Model Review: Disabled Deduction (Supplement to Personal Income Tax model)

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Model Purpose	For the personal income tax (PIT) model, assign an assumed disability status, which will allow us to estimate the disabled deduction
Data Sources	(1) IRS individual income tax data, TY2017 (2) American Community Survey (2013-2017), as summarized in the American FactFinder
Attachment	U.S. Census Bureau (n.d.) American FactFinder: S1810 Disability Characteristics - 2013-2017 American Community Survey 5-Year Estimates.
Requirements Model Used to Fulfill	This is a supplemental analysis, to support development of a model for a personal income tax, as required under ESHB 1109 (2019), Sec. 137(B) (c)(vii).
Questions for Technical Advisory Group	We do not have specific questions, but welcome advice and suggestions.
Questions from Technical Advisory Group	

Overview

The 2002 Gates report recommended a $1,000 deduction for disabled filers. However, it did not describe the deduction, and 2003 legislation did not include this feature. We assume individuals meeting the definition of "disabled" used by the American Communities Survey (ACS) qualify for the deduction.

Using ACS information, we will develop assumptions about which filers are disabled, and assume they take the deduction, taking the following steps:

1. We will develop an equation that describes the relationship between age and disability status.
2. We will use each taxpayer's age to estimate the likelihood of disability.
3. Using this likelihood, we will assign an assumed disability status for each taxpayer.

Background

According to the American Communities Survey, among Washington residents living in the community, an estimated 13 percent were disabled in 2017 [1]. The survey classifies a person as disabled if the survey response indicated a difficulty with hearing, vision, cognition, mobility, self-care, or independent living [2].

While ACS documentation does not clearly define "living in the community," it does state that disability tabulations are reported for the "civilian noninstitutionalized population." Thus, we assume that populations living in residential treatment centers, skilled nursing facilities, group homes, military barracks, and correctional facilities are excluded from summary tables.

For community-dwelling individuals, summary statistics from the Census Bureau's American FactFinder reveal a positive association between disability and age. For instance, in Washington, middle-aged adults (age 35 to 64 years) had disabilities at a similar rate as the state average (13%). But older adults had higher rates; about one-quarter of those age 65 to 74 were disabled, while about half of those age 75 or over were disabled [Figure 1].
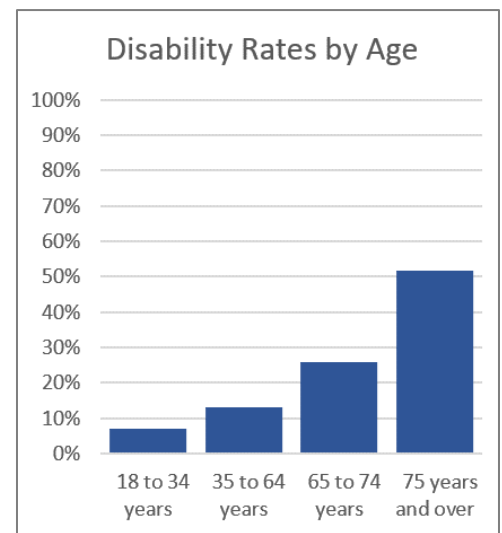

Figure 1. Disability rates by age, 2013-2017, Washington state. Author's analysis of [1].

Data Sources

American Community Survey

The American Community Survey (ACS) is a nationwide survey designed to provide communities a look at how they are changing. It collects information such as age, disability status, and income levels. About 3.5 million housing units are selected annually for participation.

The ACS produces 5-year estimates annually for geographic areas with a population of 20,000 or more; these represent responses from about 5 percent of the population. Since the five-year estimates represent more responses, estimates based on these are more precise than those made from a single-year file. However, for outcomes that change considerably year to year, analysis of a single-year file yields more accurate results.

The American FactFinder is an electronic system allowing access to Census Bureau data through the Internet. It offers prepared and user-selected data tables from several Census surveys, including the ACS. It went offline in March 2020 and was replaced by data.census.gov.

IRS Individual Income Tax Data

The IRS individual income tax data represent individual federal income tax returns and related information for Washington state residents. Relevant to this analysis, it includes the birthdate for each filer. It does not include information on disability status.

Methodology

We will use information from the ACS survey, as reported in the American FactFinder, to estimate the probability of being disabled for each taxpayer in the IRS data. Both datasets have information on age.

Using the IRS data, we will report summary statistics for the age of filers, and, for joint filers, the age of spouses.

We considered performing a multivariate analysis to arrive at a more precise estimate of the likelihood of disability. For instance, income and disability are associated, and income variables are present in both data from both the IRS and the ACS. Because our preliminary analysis revealed a strong association between age and disability status [Figure 2], we decided that to use age as the sole predictor variable.

We will estimate the coefficients for an equation that describes the relationship between age and natural logarithm of the odds of being disabled. Using this equation, we will calculate a point estimate for the odds of disability for each taxpayer, based on age. We will convert the odds to a probability, and then probabilistically assign each taxpayer an assumed disability status.

Figure 2. Association between age and disability, Washington State (2013-2017). Author's analysis of [1].

If we select a linear model, the basic form of the equation will be the following, where betas represent coefficients for the point estimate, and epsilon represents the error term:

$$\text{logit}(Disabled) = \beta_0 + \beta_1 * Age + \varepsilon$$

The following example shows how estimated coefficients will allow us to estimate the likelihood of disability. Example coefficients are used for the sake of illustration.

$$\text{logit(Disabled)} = -4.19 + 0.0502*Age$$

Setting age equal to 45 years and solving for p(Disabled), we obtain the following:

$$\text{logit(Disabled)} = -4.19 + 0.0502*45 = -1.931$$

$$\text{odds(Disabled)} = e^{-1.931} = 0.145$$

$$\text{p(Disabled)} = \text{Odds/(Odds+1)} = 0.127$$

Based on this result, we would randomly select 12.7% of 45-year olds in the IRS data and assume they are disabled.

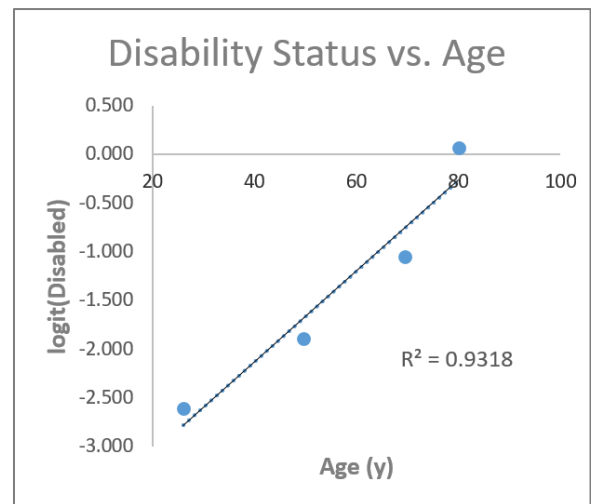## References

1. U.S. Census Bureau (n.d.) *American FactFinder: S1810 disability characteristics - 2013-2017 American Community Survey 5-Year estimates.*
2. U.S. Census Bureau (n.d.) *American Community Survey and Puerto Rico Community Survey 2018 subject definitions.* (https://www.census.gov/programs-surveys/acs/technical-documentation/code-lists.html)