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**Is there Agreement between State Unemployment
Insurance Division Data and Self-Reported Wages in
Disabled Persons?**

By

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Masters Thesis

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Abstract

Context: If strength of agreement and predictors of agreement were known for two commonly used income reporting sources, one might infer one of these values from the other to decrease expense and complexity in data gathering. This would streamline data acquisition for public policy investigations, such as those for disabled persons. Commonly used sources of income data used in policy studies include self-report and unemployment insurance (UI) system data. It is unknown which, if either, of these sources should be designated as a reference standard. Rather, each has strengths and weaknesses.

Objective: To explore agreement over time and predictors of agreement between survey data and state unemployment insurance (UI) system data, related to quarterly income and hours worked.

Data Sources: Self-reported survey information provided by disabled individuals on enrollment into a work-incentive demonstration project, and on an annual basis for two subsequent years. State UI System data was obtained quarterly for the one year prior to enrollment, and 2 years post-enrollment (12 quarters total).

Study Selection and Subjects: Over eleven hundred (n = 1107) subjects were enrolled in both intensive and non-intensive employment coaching cohorts in the “Wisconsin Pathways to Independence” program. They were aged 17 to 64, and involved with the Vocational Rehabilitation system in the state of Wisconsin. They were classified into 4 primary disability categories of physical, mental health, developmental and HIV/AIDS.

Data Analysis: Descriptive statistics including means, medians and quartiles were used to describe the characteristics of this population. Differences between those with complete (12 quarters) of income data versus those with less were assessed via Pearson’s chi-square tests. Cochran-Armitage test of trend was used to evaluate the “closeness”

of self-reported and UI-reported income over each year. The kappa statistic was used to evaluate agreement between the two sources. Binary logistic regression was used to evaluate possible predictors of agreement at time of enrollment (quarter 0).

Results: Of the initial 1107 subjects, 47% had complete data, which included 12 quarters of UI income information, plus 3 surveys with self-reported income (baseline, 1 year, 2 year follow-up). For all subjects, 52% were male and 48% female. The majority of subjects had a physical primary disability (46%), had completed post high school education (46%), and were white (90%). Those with complete data did not differ from those with incomplete data on these characteristics.

For employment status (employed during a particular quarter versus not), the difference between reporting sources over 12 quarters was 6%, with more self-report of employed status (45% employed via self-report versus 39% via UI-report). For quarterly income, UI data revealed 61% of subjects had no income (\$0 per quarter); and by self-report, 61% earned \$270.00 or less.

Agreement was typically best for the quarter that included the self-report. This was true using two of definitions of agreement.

Agreement was also maximized at time of enrollment (quarter 0), except when “above/below SGA” definition of agreement was considered. The tests of linear trend over 4-quarter periods, for each of three years of study, revealed that proportion of subjects for whom the sources of income agreed, showed an increasing trend the closer a quarter was to a survey data collection point. Similar tests of trend for number of hours worked, revealed this same relationship.

Kappa statistic for two definitions of agreement, exact dollar amount and above and below SGA revealed that UI and survey income data had *good* (.45-.69), but not *excellent* (.75 and above) agreement. The

single value above .70 occurred when the definition of agreement used was \$700.00 of income a month i.e. the Substantial Gainful Activity (SGA) level. At quarter 8, with this definition, the kappa value was .72, and better than time of enrollment (quarter 0).

Logistic regression was utilized to evaluate agreement at time 0, the quarter of best agreement. Predictors of agreement between survey and UI-reported income included: Physical disability (odds ratio: 1.9 [95% confidence interval (CI): 1.3-2.7]), greater than high school education, and those who had never married or had a partner (odds ratio: 1.5 [95% CI: 1.1-2.2]). Those who had HS or less education and were never married/had partner were 56% (odds ratio .44 [95% CI: 0.26-0.73]) less likely to report wage that did not agree with UI data. The final model did not include an interaction term, due to lack of statistical significance, but interaction terms and their effect were explored and added to knowledge of the effect of marital status on education as an effect modifier.

Pearson's chi-square tests comparing the 47% of subjects lost to follow-up (less than 12 quarters worth of income data) versus the 53% with complete income data revealed that none of the predictors of agreement or outcome variable were associated with whether subject stayed in study.

Conclusions: For this population of disabled persons with 3 years of annual report of income and wage, agreement was better for the quarter that included self-report. Over this same timeframe agreement was best if SGA threshold was considered. By kappa analysis agreement fell in the *good* category (.40-.75). At the time of best agreement (quarter 0) physical disability, having a partner or spouse and education greater than High School, were all predictors of increased agreement.

Background and Significance:

Employment is a valued achievement for all, including persons with disabilities, and, assisting disabled persons to obtain and sustain employments is a significant health policy issue.(1) In the United States in 2000, 19.6% of males and 17.6% of females, age 16 to 64 had a limiting disability. (2) The percent of the population with a disability increases as age increases. The US population is aging, such that those 65 years and older will comprise an estimated 20% of the population by 2030. In 1995, this same group comprised 12% of the total. For ages 65 and older, the prevalence of disability increases, such that 40-43% has a significant disability. (3) Disability is associated with a lack of earned income. The US Census Bureau in its 2000, Survey of Income and Program Participation (SIPP), revealed that among those age 21 to 64, 82% of those without a disability, but only 26% of those with a severe disability, had income levels equal to or above the federal poverty level(4).

Medicare and Medicaid were enacted in 1965 to provide a safety net for vulnerable citizens, the aged, dependents, and persons with disabilities. Medicaid beneficiaries with disabilities are a high priority for health policy, and utilize these services extensively (5). In 1997, the cost to society was approximately 60 billion dollars to provide care and assistance for persons with disabilities. Typically, Medicaid invests 8 times more per individual, for a disabled beneficiary than for an individual under the age of 18, who qualifies due to low income (6).

Social Security Disability Insurance (SSDI) and Supplemental Security Income (SSI) are distinct, but complementary, programs that form a backbone of social support for persons with severe disabilities. To be eligible for disability benefits, a person must be unable to engage in substantial gainful activity (SGA) for a period of one year, or have a condition that is likely to result in death. (7) The lower limit of earned

income deemed as SGA is set by a complex equation from the Social Security Administration, and is tied to the increase in the national average wage index. For the year 2000, the approximate midpoint of data acquisition for the current investigation, the SGA value was \$700.00 per month. (8)

Insurance, income and vocational programs exist to encourage employment for those on SSI and SSDI programs. The current support system has been noted by Hanes et al. as undermining the early steps to independence by removing the safety net of services when the SGA level of earning is attained, thereby encouraging dependence to avoid loss of insurance and benefits that might be difficult to reinstate (9). It is known that persons with chronic physical or mental disabilities will enter and leave the work force due to their disease or condition. They rely on a foundation of stable health care insurance and income when pursuing a significant life change, such as employment. (10).

Vocational assistance, counseling, focused health and income support, along with identifying and addressing administrative and legal barriers, are some of the system improvements that have been identified by ongoing evaluation of past employment and income intervention programs (11, 12). The focus on employment of disabled persons was further sharpened in October of 1999, by then President Clinton's backing of a signed partnership between the Social Security Administration and the Small Business Administration, to encourage those with disabilities "to find gainful employment or become entrepreneurs". (7)

The Federal Social Security Administration "Ticket to Work and Work Incentives Improvement Act of 1999" (Public Law 106-170) is the most recent comprehensive effort to support those on assistance to transition

back into the work place in the US. It provides enhanced employment system supports at no cost, to assist those with disabilities to reenter the work place and to maintain employment. (13)

The State Partnership Initiative (SPI) was one of the first efforts by the Social Security Administration to focus on providing innovative employment services, and boost employment and earnings, among persons with disabilities. (14) To evaluate the impact of these programs, one must ascertain the outcome of employment effort in a variety of occupational situations, such as the “entrepreneurial” one noted above. This has been accomplished by utilizing self-report surveys, as well as administrative data, such as annual social security earnings and quarterly wage records reported to employers to state UI agencies.

