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February 21, 2017

Economic Impact of Resource Facilitation: Workforce Re-entry Following Traumatic Brain Injury

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Introduction

This research note presents the economic impact of Resource Facilitation (RF) on traumatic brain injury (TBI) patients in Indiana. We focus on the ability of RF to enable patients with a TBI-related disability to reenter the workforce. Using estimates for the impact of RF on the workforce, we then proceed to estimate the potential dollar-impact of RF on wages, fringe benefits, payroll and income taxes, and disability insurance.

Estimation Methods

Job loss due to disability following TBI is not uncommon and is economically costly due to lost wages and workplace productivity. Additional costs such as potential public and private disability insurance payments also accrue TBI related accidents. . A major benefit of RF is the patients' return-to-work, with one study showing that patients treated with RF were 73% more likely to return to work than were patients undergoing standard treatments (Trexler, Parrott and Malec 2016).Here, we attempt to place a dollar value on the economic benefits of RF resulting from this increased return to the workforce.

Research on the number of TBI-related disabilities that are incurred each year is relatively sparse, and the literature doesn't contain an accurate estimate for Indiana. Therefore, we attempt to produce our own estimates of TBI-related disability prevalence in Indiana. We then use these disability estimates to determine the potential economic impact of RF. The first method seeks to estimate the annual incursion of TBI-related disability, while the second method seeks to estimate the aggregate pool of persons disabled by TBI, regardless of when their TBI occurred. In each case, we estimate the number of persons in each of various age groups with a TBI-related disability, use this number to estimate the number of additional persons that would return to work with RF treatment, and then estimate the expected wages, taxes, etc., for these potentially returned workers.

Tables 1 and 2 contain the results of each method. Table 1 shows the approximate age breakdown of TBI-related disabilities, and Table 2 details the estimated economic impact under each method.

Annual Incidence Estimate:

To estimate the annual incidence, we modify the methodology that was used in a previous research note to estimate the number of new cases of TBI-disability per year (Reid, McGeary and Hicks 2011).For this estimate, we use national annual TBI hospitalization incidence of 2.5 million cases from the CDC for 2015 (Centers for Disease Control and Prevention 2015). Based on population weights, we then estimate the number of TBI-related hospitalizations in Indiana to be 2,472 incidence per year. Based on the Selassie, Zaloshnja, Langlois et al. (2008) study, we distribute the 2,472 patients into different age categories. We then estimate the number of new TBI-disabilities incurred each year using the conditional probabilities of disability given hospitalization due to TBI observed (Selassie, et al. 2008). See Table 1, for the distribution of new TBI hospitalization incidence leading to disability by age group.

Using these TBI-disability incidence estimates, we now estimate the potential economic annual impacts of RF treatment on newly TBI-disabled patients. Since we are estimating the effects on those in the labor force, for each age group, we apply the labor force participation rates from Bureau of Labor Statistics to estimate the number of TBI-disability patients who were potentially employed prior to the TBI. The Trexler, Parrott and Malec (2016) study shows the probability of return-to-work with RF for TBI patients was 69%. From the existing literature, they found that the return-to-work probability without RF treatment for TBI patients was 40%. We apply these estimates on the TBI-disability estimates by age group for Indiana. The marginal impact of RF return to work is the number of potential patients returning to work after RF treatment minus the number of patients returning to work without RF treatment. We then estimate this marginal employment impact of RF return to work by age group. We find that 266 patients would additionally benefit from RF treatment by returning to work [i.e., they would not have returned to work without the RF treatment].

We now apply average wages by age group on the RF estimates to find the additional wages of marginal patients who received RF treatment and returned to work, who otherwise would not have returned to work without the treatment. We also estimate the potential fringe benefits of 45.77% that patients who now work would receive (BLS, 2016); payroll taxes of 15.3% for social security and Medicare (SSA, 2017); Federal income tax of 21% (IRS, 2016); and Indiana state tax of 3.3% (Flat tax, 2016).

We also estimate the potential Social Security Disability Insurance (SSDI) savings to the government due to patients returning to work after treatment. Since 30% of workers are covered under short-term disability through work that covers about 70% of wages, we also estimate the additional impact on private disability insurance after deducting the wages that they would have got from SSDI (National Compensation Survey: Employee Benefits in Private Industry in the United States, U.S. Department of Labor, Bureau of Labor Statistics, March 2006). Finally, we attempt to estimate the potential Supplemental Nutrition Assistance Program (SNAP) savings from 30% (assumed) of patients who returned to work after RF treatment and stopped participation in SNAP as a result. We also use the average SNAP household benefit in Indiana of $3,060 for our analysis (IN SNAP, 2016)

The economic impact on wages and benefits alone is estimated to be approximately $17.27 million. The revenues from taxes is about $2.15 million dollars. The potential savings from SSDI is $2.84 million and for private disability insurance is $1.5 million. The potential SNAP savings is about $0.24 million. The findings of this method are shown in Table 2.

