FINAL REPORT

ESTIMATING THE INDIRECT COSTS OF EPILEPSY

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I. Introduction

This is the final report on the determination of the indirect costs of epilepsy in the US in 1995. All empirical models are estimated separately for men and women. Further, the costs of epilepsy alone are distinguished from the costs of epilepsy in conjunction with other disabling conditions. There are three primary components of indirect costs. First, the onset of epilepsy causes some working individuals to withdraw from the labor market. The foregone labor market earnings of these individuals is one component of indirect costs. There are other individuals who continue to work even with a seizure disorder. However, epilepsy may reduce the number of hours worked per year and/or earnings per hour. The reduction in annual earnings of these individuals is another component of indirect costs. Finally, epilepsy may cause people to alter the number of hours they devote to home production. The change in home production hours times the hourly wage of home production workers is the final component of indirect costs.

Individuals do not choose to have epilepsy or choose the severity of their seizure disorder. However, the labor market and home production effects of epilepsy can be greatly affected by the choices people with epilepsy make. Epilepsy may affect an individual's educational attainment, marital status, family size, job turnover and many other factors that influence labor market and home production outcomes. The best estimate of the indirect costs of epilepsy would measure differences in labor market outcomes across a random sample of persons with epilepsy and a random sample of persons without the disorder are due to epilepsy. This comparison across random samples attributes differences in outcomes to epilepsy allowing persons with epilepsy to optimally adjust to their seizure disorder.

In this study, I do not have a random sample of people with epilepsy. First, the 18 epilepsy centers that agreed to participate in this project tended to be located in large cities and in the Midwest. To account for this difference in sampling in the empirical analysis, I control for region of the country and city size. There are also differences in the average age and racial and ethnic composition of the epilepsy and non-epilepsy samples. This study estimates the costs of epilepsy controlling for these observed differences in exogenous characteristics of the samples.

It is important to emphasize that the sample of persons with epilepsy I obtained from the epilepsy clinics tend to have more impairing epilepsy than a random sample of persons with the disorder. The indirect costs of epilepsy per person I estimate in this paper are the indirect costs for an individual who has epilepsy that is as impairing as the average person in my sample.

The key to estimating the indirect costs of epilepsy for the US is to (a) obtain unbiased estimates of the effect of particular seizure characteristics on the labor market and home production outcomes of individuals with epilepsy and (b) have accurate measures of the number of people with epilepsy in the US who have each seizure characteristic. Since individuals do not choose how impairing their epilepsy is, there is no bias induced by the oversampling of more seriously impaired patients in the epilepsy sample. The estimates of indirect costs, conditional on the severity of the disorder, presented in this report are unbiased. The per capita cost estimates in this report should not, however, be viewed as the per capita cost for a random sample of persons with epilepsy.

To obtain this national estimate, the indirect cost estimates presented here should be re-weighted to account for the distribution of seizure characteristics in a truly random sample of persons with epilepsy. I use the random sample of persons with epilepsy obtained by Dr. Annegers and Dr. Begley for their study of the direct costs of epilepsy to re-weight the indirect cost estimates. The main benefit of the direct cost study is that sample selection was based on seizure onset over an 8-10 year period in a large HMO population in Houston, Texas and in Olmstead County in Minnesota. For each person in the direct cost study, I have predicted the indirect costs. The indirect cost predictions are based on the seizure characteristics of the people in the direct cost study. The final report for the direct cost study explains how the Annegers and Begley sample will be aggregated into national cost estimates.

First, I use the large sample of adults with epilepsy I obtained to determine unbiased estimates of the indirect costs of seizure characteristics. Based on these estimates, I predict the indirect cost of epilepsy for each person in the direct cost study. The numbers presented in this report are therefore the answer to the question, "Suppose a random sample of people in the US had onset of epilepsy as severe as the average person with epilepsy in my sample". The national indirect cost of epilepsy will be based on the sample of people in the direct cost study and will be computed when the national direct costs of epilepsy are estimated.

II. Labor Market Costs

A. Theory

When estimating the annual labor market cost of epilepsy, there are three types of persons to consider. First, there are people who would not work in the labor market, even in the absence of a seizure disorder. Epilepsy imposes no labor market costs on this group of individuals. Second, epilepsy causes some workers to withdraw from the labor market. The foregone annual earnings of these individuals is the labor market cost of epilepsy for this group. Finally, there are the persons who continue to work, even with a seizure disorder. Any reduction in annual earnings is the labor market costs of epilepsy for this group. The earnings reduction can be decomposed into two parts: a reduction in the hourly wage and a reduction in hours worked per year. The hourly wage is a measure of an individual's productivity per hour. Thus the effect of epilepsy on a worker's productivity is given by the effect of epilepsy on the worker's hourly wage.

B. Data

1. Epilepsy Sample

The epilepsy data was collected between October 1995 through August 1996. Patients attending eighteen epilepsy centers across the United States comprise the data set[1]. For all centers except the MAYO Clinic, the data collection was as follows. All patients visiting a participating clinic in the interview period were asked to participate in the study and sign a consent form. As part of the consent form, patients were asked to provide their phone numbers. Once consent was obtained, interviewers at the Public Policy Research Institute (PPRI) at Texas A&M University contacted the patient by phone. PPRI was unable to contact 16.2 percent of the patients who consented to participate in the study[2].

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[1] The participating epilepsy centers are (1) the Cleveland Clinic, OH, (2) MINCEP, MN, (3) Marshfield Epilepsy Program, WI, (4) Graduate Hospital, PA, (5) The Epicare Center, TN, (6) Rush-Presbyterian, IL, (7) Henry Ford Hospital, MI, (8) Beth Israel Hospital, MA, (9) Stanford Epilepsy Center, CA, (10) Arizona Epilepsy Center, AZ, (11) Washington University-St Louis, MO, (12) University of Michigan, MI, (13) Northwestern University, IL, (14) Carolina Neurological Clinic, SC, (15) The MAYO Clinic, MN, (16) Rocky Mountain Center, CO, (17) Texas Epilepsy Program, TX, (18) Medical College of Georgia, GA.

[2] The most common problem was that the person could not be reached at the phone number provided.

Patients were asked questions about their epilepsy, labor market experiences, educational attainment, and family background. The median respondent took 20 minutes to complete the phone survey. 1302 respondents reported all the key dependent variables used in this analysis (whether the person works, and earnings and hours worked per year for the people who work). Columns 1 and 2 of table 1 report the sample means and standard deviations for men and women separately in the final epilepsy sample.

Also as part of the consent form, patients were asked to provided access to their medical charts. It is crucial to obtain accurate information about the seizure characteristics for each person with epilepsy and the existence of any other disability of social significance. Thus from each center the physician, or a competent individual identified by the physician, completed a medical questionnaire about the individual's epilepsy. In particular, date at seizure onset, etiology, seizure type(s), treatment(s), and seizure frequency was obtained from the medical staff. In addition, the medical staff was asked to identify any other disabilities of social significance that the patient has *in addition* to their epilepsy. In the phone interview, patients were asked to provide information on date of last seizure and age at onset. This patient information was used to supplement the medical data whenever the medical data were missing.

Table 2 reports sample means for the medical data. As I suspected given the sample design, it appears that persons in this sample have more severe epilepsy than would observations from a random sample of persons with epilepsy. Note that 24.2% of the sample has had seizure surgery and 20.4% experience more than 12 seizures per year. On the other hand, 14.5% of the sample have not had seizures for at least two years. Thus it is possible with this sample to estimate the labor market consequences of less impairing epilepsy as well as quite severe cases of epilepsy. Note that where the costs of epilepsy are large, for the more impaired people with epilepsy, the estimated indirect costs will be relatively precise because of the sample design.

The MAYO Clinic data is based on the sample of adults obtained in the direct cost study. As a result, data collection was somewhat different for this center. Patients identified for the direct cost study were sent a letter asking them to participate in the indirect cost study. Unless the patient sent back a refusal, the patient was contacted by phone and administered the same telephone interview as the other individuals participating in this study. The refusal rate was 59.8% for the MAYO Clinic patients.

2. Control Sample

The individuals responding to the March 1996 Current Population Survey (CPS) comprise the control group. The CPS is collected by the Census Bureau to provide the Federal government with monthly unemployment statistics for the U.S. The CPS is a commonly used source of annual data on individual employment and earnings. The March survey asks about employment and earnings for the preceding year. There are 71,641 persons between the ages of 18 and 64 in the March 1996 CPS. There are 36,907 persons in the same geographic areas as the epilepsy sample. All sample statistics and regressions for the CPS use the US population weights. Columns 3 and 4 of table 1 reports sample means and standard deviations for this selected sample from the CPS.

As noted in the introduction, there are two types of variables in the empirical analysis. First, there are exogenous variables that are not expected to be affected by a seizure disorder, such as age, race, or sex. These variables nevertheless may differ on average across the CPS and epilepsy samples because of the sample design and the relatively small sample of people with epilepsy. Column 5 of Table 1 reports the differences between the mean values of the exogenous variables across the CPS and epilepsy samples. Column 6 reports the standard errors of the difference in means. There are some significant differences in the characteristics of the two samples. There are fewer Hispanics in the epilepsy sample. The epilepsy sample is 1.9 to 2.2 years younger on average than the CPS sample. The epilepsy sample tends to be located in the largest cities and in the Midwest. It is important to note that some of the differences in the fraction working, earnings, wages, and annual hours across the two sample are attributable to differences in these exogenous variables. I use multiple regression analysis to hold constant differences in these exogenous variables, while estimating the impact of epilepsy on labor market outcomes

People with epilepsy are 21-22 percentage points more likely to have a disability *in addition* to their epilepsy than the control group is likely to report having *any* disability. An individual in the CPS has a disability if the person responds yes to the following question, "Do you have a health problem or disability which prevents you from working or which limits the kind or amount of work you can do?" Note that persons with epilepsy in the CPS are likely to respond yes to this question. Thus some of the CPS disabled have epilepsy or epilepsy in conjunction with another disorder. An individual in the epilepsy sample has a disability in addition to epilepsy if the physician, or a competent staff member identified by the physician, reported that the patient with epilepsy had another disability of social significance. To estimate the effect of epilepsy alone, I compare people in the CPS who report that they have no disability to persons with epilepsy who have no other disability according to their physician. I also determine whether epilepsy has an added impact on persons who have another disorder by comparing disabled people in the CPS to persons with epilepsy who have a disability in addition to their epilepsy (according to their physician). Although a small fraction of persons in the CPS may have epilepsy, the comparison of disabled persons in the CPS and disabled persons in the epilepsy sample is likely to generate a reasonable estimate of the additional cost of epilepsy conditional on other disabilities.