One recent assessment of survey and UI sources revealed that self-reports often give significantly higher estimates of the impact of employment support, such as in the 2003 evaluation by Mathematica Policy Research of the Job Corps. (15) This study by Mathematica explored the impact of the Job Corps intervention. They investigated the estimates of earnings and work hours from social security, unemployment insurance agencies as compared to self-reported data from surveys. Findings for this young, disadvantaged population revealed that self-report consistently provided higher estimates of earnings and hours. The self-reported earnings were 40% higher than the UI data, though job number reported were the same, in addition, employment levels were reported higher between these two sources with 13% more employment reported by survey than UI data.

Key insights provided by this detailed investigation were that the reporting differences in this population were attributable to errors in social security numbers, non-reported jobs (such as self or federally

employed, small business enterprise, or those self employed or in agriculture), and under-reporting by employers. Job misclassification also contributed to lack of agreement in data. The impact of the UI non-reported occupational categories was found to be smaller than expected. Over-estimating the number of hours worked was thought to be key in the overestimates. For wage data, there was better agreement when the time at the job was longer, such as several months to years rather than short-term employment.

The authors further concluded that there were “substantial unobserved factors” that contributed to employment rate differences by source. The multivariate regression models, with many characteristics considered revealed that being female, self employment, or having a benefits package, were the characteristics predictive of agreement in job status reporting for both groups.

Neither self-reported nor UI data have been shown to be superior, but rather have different weaknesses and limitations, as outlined in the Mathematica investigation, which was done in a younger (age 16-24) non-disabled population. Self-report may well overestimate hours and wages; despite concerns regarding confidentiality issues or concern over loss of income or benefits. This outcome would then overestimate the impact of policy changes and program implementation. State UI databases may well provide a low estimate of hours worked and wages earned, therefore potentially underestimating impact of implemented programs.

If there was a measurable and consistent relationship between UI and self-reported income data, and the details well understood, then this relationship could potentially be exploited to predict one value from the other for different populations. This might allow one to choose one of

these sources from which to obtain data, as a cost and efficiency strategy, rather than requiring both. It might also allow one to impute one source, when only one was known. This study focuses on investigating income and wages in a population of disabled persons, to compare trends and agreement, as well as predictors of agreement. The ultimate goal of this work is to help inform future efforts regarding this relationship for predictive purposes with a focus on best estimation of the impact of public policy change.

Aims:

This investigation explored agreement, over a three-year time frame, between self-reported survey data and state unemployment insurance data in a population of disabled persons in the state of Wisconsin.

Hypotheses: There are differences in report of earned income and work effort between survey and state unemployment insurance division data in a population of disabled persons who are enrolled in a work incentive program. As compared with time of enrollment, these differences will increase over 12 quarters.

To test these hypotheses, we met the following four specific aims:

1. Identify a sample of persons with disabilities who have provided self-report of wages and work effort over time. Obtain income and employment status information from a state administrative database.
2. Describe this population and differences in the reporting of these wages and employment status between these two sources of data.
3. Evaluate agreement over time and patterns of divergence between these two sources.
4. Investigate predictors of agreement at one point in time.

Preliminary Studies:

In December of 1998, the Robert Wood Johnson Foundation (RWJF) awarded a grant to the Oregon Health Policy Institute at Oregon Health and Science University to conduct an independent evaluation of a three state project for disabled persons. This project was the “3-State Work Incentives Initiative: Oregon, Vermont and Wisconsin,” and was funded by RWJF and the Social Security Administration in 1998 for the states of Vermont and Wisconsin, and the Rehabilitation Services Administration for the state of Oregon (9,12). The global theory tested was that a more secure health insurance and income safety net would support individuals with serious and persistent disabilities, in pursuing employment and optimizing overall health and well being. Individuals were recruited over a several year time frame and followed over time, for multiple outcomes.

The three state study target population was adult disabled persons ages 18 to 64. Disability categories were physical, mental illness, developmental, and cognitive disability. There may have been more than one disability present. The primary disability, as determined by state and federal criteria, determined the category for each person. Most were enrolled concurrently in Social Security Disability Insurance (SSDI) and Supplemental Security Income (SSI), as well as accepted into the Health and Employment Counseling Program. They furthermore, must have had taken steps to re-enter the labor market or increase their earnings, have an income of less than or equal to \$8,980 per year, and have total assets worth less than \$15,000. The income level that determined Substantial Gainful Activity (SGA) used for qualifying for disabled benefits were relaxed by some of these state programs to allow for a deeper safety net of support for participants and non participants.

Both qualitative and quantitative data were collected. Data collection for

participants included baseline enrollment information on a monthly, quarterly as well as annual basis by written questionnaire. They included:

- 1 Entry enrollment questionnaire
- 2 Quarterly update form
- 3 Annual follow-up survey

These included information in 8 domains:

1. Work readiness and motivation
2. Knowledge of existing SSA work incentives
3. Employment before Social Security (SS) disability benefits began
4. Employment after SS disability benefits began
5. Psychological, social and physical barriers to employment (Mastery Subscale, Pearlin and Schooler, 1978; Motivation to Work Scale, Blankertz 1998)
6. Self esteem (Self-esteem Scale, Rosenberg, 1965)
7. Health Status (SF-12, Medical Outcomes Trust 1992)
8. Life satisfaction (Quality of Life Scale, RCIAPRS, 1995)

From each of the three state administrative databases, information on unemployment insurance benefits and wages was obtained. Not all employers were required to report into this system, which then uses this information to calculate taxes for unemployment benefits. The self employed, out-of-state work, nonprofit religious, charitable organizations and some elected officials are exempt from these reporting requirements. These requirements vary between states, for details of reporting requirements.

Wisconsin Independence (PTI) Pathways to Independence

The Wisconsin portion of the 3-State Work Incentives Initiative project was designed to be a comprehensive intervention to address key barriers

to employment. These were health and long-term care, fragmentation/inadequate supports, employer readiness to accommodate employees with disabilities, job availability, plus the disabled person's personal skills and job readiness. The Wisconsin Pathways to Independence project included 20 sites by county, located primarily in the southwestern parts of the state. Those enrolled into this intensive employment coaching intervention were not selected at random, but rather referred from service agencies. The vocational rehabilitation counselors were the primary referral source for those enrolled. However, not all individuals with disabilities who met the criteria for enrollment in PTI were actually enrolled, but they still had contact with the Vocational Rehabilitation Services in Wisconsin (non-intensive coaching cohort). Those in the intensive coaching cohort were slightly younger than those in the non-intensive cohort at 38 vs.40 years, more likely to have had more than a high school education and be single, and 57% vs.40% had a physical disability. Thirty five percent of those in the intensive group were employed at baseline as compared to 46% of those in the non-intensive group. Both groups had nearly equal proportions of primary disabling conditions, though those with a total of 3 disabling conditions numbered 58% for non-intensive vs. intensive cohort at 42%.

