UNIVERSITY OF SOUTH CAROLINA
College of Nursing

August 15, 2016

RE: cumulative report: 6, 12, 18 month and FINAL progress report, NCE (Bell – 2014 P01)

6 month report

Aim	Description	Status
1	Estimate the proportion of persons who reside* <60 miles to a regional rehabilitative care facility;	In progress
2	Estimate the proportion of persons who reside* >60 miles to a regional rehabilitative care facility;	In progress
3	Estimate the proportion of persons who reside* >120 miles to a regional rehabilitative care facility;	In progress
4	Estimate the rate ratio of service utilization among persons who reside* <60 miles to care;	In progress
5	Estimate the rate ratio of service utilization among persons who reside* >60 miles to care;	In progress
6	Estimate the rate ratio of service utilization among persons who reside* >120 miles to care;	In progress
7	Estimate the concordance between areas classified as having poor access and low service utilization;	In progress

* This word has been changed to 'travelled' for purposes of the study due to the structure of the data released by the RFAO

Summary

On Friday, May 29, 2015 I received feedback from the South Carolina Revenue and Fiscal Affairs Office (RFAO) that the project has been approved and data will be released. RFAO approval required substantial time (on the part of PEBA) to complete the internal data request and analysis. In particular, PEBA requested that all state health insurance + Medicaid claimant records be combined into a single database per their release specifications at geographic scales below 'region'. As the primary purpose of this study was to map the geographic distances between patients and providers and its relationship to frequency of service use we agreed to this revision. On June 1, 2015 I received the data documentation and download instructions from the Medicaid and PEBA data stewards within the RFAO. Data for this project has now been uploaded to the USC Nursing secure server and can be prepared for analysis.

Summary of data file released by RFAO

A total of 306 patient records were released for this project. These records represent SCI claims from individuals whose primary provider was either Medicaid and PEBA between the 2008 – 2012 calendar period. Released with this data were all inpatient and outpatient claims data for each person over a two year period. The output file contains the following variables: encrypted ID, age at time of injury, sex, region (Upstate, Midlands, Pee Dee, Low Country), and number of months covered under Medicare/PEBA.

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The 306 records from the patient eligibility will be linked with a corresponding claims file that contains the following information: provider specialty, encrypted billing provider code for grouping claims, place of service, procedure codes, discharge status, an out of state provider flag, and the geographic distance between the patient's residence and place of service.

In total, 34,785 inpatient and outpatient claims records for the period 2008 – 2012 have been released. These claims will be coded and classified according to inpatient and outpatient visitations and by ICD diagnosis codes 803.0 – 806.9 and 952.0 – 952.9. The primary diagnosis codes were not released by RFAO in the original data release and I have submitted a claim to have the dataset resent (June 15, 2015). Once returned, records specific to general physician and rehabilitation services visits will be evaluated to determine whether geographic distance to services is a statistically significant indicator of frequency of services obtained. We will stratify our analysis by SCI injury grade using the ICD diagnosis codes.

Timeline for data analysis

It is anticipated that this project will be completed on schedule on/before December 2015. My goal is to have the data analysis component of this work completed by the end of September, with manuscript submission to follow. I also plan to submit a revised request to the RFAO in the fall to release Vocational Rehabilitation records for this file for a separate analysis. I plan to submit the results from this work to the American Public Health Association annual meeting in 2016 and corresponding NIH or DoE funding cycles in 2016.

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12 month report

All components of this project that were specified in our 6 month progress report (below) have been completed. Following our presentation to the SCSCIRF board of directors meeting and inclusion of participant comments and critiques we will submit our study for peer-review.