C. Empirical Analysis

1. Costs for Non-Participants

The first step in the empirical analysis is to determine the fraction of people in the CPS who are currently not working. These individuals would have no labor market costs if they were to get epilepsy because they are currently not in the labor force. Among those without a disability, 6.85% of men and 20.17% of women are not employed. A much higher fraction of disabled individuals in the CPS do not work: 62.95% of men and 65.45% of women.

2. Costs for Those Who Withdraw From the Labor Market

a. Identification of the Fraction Who will Withdraw

The second step in the analysis is to determine which workers in the CPS would choose not to work in the event of seizure onset. To estimate the effect of epilepsy on the probability of working, I estimate a probit model where the dependent variable is a one if the person works and is a zero otherwise. The independent variables in the regression are dummy variables for having epilepsy alone, having epilepsy in addition to another disability, having a disability but not epilepsy, black, “other” race, Hispanic, quartics in age, minority (black and “other” race) interacted with the age quartics, 3 region dummy variables, and 4 city size dummy variables. Table 3 presents probit results for both men and women.

The probit coefficients yield the probit index, Xb. The predicted probability of working is then p=F(Xb) where F is the normal cumulative distribution function. The coefficient on the epilepsy alone dummy variable is the estimated impact of a seizure disorder on Xb for those without a disability. Epilepsy has a large and significant effect on the probability of working for both men and women. Epilepsy reduces the probability of working by 48.78% for non-disabled men and by 38.14% for non-disabled women.

The difference between the coefficient on the CPS disability variable and the epilepsy plus another disability variable is the estimated added impact of epilepsy, given the individual already has another disability. Even for people with another disability, epilepsy significantly reduces the probability of working: 15.76% of disabled men and 15.06% of disabled women would be predicted to drop out of the labor force if they got epilepsy.

b. Determining the Costs of Withdrawal from the Labor Market

The next step is to determine how costly it is to society that the above fractions of individuals leave the labor market with the onset of a seizure disorder. Economic theory predicts that profit maximizing firms will hire workers as long as the value of the output produced by the worker is greater than or equal to the worker’s pay. Thus a conservative measure of the output lost to society when an individual withdraws from the labor market is the earnings the individual would have made.

The key question is to determine which CPS workers would leave the labor market with the onset of a seizure disorder. One possibility is to assume that workers randomly withdraw from the labor market at seizure onset. Under this assumption, the average pay of CPS workers is the measure of the labor market costs of epilepsy for people who leave the labor market with the onset of epilepsy.

Economic theory predicts it is non-random who will leave the labor market. Using the probit model presented in Table 3, I determine the probability that each person in the CPS works, given his or her observed characteristics. I then determine the persons who are the least attached to the labor market, i.e., have the lowest predicted probabilities of working. I then compute the average earnings paid to the people I predict are the most likely to drop out. For example, I predict that 48.8% of non-disabled men will drop out of the labor force with epilepsy onset. The average annual earnings of non-disabled men in the CPS is $35,034. Using the probit estimates, I can identify the 48.8% of the men with the lowest predicted probability of working. The average annual earnings among the 48.8% of non-disabled men with the lowest probabilities of working are $29,959. I use the $29,959 as the per person cost of epilepsy attributable to labor market withdrawal for non-disabled men as opposed to the $35,034 earned on average by non-disabled men in the CPS.

I use the same methodology to calculate the costs of labor market withdrawal for men with a disability, and women with and without a disability. The costs of labor market withdrawal are the highest for non-disabled men, and are substantially lower for non-disabled women: $18,533 per woman who leaves the labor market. The annual costs of labor market withdrawal attributable to epilepsy are $15,475 per disabled man and $10,268 per disabled woman.

3. Costs for Those Who Remain in the Labor Market

Epilepsy may lead to production losses even when workers do not withdraw from the labor market. In economic models of the labor market, a worker is paid the value of the additional output she produces. To the extent that earnings are lower for people with epilepsy than those without the disorder, economists assume there is a corresponding reduction in output produced by people with epilepsy. Note that earnings per year will be lower if either the worker's hourly wage or if the annual number of hours worked fall.

It is inappropriate to determine the costs associated with epilepsy by *directly* comparing the earnings of people with epilepsy to people without the disorder because of the large negative effect epilepsy has on the probability of working. Since so many people with epilepsy are not working, the sample of workers with epilepsy is a select group of the population of persons with epilepsy and not a random sample[3]. In particular, employed people with epilepsy are likely to have more labor market skills, be more motivated, or more determined than employed persons without epilepsy. These are all characteristics that are likely to lead to higher pay and are unobserved to the researcher but observed by

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[3] This selection bias is apparent from comparing the predicted probability of working (in the absence of a seizure disorder) among working people with epilepsy and the average predicted probability of working in the working non-epilepsy sample In the absence of epilepsy, the predicted probability of working among the working men with epilepsy is 96.2% and among the working men in the CPS is 93.9% (the corresponding probabilities for women are 84.5% for working women with epilepsy and 80.8% for working women in the CPS)

employers[4]. The failure to control for these factors leads to what is called selection bias in the economics literature. In my previous research, I demonstrated the importance of accounting for selection bias in estimating the costs and consequences of epilepsy. In that study, I estimated average hourly wage costs of epilepsy for the 70 working people in the sample to be $2.45 without accounting for selection bias, but $3.02 when accounting for selection bias. Heckman's selection bias correction technique provides a (statistically) consistent estimate of the true wage losses associated with epilepsy. Note also that in the previous section I found that workers with high predicted probabilities of working earn more on average than workers with low probabilities of working.

When I do not use selection bias correction techniques proposed by Heckmen, I substantially underestimate the earnings losses sustained by working people with epilepsy. In an OLS earnings regression for workers, I find that epilepsy significantly reduces earnings by $5,850 for men while there is no significant effect of epilepsy on the earnings of women, though the point estimate implies that epilepsy adds $1,449 in annual earnings for women. For persons with a disability, epilepsy *adds* $209.55 per year in earnings for men and $1,058.08 for women.

Table 4 reports the selection bias corrected earnings regressions for men and women. I find significant selection bias in estimating earning regressions for both men and women. The coefficient on lambda, the selection bias correction factor, is significantly positive. This positive coefficient says that the most productive people are over-

[4] Labor economists have long been concerned about the differences in unobserved motivation or determination between the employed and unemployed. James Heckman (July 1974), "Shadow Prices, Market Wages, and Labor Supply." *Econometrica*: 679-694, developed a statistical technique to account for the possibility of unobserved differences across the employed and the unemployed. There is some evidence that there exists substantial selection bias in a sample of working people with disabilities. See in particular Jean Mitchell and J. S. Butler (March, 1986), "Arthritis and the Earnings of Men," *Journal of*

represented in the sample of workers. The coefficient on the "epilepsy only" variable is the estimated effect of epilepsy on earnings. The difference between the coefficients on "another disability" and "epilepsy plus another disability" is the estimated *added* of effect of epilepsy, given the individual already has another disability. Epilepsy has the largest negative impact on the earnings of men without another disability. The effect of epilepsy is to reduce non-disabled men's earnings by $12,654. Non-disabled women's earnings decline by $4,994. The effect of epilepsy on earnings is substantially reduced when the individual has disability in addition to epilepsy. When the individual has another disability, the additional effect of epilepsy is to reduce men's earnings by $2,587 and women's earnings by $2,407.

I next determine the earnings of CPS men and women with and without other disabilities. The key is to identify which people in the control group would continue to work, even if they got epilepsy. Again, I use the work-not working probit to determine which members of the control group have the highest propensity to work. These are the persons most likely to work even if with the onset of a seizure disorder. I then determine the actual average earnings of these workers in the CPS. For example, there are 15,180 working, non-disabled men in the CPS in the same areas as the epilepsy sample. 47.7% of these men (7,233 men) are predicted to continue working in the event of onset of a seizure disorder. The average earnings of the 7,233 men with the highest predicted probabilities of working are $41,006. Epilepsy was estimated to reduce non-disabled men's earnings by $12,654, which represents a decline of 30.9%. Using similar calculations, I find that non-disabled women's earnings decline 19.2% with the onset of epilepsy. Among the

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Health Economics, pp. 81-98 and Melissa Famulari (April, 1992), "The Effects of a Disability on Labor Market Performance: The Case of Epilepsy." *Southern Economic Journal*, 58: 1072-1087.

disabled, epilepsy further reduces women's earnings by 19.2% and men's earnings by 12.3%.

4. Total Per Person Labor Market Costs

The final step is to calculate the average per person labor market cost of epilepsy. For the 16,293 non-disabled men in the CPS, for example, the average per person labor market cost of epilepsy is determined as follows. First, 1,113 non-disabled men are not working and so epilepsy would impose no labor market costs. Of the 15,180 who work, 7,947 are predicted to drop out with the onset of epilepsy with a cost of $29,959 per person. The remaining 7,233 are predicted to continue working, but have an earnings reduction of $12,654 per person. The per person labor market cost of epilepsy for non-disabled men is [$0*1113 + $29959*7947 + $12653.6*7233]/16293 = $20,230. Note that 72% of the labor market costs are attributable to the fact that epilepsy leads men to withdraw from the labor market. For disabled men and non-disabled and disabled women, the costs of labor market withdrawal represent 76.7 to 81.5% of the total labor market costs of epilepsy.

The final step in the calculation of labor market costs is to adjust for the fact that the sample of people with epilepsy did not come from all areas of the US. For each of the four groups (non-disabled men and women and disabled men and women), I test whether there is a significant difference between the average earnings of the March CPS sample in the geographic areas used in this study and in the overall CPS. For only one group, non-disabled men, was there a significant difference between the mean earnings used in this analysis and the mean earnings in the overall CPS sample. The sample of non-disabled men I used had average earnings of $35,033 whereas the average earnings of non-disabled men in the entire CPS sample was $34,486. I therefore adjust down the $20,230 per non-disabled man labor market cost by 1.6%. Therefore, if a random sample of non-disabled men were to get epilepsy, the per person labor market cost is expected to be $19,907. If a random sample of disabled men got epilepsy, the per person labor market cost is expected to be $2,981. The expected per person labor market cost for non-disabled women is $9,157 and is $2,017 for disabled women. Tables 5-8 present a summary of the calculations of the labor market costs of epilepsy for each group.