Research Design and Methods:

Secondary data was utilized for analysis of intensive and non-intensive employment coaching cohorts, for earned wages and hours worked-from two different sources. This was done for a 3-year window of time. The first source is a self-report survey of earned income/work hours and the second was state report from the UI division, on earned income/work hours, reported by employers in the same state.

Subjects-Inclusion Criteria

Subjects were 1107 disabled persons ages 18 to 64, who were residents of the state of Wisconsin from January 1, 1999 thru November 30, 2003. They were participants in an intensive and non-intensive employment intervention, "Pathways to Independence" (PTI). This intervention provided vocational rehabilitation efforts and employment support to disabled persons who desired employment and earnings to a gainful level. This intervention was offered in 20 pre-existing community based comprehensive vocational support centers for persons with disabilities. Employment status or participation in PTI was not a criterion for inclusion in this study cohort.

Subjects in this population were classified as permanently disabled by federal standards (17). There were four categories:

1. Physical disability
2. Serious and persistent mental illness
3. Developmental or cognitive disability
4. HIV disease or AIDS.

There may have been more than one disability present, however primary disability determined categorical classification. Primary disability category was determined either by Vocational Rehabilitation (VR) disability codes "RSA 911 codes" (18) by the state VR Agency counselor, or the federal standards listed above. The primary disability was attributed to the condition that caused the "substantial impediment to employment" as noted in the Federal RSA 911 codes, or was the accepted first disability by the State of Wisconsin Disability Determination Bureau (DDB), by criteria in the SSA "bluebook" noted above.

All subjects were candidates to receive Social Security Disability Insurance (SSDI) and Supplemental Security Income (SSI), along with state sponsored programs, such as the state of Wisconsin sponsored

Medicaid buy in program-“Medical Assistance Purchase Plan”. (9)

Exclusion Criteria

Exclusion criteria used in this investigation were the same as the primary study. Subjects were excluded for violent or unreasonable behavior directed towards staff in the community benefits center, or lack of communication with VR center staff for 3 months or more.

Methods and Measurement:

Information was ascertained by self-report questionnaire from the disabled individual and from employers within the State of Wisconsin Unemployment Insurance Division mandatory reporting system.

Collection of Self-Reported Data

Each subject was mailed the questionnaire at yearly intervals. The questions included queries of employment status and earned wages. For the subset of participants in the WPTI intervention, a counselor, who was trained to ask the questions verbatim, may have assisted the subject in completion of the questionnaire.

Information was requested by questionnaire mailed to the subject regarding the year prior:

1. For the baseline and annual follow-up: “During the last 12 months, what was your average monthly wage (before taxes are taken out)?”
2. For the baseline and annual follow-up: “During the last 12 months, how many hours a week, on average, do you or did you work at this job?”
 - Less than 20 hours a week (part-time)
 - 20-29 hours a week (half-time or more)
 - 30 or more hours a week (full time)

Collection of State Reported Data

Wage information was obtained from the State of Wisconsin Unemployment Insurance (UI) Division. Employers subject to State unemployment insurance laws and Federal Employees programs within Wisconsin, submit quarterly tax reports on wages. Both public and private sector employers are required to report wages paid. The reports are available on an individual basis by quarter. Data available included:

1. Employment during a calendar quarter (yes/no)
2. Quarterly gross earnings

The UI division requires mandatory reporting by many, but not all employers. (19) Exceptions to mandatory reporting of wages within the State of Wisconsin Unemployment Insurance system are listed below in Table 1.

Table 1
Exceptions to Mandatory Reporting for Unemployment Division
State of Wisconsin

Self/parent/partnership employment	Railroad system employee
Sheltered workshop	Commission or per-diem income
Co. w/ tax exempt 501 status	Military officer
Religious business employment	Maritime worker
Age 18 or under	Taxicab Driver
Federal work/study program	Penal institution employment
Patient also employed by Hosp.	Elected official
Seasonal agricultural work	National Guard

Domestic Service work	Emergency system worker
News Carrier	Home office located out of state

Data Acquisition and Quality Control:

Data sharing agreements were detailed and complete for primary data collection between Wisconsin and Oregon where master database was housed in Microsoft Access format. The state and master database managers, who reviewed a random 1% of records, monitored primary collection for errors or inconsistencies.

Oregon Health and Science University Institutional Review Board (IRB) approved the study protocol for this secondary investigation of previously collected data. After IRB approval was granted, subjects were assigned an uninformative unique identifier number in both the survey (self-report) and state databases. The uninformative unique identifiers were used to correctly merge the two data sets. Analysis was performed with SAS v.9.1 and SPSS Version 11.5. Ping Chen M.S. provided data management and SAS expertise, crucial to this investigation.

Survey data, which included both the intensive and non-intensive cohorts in Wisconsin, were evaluated. The database received included self-reported data from

- Enrollment survey done at time 0
- Annual survey completed and years 1 and 2
- Monthly update, available only for intensive coaching cohort

The monthly update information was available only for those who participated in the “PTI pathway” (more intensive employment coaching), therefore the monthly update information could not be utilized for this

study.

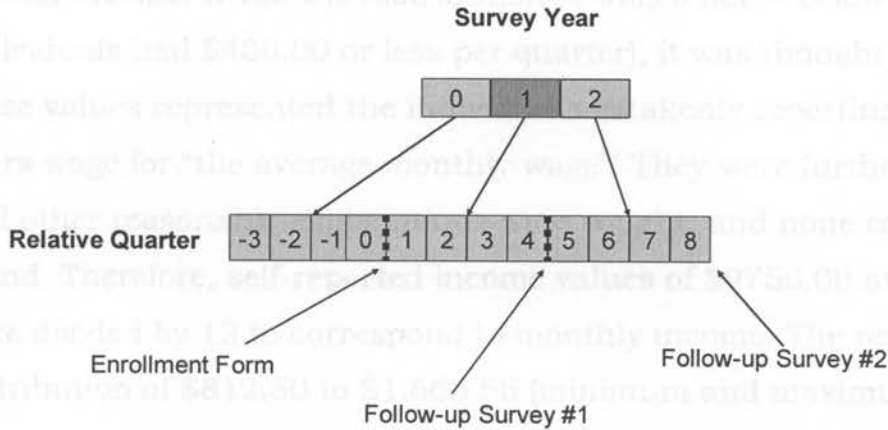
Data was available from the enrollment, year 1, and year 2 surveys for both the self-report and state sources. The enrollment questionnaire provided the self-reported data for quarters -3 thru 0. The subsequent annual questionnaires provided self-reported data for over the following 2 years.

There were 112 of the total 1223 individual records, available in the state and individual data sets (9%) that did not have one of the two sources of data available, despite detailed investigation. Therefore, these 112 could not be included in this analysis. . During exploration, duplicate copies of questionnaires were sought, and none were found.

The UI data was investigated and found to be complete over this same time frame. It contained records for each calendar quarter over the time period of interest. These two sources were merged after evaluating that the relative quarter after enrollment for each individual corresponded to the correct calendar year time frame, for reported data from the state. To compare sources, they were correctly aligned chronologically. This is illustrated in Figure 1.

Figure 1

Algorithm Used to Merge Self Report and State Administrative Data for Subjects



The same merging process was carried out for the self-reported categorical information on work hours: 0-19, 20-29 or 30-40 hours a week. These categories were ones dictated by information available on surveys; the state UI data contained exact number of work hours, which were recoded into these categories so they could be directly compared to the survey data.

