regardless of who is asking the question or if the question is asked in different time periods. Validity means that individuals who respond to the question fit the definition of the population they seek to measure. Specific tests of these properties have not been conducted on the CPS work disability questions. The problems highlighted in this paper suggest that the questions might fall short of having the desirable reliability and validity properties."

(ibid, page 1) Later, at page 3, the Bureau writes "it is important to note that these questions were not designed with a specific concept of disability in mind. The concepts measured by the questions are embodied in the questions themselves and may or may not be useful for any other specific purpose." (*ibid*, page 3) The concluding sentence is "The user should assess the appropriateness of the 7-question aggregate measure published by the Census Bureau (or derived from any subset of those questions) for their particular use and understand the limitations of these questions as measures of disability status overall, or of work disability in particular." (*ibid*, pages 5,6) Since the user is cautioned against using these tables for work disability, which they implicitly define, it is hard to see *any* use for these tables, or any tables or study which rely on them.

Some additional history of these Census Tables is useful. The Census documents P-23 No. 127 and 160 published similar cross tabulations for the years 1981-1988, where work disability was defined. The Census Bureau stopped performing these calculations from 1989 until 1994 when VEI paid the Bureau to perform a special tabulation, pursuant to contract 33-94-30. In 1994 some questions in the CPS changed. VEI uses these data for 1992-2001, combining privately tabulated data and publicly provided data, and mixing pre-1994 and post-1994 data.

Some users, hearing that there are severe problems with the VEI worklife tables, may employ the Census data directly, either employing the PE ratio from Table 2 or quoting an income comparison between the non-disabled and disabled or severely disabled populations from Table 3. Other users have employed the answer to one or two questions only to construct a control variable for or definition of work disability. It is evident that the problems discussed in detail in this paper apply with equal force to the Census Tables themselves and to any other definition constructed from the CPS. Any use, litigation or otherwise, must proceed from a disability construct. The litigation construct is individuals having the same injuries or impairments, age and educational status as the plaintiff, before and after an injury. Since the CPS

and all such tables constructed therefrom employ *no* concept of disability, they cannot hope to validly and reliably measure anything of interest in a lawsuit, or anywhere else except perhaps in rough measures of trends. By the Bureau's own statement referenced above, its disability data are subject to sample selection problems, they lack exogeneity, and they capture heterogeneous impairments -- the same fundamental issues raised in this paper.

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Endnotes

[1]Criteria 1-6 are taken from U.S. Bureau of the Census (1989). Criterion 7 is described in Skoog and Toppino (1999 and 2002) and Gamboa (1998). These conditions, described as 'methodology for identifying persons with a work disability in the current population survey,' are presented at the Census Bureau web site at: http://www.census.gov/hhes/www/disable/cps/cpsworkd.html.

[2]Sample selection is not merely an academic footnote – it is central and important in mainstream economics. James Heckman won the Nobel prize in economics in the year 2000 in part for his contribution of an econometric estimator which corrects for this problem. A classic and famous real world example illustrating the problems that may result from ignoring sample selection occurred in the 1936 Literary Digest poll, which failed to predict the greatest landslide in American presidential politics. While based on a very large sample of 2,376,523 questionnaires by mail, this magazine poll contradicted the more scientifically constructed Gallup and Roper poles. Unfortunately the Literary Digest poll used automobile and telephone owners, over-sampling those with higher incomes who were more likely to vote Republican.

3.A formal theoretical analysis of the heterogeneity problem and aggregation issues is provided in Skoog (2002).

4.See especially Chapter 9 in Hood and Koopmans (1953) for a discussion of bias and inconsistency due to lack of regressors being pre-determined or exogenous.

[5]There is a reasonable econometric literature (John Bound), which finds just this feedback, consistent with the economic and econometric theory: "When self-reported measures are used, health seems to play a larger role and economic factors a smaller one than when more objective measures are used." (p. 106) One need not take the extreme position of former Chief Actuary of Social Security Robert J. Myers (1982), who argued that there was no useful information in self-reported health, to appreciate the suspicions surrounding respondents' non-expert personal judgments in response to CPS field workers. While there is some evidence in a paper by Benitez-Silva, Buchinshy, Chan, Cheidvasser and Rust (2000) that self-reported health and disability measures are not biased and endogenous, papers by Kreider (1999) and Autor and Duggan (forthcoming 2003) provide additional evidence that disability is endogenously related to economic incentives.

6.The unique situation for railroad workers is described in Skoog and Ciecka (1998).

7.It may be that this class includes "too many" impairments that are dissimilar to the plaintiff's specific injury, per the point above, so that this is a heterogeneous class, but we ignore that distinction for now.

8.We do not want to generally endorse LPE methodology, which suffers from its own shortcomings quite aside any disability issues.