III. Home Production Costs

A. Theory

People can devote their time to either home production, the labor market, or leisure. When deciding whether to devote an additional hour to housework, individuals weigh the benefits and the costs. As long as the benefits exceed the costs, the individual will devote another hour to home production. Epilepsy is likely to affect both the costs and benefits of home production. In the previous section, I determined that epilepsy reduces the market wage. Thus the cost of home production is lower for people with epilepsy than for those without the disorder. Just as epilepsy may reduce an individual's productivity in the labor market, epilepsy may also reduce an individual's productivity at home. People with epilepsy may spend more or less hours in home production than people without the disorder, because epilepsy reduces both the costs and benefits of home production.

The indirect cost of epilepsy on home production is the difference between the value of home production in the absence of epilepsy and the value of home production for individuals with the disorder. To place a value on time spent at home, I use the average wage paid in 1995 to individuals working in Social Service occupations. Social Services includes persons working in residential care, individual and family services, child day care, and home health care. Note that if persons with epilepsy devote more time to home production, I will estimate that epilepsy increases the value of time at home.

B. Empirical Analysis

1. PSID and Epilepsy Samples

The empirical analysis of the effect of epilepsy on home production is based on the individual's response to the following question, "About how much time do you spend on housework in an average week? I mean time spent cooking, cleaning, and doing other work around the house." This question was asked of the epilepsy sample and is also asked in the Panel Study of Income Dynamics (PSID)[5]. The epilepsy sample used in the analysis of home production is slightly smaller than the sample used to analyze labor market production because of non-response to the question on hours spent in home production. The most recently available PSID data is 1992. In 1992, 9,829 heads of families were interviewed, and information on 5,214 spouses was also obtained. My control group is these 15,043 persons from the PSID.

On average the people with epilepsy were surveyed in March of 1996. I include the unemployment rate as a dependent variable in the housework hours regressions to account for the fact the PSID sample reports housework hours for 1992, a mild recessionary period, while the average person with epilepsy reports housework hours for

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[5] This question is not asked in the CPS and so it was not possible to use the same control sample in the analysis of labor market costs and non-labor market indirect costs.

March of 1996, a period of economic expansion. More hours are expected to be devoted to home production in a recession, when the opportunity cost of home production is low.

In the PSID, housework hours are topcoded at 84 per week (12 hours per day maximum value). The six people with epilepsy who reported more than 84 hours of housework per week were topcoded at 84.

There is a difference in the definition of a disability across the PSID and the epilepsy samples. An individual is classified as having a disability in the PSID if the respondent reports a physical or nervous condition that limits the type of work or the amount of work the respondent can do. For people with epilepsy, a person has a disability if the physician reports the individual has a disability of social significance, *other than epilepsy*.

The top panel of Table 9 reports sample means for women in the epilepsy sample in column 1, in the PSID sample in column 2, and mean differences are presented in column 3. All sample statistics and regressions using the PSID are weighted to reflect the entire US population. Women in the PSID spend 1,000 hours per year on average in home production. Women in the epilepsy sample spend 231 fewer hours in home production per year than women in the PSID. Women in the epilepsy sample are more likely to live in a large city in the Midwest than are women in the PSID. Finally, the unemployment rate faced by women in the epilepsy sample is significantly lower than the unemployment rate faced by women in the PSID sample.

The bottom panel of Table 9 reports sample means and mean differences between the men with epilepsy and the men in the PSID. Men in the PSID spend 400 hours per year on average in home production. Men in the epilepsy sample spend an average of 93 *more* hours in home production per year than men in the PSID. Men in the epilepsy sample are significantly less likely to be Hispanic. The men in the epilepsy sample are 3.94 years younger, are more likely to be disabled, and are more likely to live in large cities in the Midwest than the men in the PSID sample.

2. Regression Analysis of Housework Hours

In this section I examine the difference in home production across the epilepsy and PSID samples more systematically by estimating a regression model. I determine the effect of epilepsy on home production holding constant all differences in exogenous variables across the epilepsy and PSID samples that are likely to be due to the design of the epilepsy sample obtained for this project. In particular, I estimate the effect of epilepsy on home production holding constant region of the US, city size[6], area unemployment rates, age quartics, race, ethnicity, and minority interacted with the age quartics.

The analysis of home production is conducted separately for men and women. Table 10 reports the results from the annual hours of housework regressions for men and women. Epilepsy significantly reduces home production hours for women and significantly increases home production by hours for men. Non-disabled women spend an average of 989 hours in home production per year. Epilepsy reduces non-disabled women's annual hours spent in home production by 109 hours, a decline of 11.02%. The average annual hours of home production for disabled women is 1063. If a women who already has a disability has seizure onset, her hours spent in home production decline by 299 per year, or 28.13%. Non disabled men with epilepsy actually spend 120 *more* hours in home production per year than non-disabled men without epilepsy which is an increase of 30.23%. Finally, disabled men in the PSID spend 420 hours in home production on average per year. Disabled men with epilepsy spend an additional 37 hours in home production than disabled men in the PSID.

To place a dollar value on the effect of epilepsy on home production, I use the average hourly wage paid to Social Service workers in the US which was $8.83 in 1995. Social Services includes residential care, individual and family services, child day care, and home health care. Since epilepsy causes men to devote more time to home production, the indirect costs of epilepsy are reduced by $1060 per year for non-disabled men and by $323.53 per year for disabled men. Epilepsy causes women to reduce the number of hours devoted to home production. The indirect costs of epilepsy are increased by $963 per year for non-disabled women and by $2,643 per year for disabled women. Note that the effect of epilepsy on home production comprises 57% of the indirect costs of epilepsy for women who already have a disability.

To determine the per person indirect cost of epilepsy *in this sample*, I sum across the categories of labor market withdrawal, reduced earnings of workers, and the value of changes in annual hours of home production. The 1995 per person indirect costs of epilepsy are therefore $19,170 for non-disabled men, $2,657.86 for disabled men, $10,120 for non-disabled women, and $4,660 for disabled women.

IV. Differences in Costs by Seizure Characteristics

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[6] The PSID reports city size categories more broadly than does the CPS. This accounts for the difference in city size categories for the annual housework hours regressions than the work probit and selection bias corrected earnings regressions which used the CPS as the control group.

In the previous section I estimated the indirect cost of epilepsy for the onset of a seizure disorder as severe as that of the average person in my sample. Epilepsy is not a uniform disorder, there are many seizure characteristics which may have differing effects on the functioning of an individual in the labor market or in home production. In this section, I allow the indirect costs of epilepsy to vary across the specific seizure characteristics of the individual's epilepsy.

The estimates presented in this section will be used to predict the indirect costs of epilepsy for the persons sampled for the direct cost study. Information on age, sex, race, and the characteristics of the individual's seizure disorder was obtained for each patient in the direct cost study. Thus for each individual in the direct cost study I predict the indirect cost of the person's seizure disorder. The sample design of the direct cost study makes it possible to determine the costs of epilepsy for a randomly drawn individual who had onset of the average seizure severity. Thus, the indirect cost of epilepsy in the US and the lifetime costs of epilepsy will be based on the direct cost study's sample.

There are 9 seizure characteristics that are used in the empirical analysis. Dummy variable were created for (a) if the person has generalized seizures, (b) if the person has only one type of seizures, (c) if the person has had seizure surgery, (d) if the person has a symptomatic etiology, (e) if it has been two or more years since the person's last seizure, (f) if the onset of seizures was age 5 or less, (g) if the onset of seizures was between the age of 6 and 18, (h) if the onset of seizures was age 19 or more, (i) if the person had no seizures in past year, (j) if the person had between 1 and 12 seizures in the past year, and (k) if the person had more than 12 seizures in the past year.

Given the manner in which seizures were coded in the medical questionnaire, there were some categories where I knew the individual had at least one seizure in the past year, but I could not tell if the person had more or less than 12 seizures[7]. In the direct cost study, the only information on seizure frequency in past year is none, less than 12 or more than 12. For comparability across the two studies, I included a variable in all regressions if I was unsure if the individual had more than or less than 12 seizures per year. In this manner, I can obtain unbiased estimates of the effect of less than 12 and more than 12 on indirect costs.

Although some of the seizure characteristics are not reported for some of the individuals in the analysis, I do not exclude these observations from the analysis because they contain valuable information on other covariates. Instead, I replace missing values of each independent variable with its mean value in the sample and generate a dummy variable that equals one if the independent variable is missing. I then create a variable for the number of missing seizure characteristics. Thus I use the entire sample by including both the independent variable and the number of missing dummy variables as regressors.

Tables 11-13 report, for men and women separately, the work probit, the selection bias corrected earnings equations, and the annual hours of house work regressions when conditioning on the specific characteristics of a seizure disorder. The omitted category, or the baseline case, is a person with no disability other than epilepsy, who had onset over the age of 18, who is having 12 or more seizures per year, has idiopathic etiology, has not had seizure surgery, has more than one type of seizures, and has seizures that do not generalize. The effect of this type of epilepsy is the estimated coefficient on the epilepsy only variable.

[7] This is because the seizure frequency categories were as follows: for seizure type 1, did the person have none, less than 1, 1-6 6-12 or more than 12. For seizure type 2, did the person have none, less than

In all estimates except women's annual hours of home production and men's earnings, I find that there are significant differences (at the 10% level) in the effect of epilepsy that depends upon the seizure characteristics identified above. Seizure frequency has a significant impact on the labor force participation decisions of both men and women. Compared to having 12 or more seizures per year, men and women are significantly more likely to work if they have 1-12 seizures per year. Compared to having 1-12 seizures, men and women are more likely to work if they have no seizures per year. Compared to having no seizures in the past year, men and women are more likely to work if they have not had a seizure in the past two years.

In the selection bias corrected annual earnings regressions, I reject the hypothesis that the effect of epilepsy varies across the 10 seizure characteristics for men. For women, there are significant differences in the effect of epilepsy on earnings that depend upon the specific characteristics of the individual's seizure disorder. In particular, onset before the age of 19 significantly reduces the earning of women. Seizure onset before the age of 6 has a larger negative impact on earnings than onset between the ages of 6 and 18. Women who have not had a seizure in the past year have significantly higher earnings than women who have had 12 of more seizures in the past year. Compared to women who have not had seizure surgery, women who have had seizure surgery have significantly lower earnings. This result is likely due to omitted aspects of seizure severity. Surprisingly, I also find that women who have only one type of seizure earn significantly less than women with more than one type of seizure.