Since individuals were enrolled into the Wisconsin PTI evaluation over time, both the primary study, and this secondary investigation, coded time using “relative quarter” (quarter relative to persons’ enrollment) rather than actual calendar time (e.g. Jan – March 2000). The relative quarter variable was matched using date details of the enrollment and annual survey questionnaires to appropriately chronologically align the two sources of income and work status data.

Self-reported income data in 728 (7.3%) person-quarters were distinctly different in value from other records (i.e. outliers), and likely represented misunderstanding the question asked. These were values of \$9750.00 to \$20,000 reported as a monthly income, but probably represented an annual income. Given the distribution of wages noted below (75% of individuals had \$400.00 or less per quarter), it was thought likely that these values represented the individual mistakenly reporting the past years wage for “the average monthly wage”. They were further explored, and other reasonable explanations were sought, and none could be found. Therefore, self-reported income values of \$9750.00 and above were divided by 12 to correspond to monthly income. The resulting distribution of \$812.50 to \$1,666.66 (minimum and maximum values) per month was consistent with the rest of the data, though in the upper 9% of reported income.

The time frame included in this investigation was defined. Person-quarters -3 thru 8 incorporate the year before and 2 years after enrollment. There were 582 subjects available at the end of year 2 after enrollment. There were 18 records available in year 3 after enrollment. These were likely the year 2 questionnaires, returned more than a year late. Therefore, analysis was performed with data from 3 years of questionnaires.

Statistical Analysis:

Descriptive statistics including means, medians, standard deviation, and quartiles where appropriate were used to describe the characteristics of this population. The Cochran-Armitage test of trend was chosen to best evaluate concurrence (“closeness”) between survey and state data on employment status and earned wages for each year.

To assess trends, “close” and “not close” were defined as a \$50 or less difference in means per quarter as column header in a 2 by 2 table format. Quarterly income was stratified into $\leq \$2099.99$ and $> \$2100.00$, to define the rows. It was considered that income might be reported by the individual differently, if above the SGA level of \$700.00 per month or \$2100.00 per quarter. This value was a historical threshold for loss of benefits for 2001-the midpoint of this study. (20) This SGA income threshold as well, approximates the Federal Poverty Level of \$715.83/month-a level at which benefits traditionally might have been withdrawn. This historical threshold had been administratively suspended for this population of disabled persons, however it was unknown if this would still affect behavior.

For employment status, the column definition was employed yes/no and hours worked by category of <20 , 20-29 and 30 or more hours a week.

The kappa statistic was used to evaluate agreement by quarter, between the two sources for wage and employment status over the three consecutive years. (21)At the time of this investigation, no literature existed suggesting a dollar value that represented a significant difference between the two sources of income. Given that approximately 50% of this population had no income according to self-reported data, and only 5% earning above \$1000.00 per quarter, two options for agreement were considered.

1. Earned income or no earned income
2. Income above or below SGA (\$2100.00/qtr)

Logistic regression was used to evaluate predictors of agreement as the outcome of interest. Agreement was defined as an absolute difference between survey and UI data source of 10% or less. Modeling was begun using variables that might have appeared to influence agreement in previous exploration and in the Mathematica work. (15)

Distribution was evaluated for the single continuous variable of age. All other potential predictors were categorical. There were no ordinal predictors.

Univariate analysis was used for initial investigation and importance. A Wald p value of 0.25 was used as criteria for entry into multivariable analysis. (16) Model was fitted with all selected variables and assessed for predictor contribution to the overall model. Age, which was not statistically significant in univariable analysis, was added back to model options to assess possible contribution. A preliminary main effects model was generated. Transformations for age were explored, though none improved the models. Plausible interactions were assessed with further model explorations. Confounding was evaluated with graphic contingency tables and changes in odds ratios of 10% or greater. Best models were assessed with Nagelkerke R Square and Receiver Operator Curve (ROC) values.

Results:

Both the intensive and non-intensive employment-coaching cohorts were considered to be representative of a population of disabled persons; therefore both were included in the analysis. Overall, this population of 1107 was noted to have consistent loss subjects over time. By year 2 after enrollment 47% of participants were lost to follow-up, leaving 582 subjects. This attrition was thought due to difficulties in communication, withdrawal from the Vocational Rehabilitation system, PTI intervention, or not returning the questionnaires. Details of subject numbers available by study year and relative quarter are detailed below:

Table 2
Number of Subjects by Study Year and Relative Quarter

YEAR	RELATIVE QUARTER	TOTAL SUBJECTS
0	-3	1107
0	-2	1107
0	-1	1107
0	0	1106
1	1	792
1	2	792
1	3	792
1	4	792
2	5	592
2	6	592
2	7	591
2	8	582
3 TOTAL YEARS	12 TOTAL QUARTERS	9952 PERSON QUARTERS

At quarter -3, study began with 1107 subjects. One subject was lost to follow-up in quarters -3 to -1, leaving 1106 at relative quarter 0. This number dropped to 792 at quarter 4, and subsequently to 582 by the end of the study. This represents a 27% decrease between relative quarter 0 and four, and a subsequent further loss of 20% of subjects during quarters 5 thru 8, for a total loss of 47% of subject data available over a three year time frame. This resulted in 9952 person-quarters.

Further analysis to investigate whether staying in study was associated with demographic factors or agreement did not reveal any significant association between these factors and completion of 12 quarters of the study.

Cohort characteristics were explored for demographic, wage, number of hours worked, and educational variables. Trend testing was performed for income and hours worked for agreement between survey and UI

source.

Table 3
Study Population Characteristics and Differences in Survey and
Administrative Source Information

Age Range	17 to 66	Mean age 39		
Gender	51.6 % male	48.4 % female		
Marital Status	55.7 % never married	20.8 % married/domestic partner	23.5 % separated/divorced or widowed	
Ethnicity	83.5 % white	9.7 % black	6.6% other	
Disability Type	46.4 % Physical	26.7 % Mental Health	23.9 % Developmental	2.9 % HIV/AIDS
Educational Attainment	15.3% less than High School	38.3% completed High School	46.4% completed post High School education	
Employment U.I. Data over 12 qtrs	39.4% Employed	60.6% Not Employed		
Employment Self-Report Data over 12 qtrs	44.8% Employed	55.2% Not Employed		
Income U.I. Data over 12 over qtrs	60.6% had 0 income	75% had \$861 or less income	90% earned \$2003 or less income	Upper 5% earned \$3411.00 or more
Income Self-Report Data over 12 qtrs	60.6% had \$270 or less income	75% had \$1185 or less income	90% earned \$2100 or less income	Upper 5% earned \$3780.00 or more

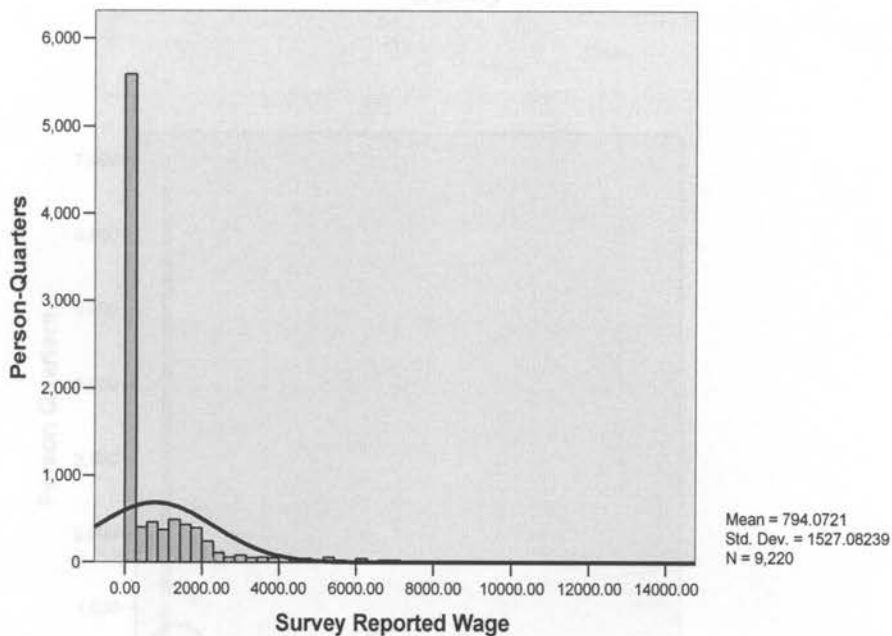
In this cohort, there is a predominance of white, never married, and physically disabled persons with a post high school education. For mental health, HIV/AIDS and physical disability categories, attainment of post high school education was the most common. Those with a developmental disability were most likely to have attained a high school education, less than high school was the next most common level of education, with about 5 % attaining post high school education.