Aggregate Lifetime Estimate:

The previous method (annual incidence estimate) accounts for the impact of RF on a single cohort of patients, for a single year. Disabled patients who return to work after RF are likely to continue working beyond a single year period. The cumulative annual effect of RF might be better represented by applying an impact analysis to the pool of all TBI-disabled persons rather than the annual incidence of TBI-disability. In 2015, the CDC reported an estimated pool of 3.2 to 5.3 million persons living with a TBI-related disability (Centers for Disease Control and Prevention 2015). Using the lower bound of this estimate, Indiana's share of the disabled pool is approximately 66,410 persons. See Table 1 last column for cumulative distribution by age group. Using annual TBI incidence by age group (calculated as in the previous method) and CDC mortality estimates by age group, adjusted to reflect increased mortality due to TBI, we simulate a stable state of the disabled population by age group. We then apply our economic impact estimates to the entire pool of TBI-disabled persons to determine the potential long-term impact of RF treatment.

Assuming that all persons in the pool underwent RF as part of a post-TBI treatment, around 7,255 additional persons would return to work, who would otherwise not have returned to work had they not received RF treatment. Accounting for the fact that disabled persons are likely to take a lower-paying job when they return to work, we attempt to provide a lower-bound estimate by assuming that disabled workers would have approximately half the earning power of the average individual. Under this assumption, the estimated annual impact of RF in Indiana is approximately $249.1 million in wages and benefits, $30.97 million in taxes, savings of $80.1 million in reduced disability insurance benefit payments and $6.6 million in SNAP impact. The detailed findings are shown in the last column of Table 2.

The results of the aggregate estimate are more indicative of the long-term annual impact of RF. While it may not be possible to provide retroactive RF for every patient who has ever suffered a TBI-disability, we can view the assumed impact of RF on the entire disabled pool as the potential cumulative annual economic impact of RF if it had historically been administered to all new TBI-disabled patients. Similarly, this cumulative impact demonstrates the potential annual impact of RF treatment after several years of application to new TBI patients.

Table 1: TBI-Related Disabilities per Age Group

	New Incidence	Cumulative Incidence
0 to 4	29	177
5 to 9	29	336
10 to 14	29	480
15 to 19	108	1,082
20 to 24	114	1,657
25 to 34	169	4,520
35 to 44	195	5,743
45 to 54	240	7,081
55 to 64	215	7,582
65 to 74	342	8,525
75+	1,002	29,227
Total	**2,472**	**66,410**

Table 2: Estimated Economic Impacts Attributable to RF

	New Incidence	Aggregate Lifetime Estimate
Employment	**266**	**7,255**
Wages	$ 11,844,570	**$ 170,875,856**
Fringe Benefits	$ 5,421,260	**$ 78,209,879**
Payroll Tax	$ 829,453	**$ 11,966,111**
Income Tax	$ 1,317,366	**$ 19,005,001**
Federal	$ 1,138,465	$ 16,424,075
State	$ 178,902	$ 2,580,926
Disability Insurance	$ 4,339,316	**$ 80,134,992**
Social Security	$ 2,837,856	$ 80,134,992
Private	$ 1,501,460	(Policy-Specific)
SNAP	$ 244,188	**$ 6,660,090**

Summary

In this research note, we estimate the marginal economic impact of RF treatment by estimating the potential TBI-disabled patients that would return to work after receiving the treatment, who otherwise would not return to work had they not received the treatment. We estimate the impact based on annual incidence and aggregate lifetime incidence. Table 2 summarizes the economic impact of both methods.

To illustrate the potential long-term impact of RF, let us assume that an average-earning 25-year-old suffers from a post-TBI disability. We assume also that this individual had private long-term disability insurance that covers 50% of lost wages until age 65, and that he is one of the patients who is able to return to work after RF treatment, but otherwise would not return to work at all. Assuming that he continues to earn average wages, benefits, etc., until retirement (age 65), the nominal career-total impact of his return to work total at approximately $2.94 million in wages and benefits, $0.80 million in state and federal taxes, $0.69 million in Social Security Disability Insurance payments, and $0.66 million in private disability insurance impact. These impacts are detailed in Table 3.