Finally in the annual hours of housework regressions I find that men's housework hours are significantly lower if they have had seizure surgery than if they have not had

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1, 1-6 or more than 6.

seizure surgery. Compared to men who are having 12 or more seizures per year, men who have had no seizures in the past year spend significantly fewer hours in home production.

It is important to realize that the work probits and selection bias corrected wage equations are non-linear models. As a result, it is difficult to determine what is *the* magnitude of the effect of any particular seizure characteristic on the likelihood of working or on earnings per year. The effect of each seizure characteristic depends upon all the other seizure characteristics of the individual. To provide a sense of the magnitudes of the effects of various seizure characteristics on indirect costs, I use the omitted category as the base case of epilepsy i.e., a person with onset over the age of 18, who is having 12 or more seizures per year, has idiopathic etiology, has not had seizure surgery, has more than one type of seizures, and has seizures that do not generalize. I then change each seizure characteristics one at a time and examine the effects on the probability of working, earnings given the person works, and annual housework hours. All other characteristics are held at the mean level in the CPS. These results are presented in Table 14 for men and Table 15 for women. Note that, because of the non-linearity in the models used, the sum of the component effects of seizure characteristics need not equal the total effect.

The effects of seizure frequency on the probability of working are substantial for both men and women. Even a reduction of seizure frequency from 12 or more per year to 1-12 seizures per year will increase the probability that the individual works by 11 to 12 percent. A reduction from 12 or more per year to none in the past year increases the probability of working by 19 to 24 percent per year. Finally, an individual is 33.6 to 34.1 percent more likely to work if she has been seizure free for two or more years than if she is currently having seizures.

Early age at onset has the largest negative effect on the earnings of working individuals. For men, onset before the age of 6 versus onset after 19 reduces earnings by $10,605 per year. For women, onset before the age of 6 reduces earnings by 12,380 per year while onset between the ages of 6 and 18 reduces earnings by $4,997 per year relative to onset after the age of 18. Relative to having more than 12 seizures per year, being seizure free for a year increases annual earnings by $8,101 for women. There is an additional premium in annual earnings if women have been seizure free for 2 or more years. The point estimates for seizure frequency for men are similar, but these results are not statistically significant at the 10% level. Finally, women's annual earnings are reduced by $5,154 if she has generalized versus partial seizures, $4,583 if she has one type of seizures relative to having more than one type of seizures, and $4,840 if she has had seizure surgery.

There are few individually significant effects of seizure characteristics on annual hours of housework for either men or women. Annual housework hours are reduced by 82 hours if a man has had seizure surgery. The largest point estimate for men is the reduction of 137 hours per year on housework when the individual has been seizure free for a year versus having 12 or more seizures per year. The largest point estimate for women is the reduction of 98 hours per year on housework when the individual has a symptomatic versus an idiopathic etiology.

V. Effect of Epilepsy on Educational Attainment, Marital Status, and Job Duration

Finally, I estimate the effects of epilepsy on three important socioeconomic decisions: educational attainment, job duration, and marriage. Each of these intermediate decisions *contribute* to differences in the probability of working, earnings per year, or housework hours. Thus the effect of epilepsy on education, job duration, and marriage do not add to indirect costs estimated above but instead shed some light on the manner in which epilepsy affects labor market decisions.

A. Education Regressions

Epilepsy is likely to affect the costs as well as the benefits of acquiring an additional year of schooling. Economists model individuals as acquiring years of education until the added costs of an additional year of school outweigh the added benefits. One of the largest costs of attending school for one more year is foregone earnings. Epilepsy reduces market wages and so reduces the costs of going to school. However, epilepsy may also reduce the amount of human capital acquired per year of schooling as so reduces the benefits of attending school. Therefore, effect of epilepsy on years of education need not be linear since increases in the severity of epilepsy may not affect the added costs and benefits of schooling equally. In my previous work I demonstrated that people with epilepsy whose disorder is the least severe acquire additional years of education while people whose epilepsy is the most severe acquire significantly less education. The net costs of the effects of epilepsy on educational attainment will be estimated.

I use the March 1996 CPS sample to examine differences in educational attainment across people with and without epilepsy. The dependent variable is the number of years of education the person has completed[8]. I use the same set of independent variables used in the work probits and selection bias corrected earnings equation, i.e., exogenous variables that are likely to be different across samples simply due to differences in sample design. Table 16 presents the education regressions for men and women. I find that men with no disabilities other than epilepsy acquire .48 years significantly less education than non-disabled men in the CPS. If a man already has a disability, I find that adding epilepsy leads to no significant differences educational choice. I find similar results for women, though the effect of epilepsy is smaller in magnitude than for men. Epilepsy alone leads women to acquire .23 less years of education. In regressions not reported here, I find that there are significant differences in women's educational attainment depending upon the specific nature of their seizure disorder. Early age at onset has a significant negative impact and reduced seizure frequency has a significant positive impact on the educational attainment of women. I find no significant differences in men's educational attainment depending upon the specific nature of their seizure disorder.

B. Married Probits

Several studies have estimated a "marriage premium" particularly for men: employed men that are married earn more than employed men that are not married[9]. Economists attribute the marriage premium to the ability of married individuals to specialize in either household production or market production. People who specialize are more productive than people who do not specialize. Therefore, married individuals that

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[8] Educational attainment is reported only in categories in the March 1996 CPS. I use the midpoint of each category to construct a continuous education measure. I use the same methodology for the sample of persons with epilepsy for the sake of comparability.

specialize in market work are more productive than single individuals who can not specialize in market work.

I also use the March 1996 CPS control sample to analyze the differences in the probability of marriage across people with and without epilepsy. The dependent variable is a one if the person is currently married and is zero otherwise. I use the same set of independent variables used in the work probits and selection bias corrected earnings equation, i.e., the exogenous variables that are likely to be different across samples simply due to differences in sample design. Table 17 presents the marital probits for men and women. Both men and women with epilepsy are significantly less likely to be married than men and women without the disorder. For women with no disability and the average CPS characteristics, there is a 61 percent chance that the individual is married. If the person has epilepsy, the probability of marriage falls to 45%. For the average women with a disability in the CPS, there is a 46 percent chance that she is married. If the women also has epilepsy and another disability, the probability of marriage falls to 36%. In regressions not reported here, I find that there are significant differences in women's probability of being married depending upon the specific nature of their seizure disorder. Being seizure free for 2 or more years and later age at onset significantly increase the likelihood of marriage for women with epilepsy. The average non-disabled man in the CPS has a 61 percent chance of being married. If the person has epilepsy, the probability of marriage falls to 38%. For the average man with a disability in the CPS, there is a 46 percent chance that he is married. If the man also has epilepsy and another disability, the probability of marriage falls to 32%. Thus the negative effects of epilepsy on the chance of

[9] Kermit Daniel, "Does Marriage Make Workers More Productive?" Ph.D. dissertation, University of Chicago, August 1993.

being married is larger for men than for women. In regressions not reported here, I find that there are significant differences in men's probability of being married depending upon the specific nature of their seizure disorder. A reduction in seizure frequency per year, being seizure free for 2 or more years, and later age at onset all significantly increase the likelihood of marriage for men with epilepsy.

C. Selection Bias Corrected Tenure Regressions

Epilepsy may affect job turnover in several ways. First, the onset of seizures may either depreciate specific investments in job skills or cause them to become obsolete. The depreciation of investments in human capital are expected to increase job turnover. For example, consider an airline pilot who first has seizures at age forty. Clearly the human capital investments made prior to the onset of her seizure disorder have depreciated dramatically. Employers may find that accommodating an individual's seizure disorder is costly and so may be more likely to lay off persons with a seizure disorder.

Epilepsy may instead reduce job turnover. Most people in the U. S. obtain their health insurance through their employer or the employer of a family member. It has been hypothesized that there is less job mobility than there would be in the absence of employer-provided insurance because workers with pre-existing conditions are unwilling to leave their jobs for fear of losing their health insurance coverage. Recent estimates suggest that the turnover of workers with pre-existing conditions is reduced approximately 25%[10]. Economists have argued that job changing is an important source of earnings growth and

[10]Brigitte C. Madrian (February 1994), "Employment-Based Health Insurance and Job Mobility: Is There Evidence of Job-Lock?" Quarterly Journal of Economics, Vol. 109, no. 1, p27-54.

the empirical evidence for young men has provided some support for this hypothesis[11]. Note that this is not a cost of epilepsy *in addition* to the previous estimates of wage losses. Rather, reduced turnover is one of the reasons *why* wages are lower.

Length of time on the current job, or tenure, is not reported in the March 1996 CPS. Therefore, I use the 1992 PSID control group used in the annual hours of housework regressions to examine the effect of epilepsy on job tenure. The dependent variable is the number of months on the current job. I use the same set of independent variables used in the annual hours of housework regressions, i.e., the exogenous variables that are likely to be different across samples simply due to differences in sample design. Again, I use sample selection correction techniques because I only observe tenure for people who choose to work. Since epilepsy is a major influence on the decision to work, it is important to account for this potential source of bias.

Table 18 presents the selection bias corrected tenure regressions for men and women. There is significant selection bias in estimates of job tenure for both women. Interestingly, the selection into the sample is significantly negative. This means that the persons most likely to work tend to be those who have shorter job durations. I find that people with epilepsy remain on their jobs significantly longer than people without the disorder. The average PSID man without a disability has been with his current employer for 107 months. Men with only epilepsy have been with their current employer for an average of 30 months longer, which is a 28% increase in job duration. For men with a disability, I find no significant added effect of epilepsy. In regressions not reported here, I

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[11]Robert H. Topel and Michael P. Ward (1988), "Job Mobility and the Careers of Young Men." Cambridge, MA: NBER Working Paper No. 2649.

find no significant differences in men's job tenure depending upon the specific nature of their seizure disorder.

The average PSID woman without a disability has been with her current employer for 84 months. Women with only epilepsy have been with their current employers for an average of 23 months longer, which is a 27% increase in job duration. For women with a disability, I find a significant additional effect of epilepsy on job duration. Women with a disability in addition to their epilepsy remain on their jobs 25 months longer than women who have a disability but not epilepsy. In regressions not reported here, I find that there are significant differences in women's job duration depending upon the specific nature of their seizure disorder. Early age at onset significantly reduces time on the current job. Reductions in seizure frequency significantly reduce time on the current job. Women who have had seizure surgery have been on their jobs significantly longer than women who have not had seizure surgery.