Survey reported work hours data was not as complete as wage data. For the 9952 person-quarters available, 44% of subjects had missing data and 56% had data available. For the 56% with available data, 46.6% worked less than 20 hours on average per week. 29% worked between 20 and 29 hours and 24.4% reported working an average of 30 hours a week or more.

Individuals retrospectively reported income on the surveys as a gross average monthly wage, which was transformed to correspond to an estimated quarterly income. There were 7.4% of subjects who had missing data. Average self-reported quarterly income was quite varied in this population. For 55.2% of person-quarters, the individual had no income. Income was at below \$715.83 for 67% of person-quarters. This value is close to the Federal Poverty Level (\$715.00)/SGA at 700.00 for the year 2001, which was approximately the midpoint of data collection (19). See survey-reported wage graph below.

Figure 2
Self-Report Wage Amount in Dollars over 12 Quarters of Study

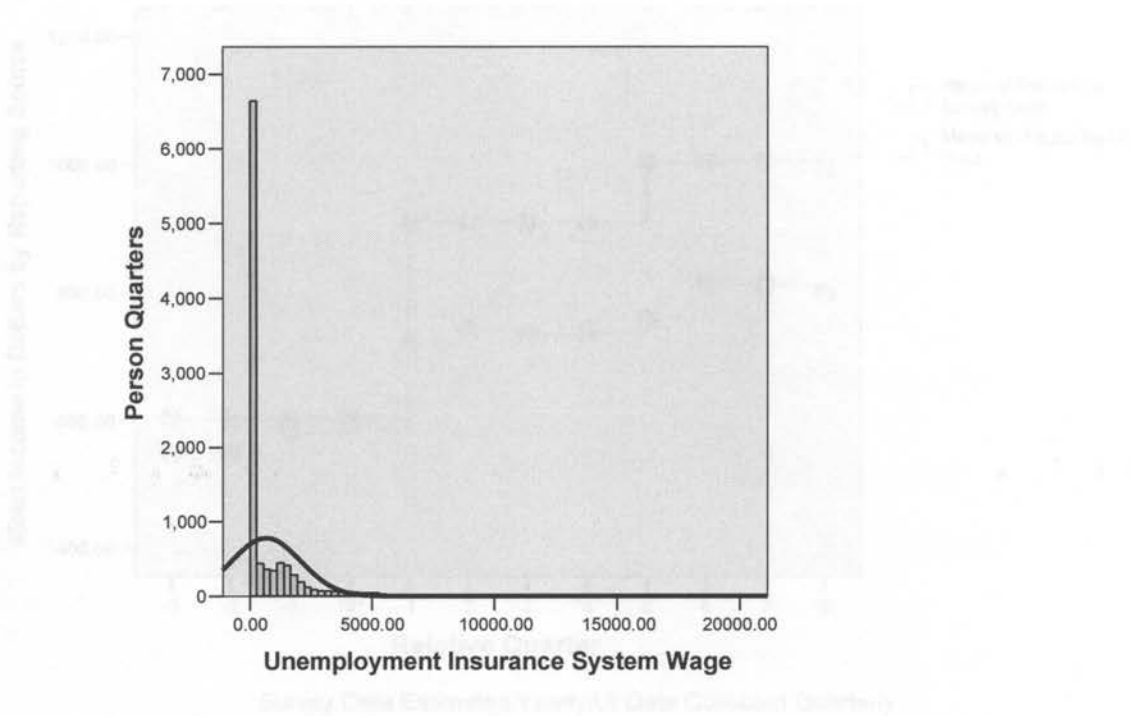
Figure 3
 Administrative Wage Report Amount in Dollars over 12 Quarters of
 Study



State (UI) source did not classify hours, as did the survey source, rather a yes/no to employment was available. 60.6% were not employed over the 12 quarters and 39.4% were employed.

State source data revealed a higher percent (60.6%) of person-quarters without reported income. Income reported by survey source was greater after time of enrollment. The seventy-fifth percentile of state reported income was \$861.00 as compared with \$1185.00 for survey source. This relationship continued to the upper 10% of income per quarter at \$2003.00 from UI source and \$2100.00 from survey source.

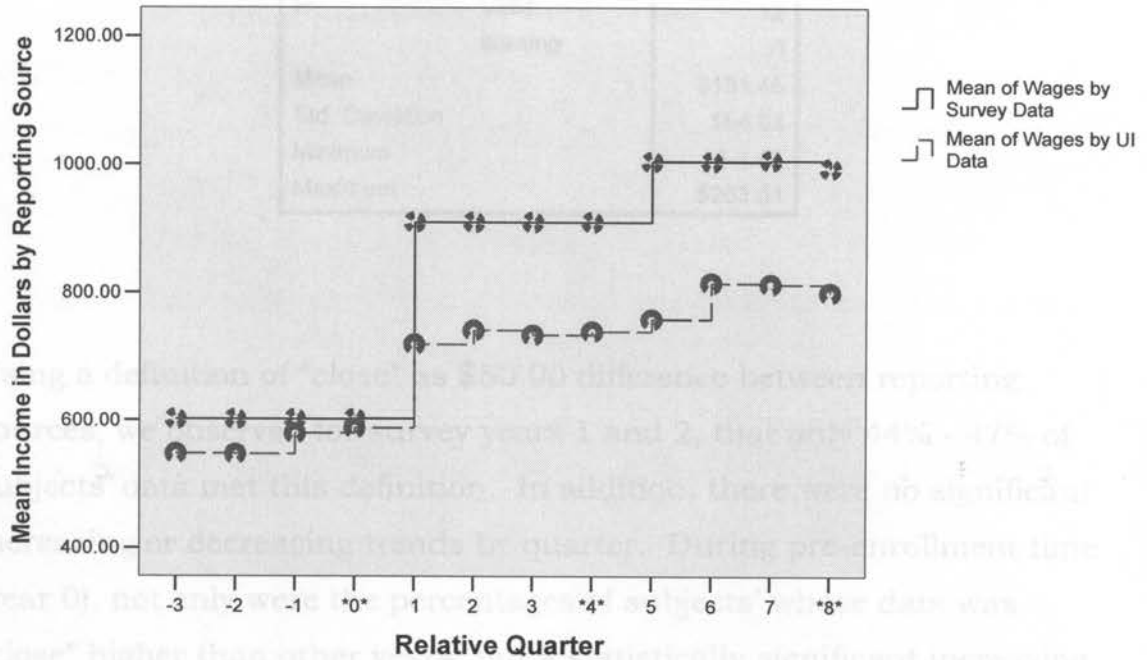
Figure 3
Administrative Wage Report Amount in Dollars over 12 Quarters of Study



Shown in figure 5 are the mean values for self-reported wage and state reported wage per quarter, over 12 quarters. This graph illustrates that for mean reported income for all subjects by quarter, survey data estimates a higher income except near time 0. This time point is at “enrollment” or entry point into the intervention for part of these subjects. After time 0, the mean survey wage estimate is greater. There does not appear to be an obvious divergence of these wage report sources over time.