Table 3: Career Impact of RF for a 25-Year-Old TBI Patient

	RF Impact
Wages	**$ 2,019,270**
Fringe Benefits	**$ 924,220**
Payroll Tax	**$ 308,948**
Income Tax	**$ 490,683**
Federal	$ 424,047
State	$ 66,636
Disability Insurance	**$ 1,354,035**
Social Security	$ 688,800
Private	$ 665,235

Additional Impact

Our estimated economic impacts consider only the benefits related to gainful employment and are very conservative because we do not include the induced effects of those patients receiving the wages i.e., the household spending on goods and services would stimulate the economy. We also do not include potential unemployment benefits payments that would have been avoided for some patients. We do not include the potential re-admission hospital costs to Medicare/Medicaid of such patients. Many RF patients who do not return to work volunteer in the community in lieu of work (Trexler, Parrott and Malec 2016). The economic benefits from this unpaid community involvement are not considered here, but likely have both economic impact to the community, and quality-of-life improvement for the patient. Further investigation into this particular RF outcome is encouraged.

Further, in Indiana in 2012, there were 191 total Medicaid waivers related to TBI, for a total of approximately $4.5 million in benefits. Even if we assume the TBI waiver population is uniformly distributed among the TBI population, RF could mitigate a portion of the waivers expenditure, resulting in a cumulative annual economic benefit of at most $2.3 million.

The study comes with certain limitations as well. Quality state-level TBI data does not exist or is not readily available. Recent estimates of the annual incursion of TBI-related disabilities are not available. The impact of TBI-disability on future earning potential is unclear. In each of these cases, we have used simplifying assumptions to estimate these values based on other less detailed data. More detailed data would allow several assumptions to be removed from our calculations, thereby improving the accuracy of our estimates.

Applying RF treatment to the entire cohort of patients with a TBI-disability every year may not be feasible. The differential impact of RF on return-to-work is estimated to be about 29%. Approximately 40% of TBI-disabled patients would reenter the workforce without RF, while another 31% will fail to return to work even with RF treatment. This implies that the economic impact of RF is concentrated among a subset of the total TBI-disabled population. Table 4 demonstrates that wages are concentrated among the better educated, and to a lesser extent, the male populations. If treating all TBI-disabled patients is not feasible, using simple classification tools such as Table 4 along with the patient's expected remaining working years could help identify patients with the greatest potential for economic impact due to RF. Further research could be conducted to better identify the patients who would only return to work with the assistance provided by RF treatment.

Table 4: Median Earnings by Education Level and Gender

	Total	Male	Female
Less than high school graduate	$20,361	$23,668	$15,510
High school graduate (includes equivalency)	$28,043	$33,235	$22,345
Some college or associate's degree	$33,820	$41,407	$28,285
Bachelor's degree	$50,595	$61,589	$41,763
Graduate or professional degree	$66,857	$84,006	$56,181
Total	$36,231	$42,106	$30,602

References

Centers for Disease Control and Prevention. 2015. "Report to Congress on Traumatic Brain Injury in the United States: Epidemiology and Rehabilitation." Atlanta, GA: National Center for Injury Prevention and Control; Division of Unintentional Injury Prevention.

Reid, Ian, Kerry A. McGeary, and Michael J. Hicks. 2011. "Potential Economic Impact of Resource Facilitation for Post-Traumatic Brain Injury Workforce Re-Assimilation." Ball State University Center for Business and Economic Research.

Selassie, Anbesaw W., Eduard Zaloshnja, Jean A. Langlois, Ted Miller, Paul Jones, and Claudia Steiner. 2008. "Incidence of Long-term Disability Following Traumatic Brain Injury Hospitalization, United States, 2003." *The Journal of head trauma rehabilitation 23.2* 123-131.

Trexler, Lance E., Devan R. Parrott, and James F. Malec. 2016. "Replication of a Prospective Randomized Controlled Trial of Resource Facilitation to Improve Return to Work and School After Brain Injury." *Archives of Physical Medicine and Rehabilitation 97.2* 204-210.

Calculation Data Sources

Centers for Disease Control and Prevention – 2007 Worktable 23R, mortality by 10-year age groups

2015 Report to Congress (listed as a reference) – annual TBI cases, TBI hospitalization chance

American Community Survey – 2015 United States population, 2015 Indiana population

Selassie (from references) – TBI hospitalization age distributions, disability probabilities by age group

Bureau of Labor Statistics – 2014 labor force participation rates by age group

Quarterly Workforce Indicators – average 2015 monthly wage by age group (all quarters)

Social Security Administration – 2017 Payroll Tax Rate

Internal Revenue Service – Average 2016 Federal Income Tax Rate

IN Tax Code – 2016 Flat Income Tax Rate