The results found in this study for people with epilepsy are consistent with previous findings about the effect of pre-existing conditions on job turnover: job turnover is reduced approximately 27-28%. Thus these results are consistent with the hypothesis that people with epilepsy experience substantial job lock as a result of their disorder.

VI. Predicting Indirect Costs for the Direct Cost Study Sample

A. 1995 Indirect Costs

I calculate the 1995 indirect cost of epilepsy for each adult in the sample of individuals obtained for the direct cost study. These estimates answer the question, "What is the annual cost of epilepsy?" Note that there are no cross section indirect costs for children nor for senior citizens. This is because these people are not likely to be participating in the labor market. There are 269 people in the direct cost study that are over the age of 18 and under the age of 65. Table 1 presents the number of observations, mean, and standard deviation for each seizure characteristics that will be used to predict indirect costs for the direct cost sample. None of the adults in the direct cost study had seizure surgery. Further, no adult had seizure onset before the age of 1 due to the direct cost sample design.

A difference between the direct cost sample and the indirect cost sample is in the difference in the definition of a disability other than epilepsy. In the direct cost study, I know whether the individual had cerebral palsy and, if the patient was from the Mayo Clinic, I know if the individual is mentally retarded. 3.4% of the adults in the direct cost study have another disability in addition to their epilepsy. For these individuals, I use the estimates of the effect of epilepsy given the individual has a disability in addition to their seizure disorder. All the estimates reported below are for the adults in the direct cost study that do not have another disability.

I am interested in computing labor market costs and non-market costs for the direct cost study. Since I am not interested in decomposing the labor market costs, the calculations are more straightforward than those I estimated for my sample. For each person in the direct cost study, I estimate what earnings would be in the absence of the person's seizure disorder and what earnings would be given the person's seizure disorder. The difference in the predicted earnings is the labor market cost of epilepsy. Using the probit models in Table 11, I predict the probability that each person with epilepsy works. I then predict the probability that each person with epilepsy would work if he or she did not have epilepsy, i.e., I determine the probability of working based only on the individual's age, race, sex, ethnicity, region and city size. On average, epilepsy reduced the women's probability of working by 29.6%. Note that this is substantially less than the 38.1% average drop out probability estimated for the woman in the indirect cost study. On average epilepsy reduced men's probability of working by 34.4%. Again this is substantially less than the 48.8% average drop out probability for the men in my study.

I then use the selection bias earnings regressions in Table 12 to predict earnings given the person chooses to work. First I predict earnings for each person given their seizure disorder. I also predict the earnings that each person with epilepsy would make if he or she did not have epilepsy, i.e., I determine earnings based only on the individual's age, race, sex, ethnicity, region and city size. Expected earnings in the absence of a seizure disorder are then the probability the individual works multiplied by predicted earnings if the person works. Take non-disabled men for example. In the absence of a seizure disorder, the average man in the direct cost study would earn $38,637 if he worked and has a probability of working of 90 percent so that expected earnings are $35,326. Given his seizure disorder, the average man in the direct cost study has a 55% probability of working and, if working, he would earn $19,644. Expected earnings for non-disabled men with epilepsy in the direct cost study are therefore $12,275. Thus, the average labor market costs of epilepsy for non-disabled men in the direct cost study are $23,051, which represents labor costs of 53.3%. The average labor market costs of epilepsy for non-disabled women in the direct cost study are $15,342, which represents labor costs of 68%.

The second category of costs is the effect of epilepsy on home production. I use the annual hours of housework regressions reported in Table 13 to predict the change in housework hours due to epilepsy for each adult in the direct cost study. On average, epilepsy is predicted to increase the number of hours the direct cost men spend in housework by 161 hours per year. At $8.83 per hour, this means that epilepsy increases the value of the average man's home production by $1,424. On average, epilepsy is predicted to reduce the number of hours the direct cost women spend in housework by 205 hours per year. At $8.83 per hour, this means that epilepsy reduces the value of the average woman's home production by $1,808.

Finally, I sum across the two categories of costs (labor market costs and home production costs) for each man and women in the direct cost study. For the average non-disabled man in the direct cost study, the indirect cost of epilepsy in 1995 is $21,627. For the average non-disabled woman in the direct cost study, the indirect cost of epilepsy in 1995 is $15,342.

B. Lifetime Costs

In this section I estimate the lifetime costs of epilepsy for each person under the age of 65 in the direct cost study. These estimates answer the question, "With the onset of epilepsy, what is the expected lifetime cost of the disorder?" Regardless of the current age of the individual in the direct cost sample, I base the lifetime costs on the individual's age at onset. Thus, lifetime indirect costs are the present discounted value of annual indirect costs incurred from the person's age at onset until the person is 65. Note that for children, indirect costs begin at age 18. There are 475 individuals under the age of 65 in the direct cost sample.

I use a discount rate of 3.6 percent which is the current (1997) annual rate of return on Federal government inflation-indexed bonds.

VII. Conclusions

Table 1: Sample Means and Mean Differences Across the CPS and Epilepsy Samples
(Standard Deviations in Parentheses)

I. WOMEN

	Epilepsy Sample		CPS Sample		CPS-Epilepsy	
Black	.107	(.310)	.119	(.324)	.012	(.012)
Other Race	.043	(.203)	.039	(.193)	-.004	(.007)
Hispanic	.019	(.136)	.071	(.257)	-.052**	(.009)
Disability	.289	(.454)	.083	(.276)	-.206**	(.011)
Age	36.579	(10.004)	38.797	(12.397)	1.903**	(.534)
not an MSA	.325	(.469)	.301	(.459)	-.024	(.017)
100-249,999 in SMSA	.027	(.162)	.028	(.165)	.001	(.006)
250-999,999 in SMSA	.123	(.329)	.197	(.397)	.073**	(.015)
1m-4,499,999 in SMSA	.385	(.487)	.394	(.489)	.009	(.018)
5m or more in SMSA	.140	(.347)	.080	(.271)	-.059**	(.010)
East	.144	(.351)	.205	(.404)	.061**	(.015)
Midwest	.583	(.493)	.375	(.484)	-.207**	(.018)
South	.137	(.344)	.244	(.430)	.107**	(.016)
West	.113	(.317)	.176	(.380)	.063**	(.014)
Fraction Working	.412	(.493)	.761	(.427)	.349**	(.016)
Earnings of Workers	20566	(19918)	19519	(20665)	-1047.3	(1173.3)
Wage of Workers	13.19	(12.56)	11.48	(9.97)	-1.715**	(.570)
Annual Hours of Workers	1572.5	(756.3)	1665.26	(764.26)	92.811**	(43.415)
Sample Size	745		19271			

II. MEN

	Epilepsy Sample		CPS Sample		CPS-Epilepsy	
Black	.090	(.286)	.103	(.303)	.013	(.013)
Other Race	.047	(.211)	.035	(.184)	-.012	(.008)
Hispanic	.032	(.177)	.079	(.269)	.046**	(.012)
Disability	.294	(.456)	.074	(.262)	-.219**	(.012)
Age	36.632	(10.286)	38.535	(12.297)	2.218**	(.454)
not an MSA	.312	(.464)	.299	(.458)	-.013	(.020)
100-249,999 in SMSA	.045	(.207)	.027	(.163)	-.017**	(.007)
250-999,999 in SMSA	.142	(.349)	.196	(.397)	.055**	(.017)
1m-4,499,999 in SMSA	.400	(.490)	.399	(.490)	-.001	(.021)
5m or more in SMSA	.101	(.301)	.078	(.268)	-.023*	(.012)
East	.163	(.370)	.204	(.403)	.041**	(.018)
Midwest	.575	(.495)	.376	(.484)	-.198**	(.021)
South	.131	(.338)	.236	(.425)	.105**	(.018)
West	.093	(.291)	.184	(.387)	.090**	(.017)
Fraction Working	.474	(.500)	.890	(.313)	.416**	(.014)
Earnings of Workers	27609	(34106)	34531	(39226)	6922.0**	(2459.0)
Wage of Workers	14.67	(14.76)	15.93	(14.22)	1.25	(.89)
Annual Hours of Workers	1779.8	(690.2)	2063.76	(749.99)	283.93**	(47.05)
Sample Size	557		17636			

* indicates difference is significant at the 10% level
** indicates difference is significant at the 5% level

Table 2: Means and Number of Observations for Seizure Characteristics

Seizure Characteristic	Number of Observations	Mean (Standard Deviation)
% With Generalized Seizures	1200	.334 (.472)
% That Have Only One Type of Seizures	1193	.453 (.498)
% Had Seizure Surgery	1202	.242 (.429)
% With Symptomatic Etiology	1119	.421 (.494)
% Onset Age 5 years or less	1292	.261 (.439)
% Onset Age 6 to 18 years	1292	.397 (.489)
% Onset Age 19 years or older	1292	.342 (.475)
% Two or More Years Since Last Seizure	1238	.145 (.353)
% No Seizures in Past Year	1168	.207 (.405)
% Less than 12 Seizures in Past Year	1168	.484 (.500)
% More than 12 Seizures in Past Year	1168	.204 (.403)
% Had Seizures in Past Year but unsure if more or less than 12	1168	.105 (.307)

Table 3: Probit Models for Work
(Standard Errors in Parenthesis)

Independent Variable	Men		Women	
Epilepsy Only	-1.741**	(.071)	-1.053**	(.058)
Epilepsy plus another Disability	-2.356**	(.116)	-1.632**	(.098)
Disability Only	-1.880**	(.041)	-1.161**	(.035)
Black	.033	(2.775)	-1.672	(2.244)
"Other" Race	-.589**	(.067)	-.322**	(.050)
Hispanic	.347	(2.775)	-1.811	(2.246)
Age	1.380**	(.163)	.368**	(.121)
$Age^2/100$	-5.175**	(.657)	-1.548**	(.485)
$Age^3/1000$	.855**	(.112)	.287**	(.083)
$Age^4/100000$	-.053**	(.007)	-.020**	(.005)
Minority*Age	-.145	(.322)	.045	(.257)
Minority*Age^2 /100	.789	(1.326)	1.754	(1.046)
Minority*Age^3 /1000	-.164	(.231)	-.074	(.181)
Minority*Age^4 /10000	.012	(.014)	.006	(.011)
Midwest	.208**	(.040)	.168**	(.028)
South	.094**	(.044)	-.073**	(.031)
West	.108**	(.049)	.025	(.034)
100-249,999 in SMSA	.289**	(.100)	.021	(.064)
250-999,999 in SMSA	.009	(.042)	.022	(.030)
1m-4,499,999 in SMSA	.098**	(.038)	.018	(.027)
5m or more in SMSA	.040	(.060)	-.055	(.041)
Constant	-11.796**	(1.427)	-2.292**	(1.073)
Psuedo R-Squared	.312		.118	
Sample Size	18,193		20,016	

Note: Also included in the regressions is a dummy variable for missing information on whether the person with epilepsy has another disability.