Figure 4

Mean Value of Wages from Survey and UI Source Over 12 Quarters



*Survey Data Estimated Yearly/UI Data Collected Quarterly

The difference in mean income between the two sources (self-report mean/qtr – state report mean/qtr) was \$-4.48\$ to \$263.54. Though not a large number in terms of SGA or overall wage, it represented 19% of the maximum difference between reported means. See table below for statistics on mean values of difference in income report source.

Relative	Personal	State	Yearly	Quarterly	Mean	Standard	Minimum	Maximum
1	45	46	46	47	244	107	157	357
2	44	46	45	47	215	107	114	314

Table 5

Difference between Means of Survey and State report over 12 Quarters

N	Valid	12
	Missing	0
Mean		\$151.45
Std. Deviation		\$94.93
Minimum		\$-4.48
Maximum		\$263.54

Using a definition of “close” as \$50.00 difference between reporting sources, we observed for survey years 1 and 2, that only 44% - 47% of subjects’ data met this definition. In addition, there were no significant increasing or decreasing trends by quarter. During pre-enrollment time (year 0), not only were the percentages of subjects’ whose data was “close” higher than other years, but a statistically significant increasing trend was observed ($P \leq .018$) (Table 6).

Table 6

Linear Test of Trend: Survey vs. State Report: Difference of \$50.00 or Greater

Year	Relative Quarter	Percent “close” by Quarter	Person-Quarters	Cochran-Armitage Trend Stat.	2 tailed P
0	-3 thru 0	57 56 59 61	4115	-2.36	.018
1	1 thru 4	45 46 46 47	2940	-0.74	.457
2	5 thru 8	44 46 45 47	2165	-0.83	.404

Closeness of the data sources regarding subjects’ employment status was

evaluated by defining “close” as an exact match of the categorized number of reported work hours. The categories used were: 20 or less hours, 21-29 hours and 30 or more hours. The linear test of trend suggests a marginally significant increasing trend in the proportion of subjects’ whose data from the two sources was “close” during pre-enrollment time (year 0, $p = 0.064$), and a statistically significant increasing trend in year 1 ($P = .009$). This is shown in Table 7.

Table 7
Linear Test of Trend: Hours Worked per Quarter Self-Report vs. State Report

Year	Quarter	% Close by Quarter	Person Qtr	Cochran-Armitage Trend Stat.	2 Tailed P
0	-3 thru 0	64 65 67 67	4399	-1.85	.064
1	1 thru 4	70 72 74 75	3164	-2.59	.009
2	5 thru 8	71 70 70 72	2353	-0.42	.672

The kappa statistic was used to measure agreement of income and hours worked for survey and state source over time. Two definitions of agreement for income were explored:

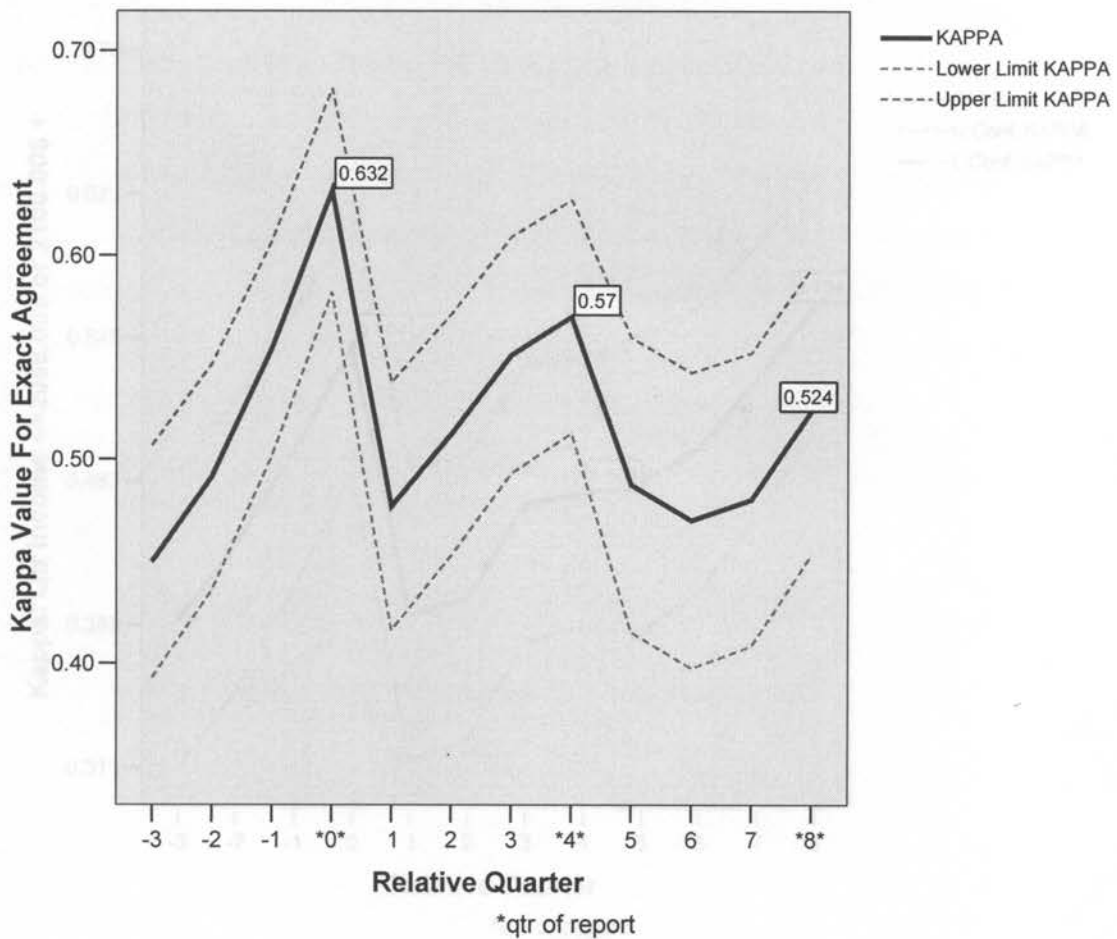
1. Income yes/no
2. Income above or below SGA (\$2100/qtr)

For agreement on income: yes/no, the kappa statistic varied from 0.45 to 0.52, with a maximum value at 0.63 at quarter 0. Agreement overall was best at quarter 0 and at the annual quarter of report. Over time the

agreement decreased between the two sources. All values fell in the *good* reproducibility range. (17) This is illustrated in Figure 5.