* indicates difference is significant at the 10% level
** indicates difference is significant at the 5% level

Table 4: Selection Bias Corrected Earnings Regression

(Standard Errors in Parenthesis)

Independent Variable	Men		Women	
Epilepsy Only	-12653.59**	(2675.02)	-4993.34**	(1232.30)
Epilepsy plus another Disability	-30219.71**	(5748.73)	-19048.33**	(2541.64)
Disability Only	-27632.44**	(1664.76)	-16641.79**	(830.00)
Black	-56479.35	(75103.33)	37589.66	(41238.77)
"Other" Race	-5716.64**	(1647.37)	-3215.64**	(857.16)
Hispanic	-59915.18	(75108.70)	33970.87	(41248.67)
Age	5672.43	(3582.96)	15158.07**	(1909.35)
Age^2	-107.54	(144.75)	-529.61**	(77.23)
$Age^3/10$	14.30	(24.87)	84.41**	(13.27)
$Age^4/100$	-1.16	(1.54)	-5.14**	(.82)
Minority*Age	6453.88	(8597.12)	-3960.00	(4710.09)
Minority*Age^2	-267.10	(351.42)	136.24	(192.12)
Minority*Age^3 /10	41.12	(61.05)	-20.54	(33.33)
Minority*Age^4 /100	-2.11	(3.82)	1.16	(2.08)
Midwest	435.09	(801.98)	-1203.50**	(434.93)
South	1161.57	(927.37)	-2007.95**	(501.38)
West	2136.01**	(982.99)	617.63	(538.18)
100-249,999 in SMSA	3897.97**	(1799.84)	1478.01	(981.01)
250-999,999 in SMSA	6580.30**	(851.72)	3265.76**	(459.47)
1m-4,499,999 in SMSA	12157.91**	(756.54)	6446.32**	(408.48)
5m or more in SMSA	15456.58**	(1202.42)	7826.55**	(639.50)
Constant	-79797.03**	(31667.53)	-149857.9**	(16842.7)
Lambda	10360.57**	(57.85)	11939.15**	(390.22)
Sample Size	18193		20016	

Note: Also included in the regression is a dummy variable for missing information on whether the person with epilepsy has another disability.

* indicates significant at the 10% level

** indicates significant at the 5% level

Table 5: The Indirect Costs of Epilepsy for Men without a Disability

There are 16,293 non-disabled men in the March 1996 CPS that live in the same areas as epilepsy sample. 93.15% work and the average earnings of workers are $35,033.53

I. Labor Market Costs of Epilepsy

Probit model predicts that 95.02% of the CPS non-disabled men would work. If the men had epilepsy, the model predicts that 46.24% would work. Therefore, the model predicts that 48.78% of the CPS non-disabled men will drop out of the labor force as a result of having epilepsy.

7,947 men will drop out. Use the probit model to identify the 7,947 men with the lowest predicted probabilities of working. These are the men most likely to drop out as a result of a seizure disorder. The average earnings of these men is $29,958.60

The remaining 7,233 men are predicted to remain in the labor force even if they have epilepsy. In the absence of epilepsy these men earn on average $41,005.90. According to the selection bias corrected earnings regression, epilepsy reduces the earnings of these workers by $12,653.59, which is a reduction of 30.9%.

The labor market costs of epilepsy per non-disabled man are therefore
[($0 * 1,113) + ($29,958.60 * 7,947) + ($12,653.59 * 7233)] / 16,293 = $20,229.82

The pay of men in the CPS who live in areas where the epilepsy sample was obtained earn 1.6% more than the entire CPS sample. Therefore, I adjust down the $20,230 per non-disabled man labor market cost by 1.6%. The per person labor market cost of epilepsy is $19,907.

II. Non Labor Market Costs of Epilepsy

Epilepsy leads non disabled men to spend an additional 120.02 hours per year in home production. The average pay for Social Service workers in 1995 was $8.83 per hour. Thus, epilepsy increases the value of home production for men by $1059.78.

The Total Indirect Cost of Epilepsy per Non-Disabled Man is $20,229.82-$1,059.78=$19,170.04

Table 6: The Indirect Costs of Epilepsy for Men with a Disability

There are 1,343 disabled men in the March 1996 CPS that live in same areas as the epilepsy sample. 37.05% work and the average earnings of workers are $18,722.35.

I. Labor Market Costs of Epilepsy

Probit model predicts that 35.84% of the CPS disabled men would work. If the men had epilepsy, the model predicts that 20.08% would work. Therefore, the model predicts that 15.76% of the CPS disabled men will drop out of the labor force if they get epilepsy.

211 men will drop out. Use the probit model to identify the 211 men with the lowest predicted probabilities of working. These are the men most likely to drop out as a result of a seizure disorder. The average earnings of these men is $15,457.13.

The remaining 310 men are predicted to remain in the labor force even if they have epilepsy. In the absence of epilepsy these men earn on average $21,118.79. According to the selection bias corrected earnings regression, epilepsy reduces the earnings of workers by $2,587.27, which is a reduction of 12.3%.

The labor market costs of epilepsy per person are therefore
[($0 * 845) + ($15,457.13 * 211) + ($2,587.27 * 287)] / 1343 = $2,981.39

II. Non Labor Market Costs of Epilepsy

Epilepsy leads disabled men to spend an additional 36,64 hours per year in home production. The average pay for Social Service workers in 1995 was $8.83 per hour. Thus, epilepsy increases the value of disabled men's home production by $323.53

The Total Indirect Cost of Epilepsy per Disabled Man is $2,981.39-$323.53 = $2,657,86

Table 7: The Indirect Costs of Epilepsy for Women without a Disability

There are 17,622 non-disabled women in the March 1996 CPS that live in the same areas as epilepsy sample. 79.83% work and the average earnings of workers are $19,832.36

I. Labor Market Costs of Epilepsy

Probit model predicts that 80.62% of the CPS non-disabled women would work. If the women had epilepsy, the model predicts that 42.48% would work. Therefore, the model predicts that 38.14% of the CPS non-disabled women will drop out of the labor force as a result of having epilepsy.

6,735 women will drop out. Use the probit model to identify the 6,735 women with the lowest predicted probabilities of working. These are the women most likely to drop out as a result of a seizure disorder. The average earnings of these women are $18,553.21.

The remaining 7,365 women are predicted to remain in the labor force even if they have epilepsy. In the absence of epilepsy these women earn on average $21,111.99. According to the selection bias corrected earnings regression, epilepsy reduces the earnings of these workers by $4,993.34, which is a reduction of 23.7%

The labor market costs of epilepsy per non-disabled female are therefore
[($0 * 3,562) + ($18,553.21* 6735) + ($4,993.34 * 7365)] / 17,662 = $9,157.05

II. Non Labor Market Costs of Epilepsy

Epilepsy leads non disabled women to reduce their annual hours of home production by 109.04. The average pay for Social Service workers in 1995 was $8.83 per hour. Thus, epilepsy reduces the value of home production for non-disabled women by $962.82

Total Indirect Cost of Epilepsy per Non-Disabled Woman is $9,157.05 + $962.82 = $10,119.89

Table 8: The Indirect Costs of Epilepsy for Women with a Disability

I. Labor Market Costs of Epilepsy

There are 1609 disabled women in the March 1996 CPS that live in same areas as the epilepsy sample. 34.55% work and the average earnings of workers are $11,532.03.

Probit model predicts that 33.66% of the CPS disabled women would work. If the women had epilepsy, the model predicts that 18.60% would work. Therefore, the model predicts that 15.06% of the CPS disabled women will drop out of the labor force if they get epilepsy.

242 women will drop out. Use the probit model to identify the 242 women with the lowest predicted probabilities of working. These are the women most likely to drop out as a result of a seizure disorder. The average earnings of these women is $10,268.27.

The remaining 314 women are predicted to remain in the labor force even if they get epilepsy. In the absence of epilepsy these women earn on average $12,516.28. According to the selection bias corrected earnings regression, epilepsy reduces the earnings of these workers by $2,406.54, which is a reduction of 19.2%.

The labor market costs of epilepsy per person are therefore
[($0 * 1053) + ($10,286.27 * 242) + ($2,406.54 * 314)] / 1609 = $2,016.74

II. Non Labor Market Costs of Epilepsy

Epilepsy leads disabled women to annual housework hours by 299.34. The average pay for Social Services workers in 1995 was $8.83 per hour. Thus, epilepsy reduces the value of home production for disabled women by $2,643.14.

The Total Indirect Cost of Epilepsy per Disabled Woman is $2,016.74+$2,643.14= $4,659.89.

Table 9: Sample Means and Mean Differences Across the PSID and Epilepsy Samples
(Standard Deviations in Parentheses)

I. WOMEN

	Epilepsy Sample		PSID Sample		PSID-Epilepsy	
Annual Hours Housework	769.13	(725.66)	999.86	(743.86)	230.73**	(28.90)
Black	.107	(.309)	.155	(.362)	.048**	(.014)
Other Race	.044	(.205)	.042	(.200)	-.002	(.008)
Hispanic	.019	(.137)	.080	(.271)	.060**	(.010)
Disability	.287	(.453)	.148	(.355)	-.140**	(.015)
Age	36.418	(9.903)	40.870	(11.872)	4.452**	(.455)
under 100,000 in SMSA	.279	(.449)	.576	(.494)	.298**	(.019)
100-500,000 in SMSA	.112	(.316)	.257	(.437)	.145**	(.017)
Over 500,000 in SMSA	.609	(.488)	.167	(.373)	-.443**	(.015)
East	.163	(.369)	.216	(.412)	.054**	(.016)
Midwest	.590	(.492)	.268	(.443)	-.322**	(.017)
South	.133	(.339)	.333	(.471)	.200**	(.018)
West	.115	(.319)	.183	(.387)	.068**	(.015)
Unemployment rate	.041	(.016)	.068	(.023)	.027**	(.001)
Sample Size	732		6869			

II. MEN

	Epilepsy Sample		PSID Sample		PSID-Epilepsy	
Annual Hours Housework	493.10	(598.49)	399.88	(425.07)	-93.22**	(19.75)
Black	.090	(.286)	.096	(.295)	.007	(.013)
Other Race	.044	(.205)	.042	(.200)	-.002	(.009)
Hispanic	.033	(.179)	.077	(.266)	.044**	(.012)
Disability	.291	(.455)	.141	(.348)	-.149**	(.017)
Age	36.757	(10.369)	40.698	(11.508)	3.941**	(.510)
under 100,000 in SMSA	.254	(.436)	.593	(.491)	.339**	(.022)
100-500,000 in SMSA	.143	(.350)	.254	(.435)	.111**	(.019)
Over 500,000 in SMSA	.603	(.490)	.153	(.360)	-.450**	(.017)
East	.203	(.403)	.223	(.417)	.021	(.019)
Midwest	.576	(.495)	.271	(.445)	-.305**	(.020)
South	.130	(.336)	.325	(.469)	.196**	(.021)
West	.091	(.288)	.180	(.384)	.088**	(.017)
Unemployment rate	.042	(.017)	.067	(.023)	.025**	(.001)
Sample Size	547		6021			

* indicates difference is significant at the 10% level
** indicates difference is significant at the 5% level

Table 10: Annual Hours of Housework Regressions
(Standard Errors in Parenthesis)

Independent Variable	Men		Women	
Epilepsy Only	126.02**	(37.60)	-109.04**	(53.56)
Epilepsy plus another Disability	63.02	(45.52)	-261.53**	(68.88)
Disability Only	26.38	(16.64)	37.81	(25.37)
Black	2434.36**	(682.34)	2118.01**	(895.12)
"Other" Race	-23.02	(29.30)	111.00**	(49.05)
Hispanic	2382.07**	(684.69)	2334.62**	(899.72)
Age	41.01	(39.25)	21.31	(55.96)
$Age^2/100$	-89.77	(150.49)	232.76	(217.63)
$Age^3/1000$	4.68	(25.31)	-80.01**	(37.11)
$Age^4/100000$	2.37	(15.64)	68.39**	(23.19)
Minority*Age	-213.85**	(69.09)	-149.21	(95.20)
Minority*Age^2 /100	696.82**	(268.88)	299.15	(379.02)
Minority*Age^3 /1000	-97.74**	(47.13)	15.46	(66.49)
Minority*Age^4 /100000	49.85*	(30.60)	-5.94	(42.83)
Midwest	8.56	(15.73)	-10.00	(24.62)
South	-45.35**	(15.70)	-11.31	(24.56)
West	11.68	(18.24)	-60.60**	(28.01)
100-500,000 in SMSA	-25.52*	(13.53)	-91.78**	(20.96)
Over 500,000 in SMSA	-29.66*	(15.88)	-84.41**	(23.79)
Unemployment Rate	-2.65	(2.51)	14.64**	(3.92)
Constant	-125.21	(381.97)	-199.76	(537.92)
R-Squared	.013		.038	
Adj R-Squared	.009		.035	
Sample Size	6,567		7,598	

Note: Also included in the regressions are dummy variables for missing information on whether the person with epilepsy has another disability and missing unemployment rate.

* indicates difference is significant at the 10% level
** indicates difference is significant at the 5% level

Table 11: Probit Models for Work Allowing For Differences by Seizure Characteristic

(Standard Errors in Parenthesis)

Independent Variable	Men		Women	
Epilepsy Only	-1.870**	(.192)	-1.480**	(.155)
Onset <= Age 5	.168	(.160)	-.175	(.125)
Onset between 6 and 18 years old	.136	(.134)	-.131	(.116)
2 or more Years Since Last Seizure	.433**	(.213)	.255*	(.151)
Symptomatic Etiology	-.534**	(.124)	.020	(.110)
Had Seizure Surgery	-.034	(.137)	-.200	(.125)
Have One Type of Seizures	.203	(.138)	-.059	(.115)
Have Generalized Seizures	-.160	(.131)	.034	(.111)
Had No Seizures Last Year	.592**	(.218)	.674**	(.178)
Had 1-12 Seizures Last Year	.388**	(.164)	.331**	(.150)
Unsure if >12 or <12 Seizures	.211	(.249)	.240	(.183)
Epilepsy plus another Disability	-2.428**	(.208)	-1.962**	(.170)
Disability Only	-1.881**	(.041)	-1.160**	(.035)
Missing+	.116**	(.044)	.040	(.037)
Black	.180	(2.777)	-1.566	(2.265)
"Other" Race	-.585**	(.067)	-.321**	(.051)
Hispanic	.501	(2.778)	-1.705	(2.266)
Age	1.371**	(.164)	.369**	(.122)
$Age^2/100$	-5.127**	(.660)	-1.551**	(.488)
$Age^3/1000$	.846**	(.113)	.287**	(.083)
$Age^4/100000$	.052**	(.007)	.020**	(.005)
Minority*Age	-.161	(.323)	.033	(.259)
Minority*Age^2 /100	.845	(1.327)	.226	(1.055)
Minority*Age^3 /1000	-.172	(.231)	-.082	(.182)
Minority*Age^4 /10000	.012	(.014)	.007	(.011)
Midwest	.202**	(.040)	.163**	(.029)
South	.093**	(.045)	-.076	(.032)
West	.104**	(.049)	.022	(.035)
100-249,999 in SMSA	.283**	(.100)	.027	(.064)
250-999,999 in SMSA	.016	(.042)	.024	(.030)
1m-4,499,999 in SMSA	.104**	(.038)	.020	(.027)
5m or more in SMSA	.047	(.060)	-.053	(.042)
Constant	-11.911**	(1.436)	-2.125**	(1.081)
Psuedo R-Squared	.316		.119	
Sample Size	18,193		20,016	
F-test for 10 seizure characteristics	54.11		33.69	
p-value of F-test	.000		.000	

+ The number of seizure characteristics that are missing for the person * indicates significant at the 10% level ** indicates significant at the 5% level

Table 12: Selection Bias Corrected Earnings Regression Allowing For Differences by Seizure Characteristic

(Standard Errors in Parenthesis)

Independent Variable	Men		Women	
Epilepsy Only	-20328.73**	(8070.23)	-13876.75**	(3542.32)
Onset age<=5	-10452.30	(6367.05)	-12244.57**	(2729.64)
Onset between age 6 and 18	-6753.78	(5164.52)	-4882.34**	(2422.64)
2 or more Years Since Last Seizure	2016.95	(7149.69)	1311.95	(2899.89)
Symptomatic Etiology	-6898.28	(5380.96)	-614.76	(2413.22)
Had Seizure Surgery	-5789.69	(5788.07)	-4723.47*	(2796.00)
Have One Type of Seizures	-6256.32	(5398.65)	-4524.38*	(2371.65)
Had No Seizures Last Year	9328.67	(8581.84)	8677.38**	(3771.39)
Had 1-12 Seizures Last Year	10415.92	(7190.87)	4907.58	(3422.08)
Unsure if >12 or <12 Seizures	-1339.95	(11440.21)	4400.52	(4208.28)
Have Generalized Seizures	1316.73	(5328.82)	-4985.63**	(2344.34)
Epilepsy plus another Disability	-35641.34**	(9664.93)	-25564.57**	(3914.50)
Disability Other than Epilepsy	-28397.89**	(1660.21)	-17706.21**	(786.06)
Miss+	2032.51	(1550.77)	543.70	(772.56)
Black	-55336.97	(75027.52)	38577.42	(40722.71)
“Other” Race	-5799.86**	(1646.56)	-3393.95**	(847.88)
Hispanic	-58630.76	(75033.26)	34920.48	(40732.67)
Age	6156.96*	(3581.58)	15582.59**	(1894.32)
Age^2	-126.91	(144.69)	-547.10**	(76.59)
$Age^3/10$	17.65	(24.85)	87.51**	(13.16)
$Age^4/100$	-1.38	(1.54)	-5.34**	(.81)
Minority*Age	6219.35	(8588.88)	-4155.14	(4651.72)
Minority*Age^2	-255.02	(351.09)	145.77	(189.73)
Minority*Age^3 /10	38.75	(61.00)	-22.32	(32.91)
Minority*Age^4 /100	-1.95	(3.82)	1.27	(2.06)
Midwest	434.31	(802.12)	-1183.84**	(431.25)
South	1177.22	(927.23)	-2079.06**	(497.56)
West	2127.50**	(982.88)	560.24	(534.28)
100-249,999 in SMSA	3967.20**	(1800.04)	1501.17	(974.76)
250-999,999 in SMSA	6612.97**	(851.66)	3297.67**	(456.29)
1m-4,499,999 in SMSA	12211.25**	(756.60)	6484.97**	(405.79)
5m or more in SMSA	15547.96**	(1202.57)	7760.04**	(635.37)
Constant	-73828.17**	(32272.05)	-141665.20**	(16894.95)
Lambda	11280.23**	(62.98)	13225.68**	(272.55)
Sample Size	18,193		20,016	
F-test for 10 seizure characteristics	10.38		38.17	
p-value of F-test	.408		.000	

+ The number of seizure characteristics that are missing for the person * indicates significant at the 10% level ** indicates significant at the 5% level

Table 13: Annual Hours of Housework Regressions Allowing For Differences by Seizure Characteristic

(Standard Errors in Parenthesis)