Figure 5
Kappa Value for Exact Agreement per Quarter

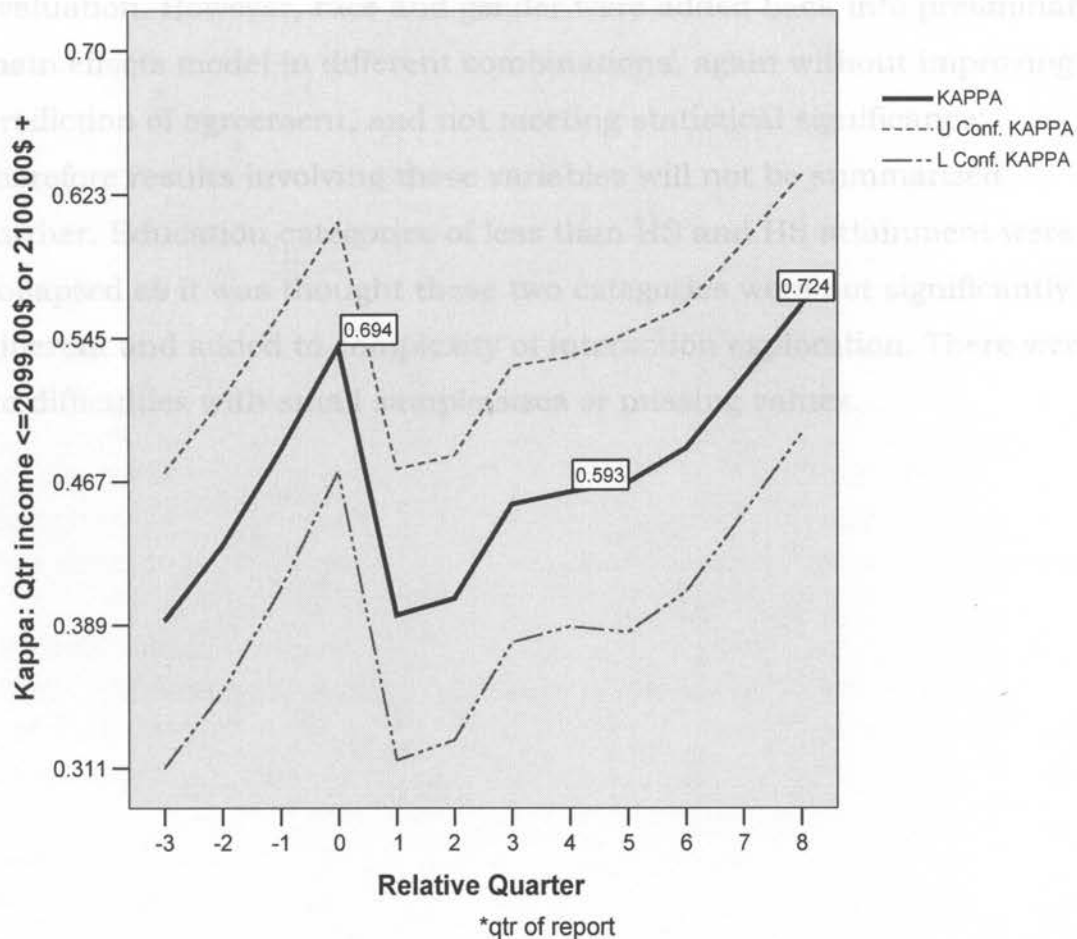
Kappa Value Using Definition of Agreement: Income yes/no



To evaluate if SGA benefit threshold impacted agreement, analysis was performed which evaluated agreement above or below the \$2100.00 threshold. Agreement over time was different for this analysis. It revealed that agreement was best at quarter 8 and near best at time 0. The overall pattern of agreement was smoother and improved over time rather than decreasing, as in the previous kappa analysis. All values fell in the *good* reproducibility range, with the exception of the quarter of final report in

year 2, with a .72 (excellent range). (17) This is illustrated in Figure 6.

Figure 6
Kappa Value for Exact Agreement on Income per Quarter
<= \$2099.99 vs. \$2100.00 and above



Logistic regression modeling was used to explore which variables might have influenced agreement. The dependent variable used in the regression models was agreement between the two data sources (yes/no), defined as a ten-percent or less difference between survey and administrative report amounts. Potential independent variables included those evaluated in the previous (3-state) exploration, and those

published in the Mathematica work. (15) Univariable models for each independent variable revealed that age barely met statistical significance alone, but did meet the criteria of Wald $p < 0.25$, so was retained and evaluated again in multivariable models. (16) Race and gender did not meet the Wald p-value criteria for further inclusion by univariable evaluation. However, race and gender were added back into preliminary main effects model in different combinations, again without improving prediction of agreement, and not meeting statistical significance; therefore results involving these variables will not be summarized further. Education categories of less than HS and HS attainment were collapsed as it was thought these two categories were not significantly different and added to complexity of interaction exploration. There were no difficulties with small sample sizes or missing values.

Table 8**Univariable and Full model Potential Predictors of Agreement at 10% or Less Difference between Survey and Administrative Source**

VARIABLE	UNIVAR O.R.	95% CI	P	FULL MODEL OR	95% CI	P
AGE	1.013	1.001-1.025	.04	.998	.983-1.013	.793
PRIMARY DISABILITY			<.001			<.001
DEVELOPMENTAL MENTAL HEALTH	1.0			1.0		
PHYSICAL	1.209	.851- 1.716	.289	1.053	.715-1.552	.793
EDUCATION			.001			.012
MORE THAN HS	1.0			1.0		
LESS THAN HS*	.701	.487-1.011	.57	.730	.490-1.087	.121
HIGH SCHOOL*	.573	.431-.763	<.001	.630	.463-.858	.003
MARITAL STATUS			<.001			<.001
MARRIED/PARTNER	1.0			1.0		
NEVER MARRIED SINGLE AGAIN	.514	.362-.730	<.001	.633	.430-.932	.021
RACE						
WHITE & OTHER	1.0			1.0		
BLACK	1.208	.809-1.803	.355	1.156	.742-1.799	.522
GENDER						
MALE	1.0			1.0		
FEMALE	.966	.749-1.247	.793	.898	.682-1.183	.446

**these were later collapsed as no additional information gained from separate categories for educational attainment: less than HS and HS*

Preliminary main effects model included disability type, education and marital status. No significant confounding was demonstrated for physical

disability, in that less than 5% change in crude odds ratio was noted for a variety of different potential final models. Interaction was explored with contingency tables with graphic representation of categorical outcome and by addition of interaction terms. As age might have been a relevant factor, this predictor was again added back to the model with no statistical significance for added prediction, therefore was not included in final model. The overall best final model without interaction to predict agreement in income included these variables: Disability type, education and marital status with no interaction term. Details are shown below:

Table 9
Final Model for Prediction of Agreement Between Survey and Administrative Source at Quarter 0

1. Model Without Interaction	B	Wald	p-value	Odds Ratio	95.0% C.I. for Odds Ratio	
					Lower	Upper
ROC: .632 (.596-.669)						
DISABILITY CAT.		17.953	<.001			
DEVELOPMENTAL MENTAL HEALTH PHYSICAL	.056	.083	.773	1.057	.724	1.545
	.637	12.139	<.001	1.891	1.321	2.706
EDUCATION						
MORE THAN HIGH SCHOOL				1.0		
HIGH SCHOOL OR LESS	-.406	7.978	.005	.666	.502	.883
MARITAL STATUS		6.608	.037			
MARRIED				1.0		
NEVER MARRIED	-.425	5.121	.024	.654	.452	.945
SINGLE AFTER HAVING BEEN MARRIED/PARTNER	-.104	.233	.629	.901	.590	1.376

This model estimates agreement predictors as follows: Compared to those whose primary disability is developmental, those with physical disabilities are 1.90 (95% confidence interval [CI]: 1.32-2.70) times more likely to provide self-report data that agrees with UI source. For those with a high school education or below, self-reported income is 33% [odds ratio [OR]: 0.67 (95%CI: 0.502-0.883)] less likely to agree with UI source data, than those with greater than a high school education. As compared to those who were married, those who have never married are 35% [OR: 0.65 (0.452-0.945)] less likely to provide information on income that agrees with the UI source. There was no significant difference between developmental and mental health as predictors for agreement, or between those who were married or single again after having a partner/been married.