Independent Variable	Men		Women	
Epilepsy Only	212.86**	(64.33)	-75.95	(85.83)
Onset Age <=5	-5.95	(50.97)	-1.86	(70.46)
Onset Age between 6 and 18	17.43	(43.96)	-36.97	(66.72)
2 or more Years Since Last Seizure	70.45	(65.92)	-44.52	(85.43)
Symptomatic Etiology	-63.26	(40.73)	-97.93	(61.17)
Had Seizure Surgery	-82.43*	(45.30)	47.49	(70.76)
Have One Type of Seizures	25.01	(45.53)	-54.77	(66.06)
Had No Seizures Last Year	-137.45*	(71.98)	31.71	(98.59)
Had 1-12 Seizures Last Year	-57.10	(53.37)	12.20	(81.88)
Unsure if >12 or <12 Seizures	-203.17**	(83.68)	242.19**	(102.27)
Have Generalized Seizures	-2.53	(42.67)	-74.20	(63.49)
Black	2344.82**	(685.80)	2311.91**	(903.26)
"Other" Race	-20.69	(29.31)	111.40**	(49.03)
Hispanic	2293.59**	(688.13)	2529.66**	(907.77)
Disability Other than Epilepsy	26.46	(16.63)	37.26	(25.35)
Epilepsy and Another Disability	153.80**	(66.90)	-213.35**	(92.34)
Age	38.97	(39.64)	-1.44	(55.69)
Age Squared/10	-8.19	(15.19)	31.76	(21.68)
Age Cubed/1000	3.44	(25.53)	-93.56**	(36.98)
Age Quartic/100000	3.06	(15.76)	76.24**	(23.12)
Minority*Age	-204.55**	(69.44)	-171.39*	(96.10)
Minority*Age Squared/10	66.18**	(27.01)	38.83	(38.24)
Minority*Age Cubed/1000	-92.16*	(47.29)	-30.60	(67.01)
Minority*Age Quartic / 100000	46.65	(30.68)	3.29	(43.11)
Midwest	7.73	(15.77)	-8.79	(24.66)
South	-45.58**	(15.71)	-11.60	(24.55)
West	11.08	(18.26)	-64.30**	(28.05)
100-249,999 in SMSA	-25.73*	(13.54)	-89.89**	(20.97)
250-999,999 in SMSA	-29.71*	(15.90)	-81.54**	(23.83)
Miss+	-10.26	(13.33)	-44.99**	(18.52)
Unemployment Rate	-2.64	(2.51)	14.31**	(3.92)
Missing Unemployment Rate	-113.46*	(60.61)	148.08	(98.63)
Constant	-100.47	(389.90)	25.20	(536.05)
Sample Size	6,567		7,598	
R-Squared	.015		.041	
Adj R-Squared	.010		.037	
F-test for 10 seizure characteristics	1.60		1.340	
p-value of F-test	.100		.203	

+ The number of seizure characteristics that are missing for the person * indicates significant at the 10% level ** indicates significant at the 5% level

Table 14: The Differential Effects of Seizure Characteristics for MEN

	Change in Probability of Working	Change in Earnings Given Working	Change in Annual Hours Housework
Onset under Age 6 versus Onset over 18	.041	-$10,605.49*	-5.946
Onset Ages 6 to 18 versus Onset over 18	.045*	-$6,753.78	17.435
Seizure Free for > 2 years versus 12 Seizures this Year	.336**	$11,345.62	67.003
No Seizures this year versus 12 Seizures this Year	.194**	$9,328.67	-137.448
6 Seizures this years versus 12 Seizures this Year	.122**	$10,415.92	-57.095
Symptomatic versus Idiopathic Etiology	-.182**	-$6,898.28	-63.256
Seizure Surgery versus No Seizure Surgery	-.005	-$5,789.69	-82.426*
One Seizure Type versus More than One Type	.063**	-$6,256.32	25.005
Generalized versus Partial Seizures	-.057**	$1,316.73	-2.530

** indicates significant at the 5% level
* indicates significant at the 10% level

Table 15: The Differential Effects of Seizure Characteristics for WOMEN

	Change in Probability of Working	Change in Earnings Given Working	Change in Annual Hours Housework
Onset at Age 5 or less versus Onset over 18	-.067*	-$12,244.57**	-1.860
Onset between 6 & 18 versus Onset over 18	-.051	-$4,882.34**	-36.968
Seizure Free for > 2 years versus 12 Seizures this Year	.341**	$9,989.33	-12.802
No Seizures this Year versus 12 Seizures this Year	.240**	$8,677.38**	31.714
6 Seizures this years versus 12 Seizures this Year	.111**	$4,9907.58	12.201
Symptomatic versus Idiopathic Etiology	.002	-$614.76	-97.923
Seizure Surgery versus No Seizure Surgery	-.063*	-$4,723.47*	47.490
One Seizure Type versus More than One Type	-.023	-$4,524.38*	-54.774
Generalized versus Partial Seizures	.011	-$4,985.63**	-74.201

** indicates significant at the 5% level
* indicates significant at the 10% level

Table 16: Education Regressions
(Standard Errors in Parenthesis)

Independent Variable	Men		Women	
Epilepsy Only	-.483**	(.116)	-.228**	(.093)
Epilepsy plus another Disability	-1.084**	(.178)	-1.103**	(.145)
Disability Only	-1.207**	(.063)	-1.046**	(.055)
Black	6.192*	(3.766)	7.334**	(3.427)
"Other" Race	.275**	(.087)	-.062	(.076)
Hispanic	5.057	(3.768)	6.173*	(3.428)
Age	2.155**	(.191)	2.064**	(.174)
Age^2	-.078**	(.008)	-.074**	(.007)
$Age^3/100$	.122**	(.013)	.114**	(.012)
$Age^4/100000$	-.071**	(.008)	-.065**	(.007)
Minority*Age	-.683	(.433)	-.874**	(.391)
Minority*Age^2	.025	(.018)	.035**	(.016)
Minority*Age^3 /100	-.040	(.031)	-.060**	(.027)
Minority*Age^4 /100000	.024	(.019)	.037**	(.017)
Midwest	-.061	(.044)	-.107**	(.040)
South	-.101**	(.051)	-.204**	(.046)
West	.326**	(.054)	.241**	(.050)
100-249,999 in SMSA	.547**	(.101)	.354**	(.092)
250-999,999 in SMSA	.474**	(.047)	.339**	(.043)
1m-4,499,999 in SMSA	.797**	(.042)	.595**	(.038)
5m or more in SMSA	1.185**	(.066)	.912**	(.059)
Constant	-8.686**	(1.694)	-7.380**	(1.539)
R-Squared	.149		.128	
Adjusted R-Squared	.148		.127	
Sample Size	18,193		20,016	

Note: Also included in the regressions is a dummy variable for missing information on whether the person with epilepsy has another disability.

* indicates difference is significant at the 10% level
** indicates difference is significant at the 5% level

Table 17: Married Probits
(Standard Errors in Parenthesis)

Independent Variable	Men		Women	
Epilepsy Only	-.578**	(.072)	-.382**	(.060)
Epilepsy plus another Disability	-1.040	(.123)	-.789**	(.096)
Disability Only	-.671**	(.039)	-.537**	(.035)
Black	-1.386	(3.049)	6.925**	(2.528)
"Other" Race	-.012	(.058)	-.044	(.051)
Hispanic	-.868	(3.048)	7.707**	(2.528)
Age	1.538**	(.155)	1.692**	(.130)
Age^2	-.048**	(.006)	-.055**	(.005)
$Age^3/100$	.067**	(.010)	.079**	(.008)
$Age^4/100000$	.035**	(.006)	-.042**	(.005)
Minority*Age	.198	(.337)	-.722**	(.282)
Minority*Age^2	-.011	(.013)	.025**	(.011)
Minority*Age^3 /100	.021	(.023)	-.037*	(.019)
Minority*Age^4 /100000	-.015	(.014)	.021*	(.012)
Midwest	.074**	(.029)	.065**	(.027)
South	.180**	(.033)	.163**	(.031)
West	.026	(.035)	.046	(.033)
100-249,999 in SMSA	-.140**	(.065)	-.147**	(.061)
250-999,999 in SMSA	-.111**	(.031)	-.103**	(.028)
1m-4,499,999 in SMSA	-.089**	(.027)	-.115**	(.025)
5m or more in SMSA	-.167**	(.043)	-.198**	(.039)
Constant	-17.857**	(1.429)	-18.590**	(1.182)
Pseudo R-Squared	.213		.155	
Sample Size	18,193		20,016	

Note: Also included in the regressions is a dummy variable for missing information on whether the person with epilepsy has another disability.

* indicates difference is significant at the 10% level
** indicates difference is significant at the 5% level

Table 18: Selection Bias Corrected Tenure Regressions
(Standard Errors in Parenthesis)

Independent Variable	Men		Women	
Epilepsy Only	29.923**	(9.916)	23.052**	(7.404)
Epilepsy plus another Disability	12.930	(16.003)	32.626**	(11.012)
Disability Only	-8.296*	(5.039)	7.904**	(3.549)
Black	399.433*	(204.527)	-81.206	(147.294)
"Other" Race	-6.567	(6.877)	-11.904*	(6.316)
Hispanic	389.042*	(204.883)	-99.627	(147.641)
Age	20.670*	(10.571)	-7.184	(8.049)
Age^2	-1.094**	(.411)	-.433	(.314)
$Age^3/100$	2.727**	(.699)	.790	(.535)
$Age^4/10000$	-2.212**	(.436)	.545	(.335)
Minority*Age	-55.197**	(21.108)	18.175	(15.812)
Minority*Age^2	2.703**	(.822)	-1.016	(.628)
Minority*Age^3 /100	-5.531**	(1.423)	2.216**	(1.088)
Minority*Age^4 /10000	4.001**	(.910)	-1.628**	(.691)
Midwest	2.632	(3.759)	-9.238**	(2.998)
South	-4.458	(3.778)	-4.386	(3.023)
West	-9.207**	(4.390)	-3.754	(3.434)
100-500,000 in SMSA	-1.744	(3.224)	6.387**	(2.529)
Over 500,000 in SMSA	-3.536	(3.775)	1.044	(2.967)
Unemployment Rate	1.383**	(.610)	.037	(.499)
Constant	-133.906	(100.969)	64.206	(76.691)
Lambda	-20.809**	(4.765)	-46.840**	(.413)
Sample Size	6,651		7,715	

Note: Also included in the regressions are dummy variables for missing information on whether the person with epilepsy has another disability and missing unemployment rate.

* indicates difference is significant at the 10% level
** indicates difference is significant at the 5% level

Table 19: Means and Number of Observations for Seizure Characteristics in the Begely-Annegars Direct Cost Study

Seizure Characteristic	Number of Observations	Mean (Standard Deviation)
% With Generalized Seizures	134	.515 (.502)
% That Have Only One Type of Seizures	222	.860 (.347)
% Had Seizure Surgery	0	0
% With Symptomatic Etiology	269	.342 (.475)
% Onset Age 5 years or less	0	0
% Onset Age 6 to 18 years	269	.186 (.390)
% Onset Age 19 years or older	269	.814 (.390)
% Two or More Years Since Last Seizure	269	.591 (.493)
% No Seizures in Past Year	265	.506 (.501)
% Less than 12 Seizures in Past Year	265	.253 (.435)
% More than 12 Seizures in Past Year	265	.242 (.429)