Models with interaction were explored and revealed an interaction between education and marital status for prediction of agreement. The odds ratio for those with physical disability was consistent at 1.8 (1.282-2.640) over models with interaction terms. Illustrated in the table below one can note that those who had a high school education or less and never married were 66% [OR .437 (.262-.730)] less likely to have data that agreed as compared to those with greater than a high school education who also had a partner or spouse.

Table 10**Model to Investigate Effect Modifier of Marital Status on Education
for Prediction of Agreement at Time of Enrollment**

DISABILITY TYPE	B	S.E.	p-value	Odds Ratio	95.0% C.I. for Odds Ratio	
DEVELOPMENTAL				1.000	Lower	Upper
MENTAL HEALTH	.022	.195	.911	1.022	.697	1.498
PHYSICAL	.610	.184	.001	1.840	1.282	2.640
>HS MARRIED			.001	1.000		
>HS NEVER MAR	-.128	.272	.638	.880	.516	1.500
>HS SINGLE AGAIN	-.217	.299	.469	.805	.448	1.448
< HS and MARRIED	-.173	.318	.587	.841	.451	1.569
< HS and NEVER MAR	-.827	.261	.002	.437	.262	.730
< HS and SINGLE AGAIN	-.150	.308	.627	.861	.470	1.576
Constant	.653	.277	.018	1.921		

In conclusion, those with a physical disability, greater than high school education and those with a partner or spouse, are significantly more likely to provide a self-report of income that is in agreement with a state UI source. Having a high school education or less, coupled with having never married predicted a decreased chance of agreement between these two sources by 21-32%, as compared with marital status or education as a single predictor. Age, race and gender were not useful in predicting income report agreement.

Discussion

In this population of disabled persons, linear test of trend demonstrated that for income by quarter, “closeness” in reported income was best at time of initial report. For hours worked, this relationship was similar from time of enrollment through year 1 of study as well. This may illustrate that recall is more consistent for hours worked, than income

over a year's time. This is consistent with work by Mathematica that has shown that for longer-term employment, sources are in better agreement for work hours than for income amount. (15) The difference in "closeness" between income and hours may hint at a subgroup with longer-term employment. As no reference standard has been established, there is no way to infer that agreement means accuracy. Therefore one might further suggest that quarterly or biannual, rather than annual, self reports of income and hours would predict better agreement to a state source than those obtained from a longer, i.e. annual interval, due to recall difficulties. This investigation does suggest that the interval for query of either work hours or income should be less than annually. Given cost difficulties in obtaining data and subject follow-up, quarterly acquisition of data might be optimal.

A component of the complexity of doing an investigation such as this is database and chronological alignment. Correctly aligning two data sets respect to relative time, subject and appropriate variables takes substantial investigation and data manipulation. Time presented a more complex difficulty than had been anticipated, as aligning the calendar year survey with the relative quarter UI data required extensive investigation. There is a possibility of error in alignment; though every effort was made to verify with several markers that the datasets were aligned correctly. Loss of subject data over time highlights how difficult it can be to maintain communication from subjects who may have mental health, communication or mobility difficulties. Despite these difficulties, the 9952 person-quarters provided a reasonable basis for statistical analysis.

As noted in the 2003 Mathematica Job Corps study (15), the quarterly employment rate is higher when measured by self-reported data, as was reported earnings. Involvement in an intervention, strongly desiring a

beneficial outcome, and simple recall problems, all may contribute to the fact that estimated employment status and income level are reported at higher levels via surveys. Overall the self-report data appears to likely have a component of “optimistic recall” when compared with state sources.

In this investigation, agreement over time, as evaluated by kappa statistic, demonstrated modest divergence between these two sources starting at time of enrollment, though this divergence is not consistently increasing over time. The overall best agreement was noted when agreement was evaluated using a binary definition- above or below SGA level (\$700 per month). This likely indicates that concern over loss of benefits if SGA level is met is quite relevant when one is attempting to obtain self-reported data. Maximizing an individual’s comfort level with a higher threshold for loss of benefits could potentially improve this factor. This might be accomplished by educational efforts, including those of key vocational rehabilitation staff to reinforce this factor, when interacting with their client.

The UI data reports are used to tax employers, which sustain the unemployment system. This may provide some employers with a potential disincentive to report. Incorrect data entry and incorrect social security numbers are also sources of error. Concern over loss of benefits when an income ceiling was broached was likely a significant factor in self-reporting over time. Binary logistic regression modeling provided insight into factors that affect reporting at baseline. Those with a physical disability, greater than high school education and those who are married or have a partner, are more likely to provide information that is in agreement. These factors suggest that those who do not have the financial reserve of a partner or spouse, who may provide additional income, are more concerned about loss of insurance and financial

support. This difference in agreement was maximized when added to the factor of less education. This may be due again to the issue of “reserve”, as education often confers more job opportunities and stability in employment. Together these two factors were predictive of significantly less agreement.

Another cause of disparity in earnings report is the potential confusion when reporting wage as either net or gross-when asked for gross wage. Those with less education-who may have cognitive struggles as well, may not be capable of recall over an entire year for survey reporting. Wage information reported to UI is potentially more likely to not suffer from this confusion-though may not always be reported. This may contribute to the consistency of survey wages being higher than UI reports. This difference then may be amplified by those in non-reported occupations.

Limitations:

There are several limitations in this work that should be noted. This population of disabled persons involved in Vocational Rehabilitation counseling in Wisconsin is likely not representative of a general population of all disabled persons in the United States. This cohort was very motivated to seek employment and some had very intensive support to attain and keep employment. They had demonstrated motivation and capability to maneuver in a very complex system of benefits and communicate effectively, to be considered for the intervention. It is notable that this cohort was quite similar to the general population of Wisconsin with respect to ethnicity and educational attainment. (22) In this cohort, 84.7% attained a high school education or greater, compared with 85.1% of the general population of Wisconsin, possibly reflecting the motivated and educated characteristics of this group.

This is not a random sample of persons with disabilities. This population was motivated and involved on a regular basis with ongoing support systems, and most, were able to provide 3 years of data. This limits generalizability of conclusions.

Both of the reporting sources have limitations. The state data source is the missing data for the self, partnership and sheltered workshop employees. This is potentially a frequent employment avenue for disabled persons. Involvement in Vocational Rehabilitation or the PTI intervention may select over time for preferential employment in many of these categories excluded in mandatory reporting. The self-reported data quality may be diminished by perceived lack of confidentiality for those with HIV/AIDS diagnosis and the concern of discussion of health issues by counselors.

Unfortunately, agreement between the data sources was not high enough at any of the time points studied to warrant the use of one source as a substitute for the other. However, if one could clarify the details of this divergence more clearly in future studies, one could possibly infer values for one given the other, to optimize use of resources for public policy evaluation.

Conclusions

This investigation revealed modest agreement between two report sources in a population of disabled persons. Concern over loss of benefits, appear to impact reporting of wage data. Self-reported number of hours worked appear to be “optimistic”, or possibly reflect non-reported job categories for state reporting systems. Having financial reserve, such as may be present with a partner or spouse, greater educational attainment or a physical disability predict better agreement between two reporting sources.

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