Aim	Description	Status
1	Estimate the proportion of persons who reside* <60 miles to a regional rehabilitative care facility;	Completed
2	Estimate the proportion of persons who reside* >60 miles to a regional rehabilitative care facility;	Completed
3	Estimate the proportion of persons who reside* >120 miles to a regional rehabilitative care facility;	Completed
4	Estimate the rate ratio of service utilization among persons who reside* <60 miles to care;	Completed
5	Estimate the rate ratio of service utilization among persons who reside* >60 miles to care;	Completed
6	Estimate the rate ratio of service utilization among persons who reside* >120 miles to care;	Completed
7	Estimate the concordance between areas classified as having poor access and low service utilization;	N/A – results indicate efficacy in geographic coverage

A total of 306 patient records were analyzed for this project. These records represented SCI claims from individuals whose primary provider was either Medicaid and PEBA between the 2010 – 2012 calendar period. We analyzed two years of inpatient and outpatient claimant records or this cohort. This included univariate analysis of the cohort and unadjusted and adjusted regression analysis measuring the relationship between place of residence and receipt of service.

Primary study findings

In our analysis we examined the relationship between geographic distance and utilization of outpatient and inpatient health care services across the state. In addition, we analyzed a select number of out-patient services by service type, including: Family Practice, Behavioral / Developmental Health, Emergency Medicine, Mixed Specialty Group, Radiology, Physical Medicine/Rehabilitation, and Physical Therapy.

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On average, SCI survivors travel an average of 20 to 40 miles to obtain these health care services. The greatest distances travelled are for obtaining physical medicine/rehabilitation services as well as behavioral and developmental health services. Family practice and Mixed Specialty/Unit services require the least amount of travel.

Overall, the unadjusted and adjusted regression analyses showed that greater distance to services does not predict less frequent service use. In some instances, demographic factors such as age or sex were significant determinants of access to health services after, but these differences could be explained by the demographic makeup of the cohort. Socioeconomic status, specifically area poverty rates, was an independent predictor of access to Behavioral and Developmental Health services. No other socioeconomic determinant explained differences in access to out-patient health care services independent of geographic distances to services.

We did find a small but statistically significant relationship between geographic proximity and utilization of in-patient health care services. However, the relative risk ratios for the negative binomial regression analysis was 0.98 (95% CI 0.96 – 0.99), so the clinical meaningfulness of this relationship may be questionable.

Taken together, these results do suggest that when analyzed as a single cohort (i.e. PEBA and Medicaid claimants), geographic distances are not a determining factor in the frequency in which SCI survivors access outpatient health care services. This does not mean to suggest that different population groups experience greater barriers to care, but this information is not captured in the claimant database.

Current status of work

1. Manuscript draft has been completed and is being reviewed by co-authors

2. Secondary pull of SC Medicaid records has been submitted to examine same findings (above), but over longer period to determine whether access has been improving over time. Output from this effort will be additional manuscript.

3. Planning phase of external funding to replicate study findings using the Model Systems database. Telephone communication with UAB have been positive and supportive of continuing this work.

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18 month report

All components of this project that were specified in our 12 month progress report have been completed. A manuscript is currently under peer-review with our study findings and a second data request to continue this study has been submitted to RFA (formally ORS).

Primary study findings

Primary study findings where submitted in our 12-month progress report. We have received a new data release from RFA that contains urban/rural indicators. In addition, we completed a log-transformation on the distance variable that allowed us to see a more accurate depiction of travel distances and service frequencies.

Amended study findings that have gone into the manuscript under review and that will be reported in October:

- Longer travel distances were statistically significant predictors of decreased physician/ specialty clinic (RR 0.87, 95% CI 0.79 - 0.96) and physiotherapy (0.57, 0.46 - 0.71) visits, with mixed findings for other providers.

- Secondary analyses in which differences in service use were analyzed using census-defined classifications of urban and rural status did not demonstrate any geographic pattern.

Recommendations from current study:

- There are significant geographic variations in the use of select outpatient services among SCI populations across the state.

- That these patterns were only visible when using travel distance models as opposed to census-based classifications of urban and rural status adds support to augmenting routine data collection and surveillance with spatial analytical models.

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Primary tables of current research findings:

Table 3: Baseline characteristics among rural and urban population groups

aracteristic	Rura (%)	Urban (%)	p-value
Sociodemographic			
Ma es	57 (65.5)	101 (64.7)	0.904
Age (SD)	54.5 (20.8)	51.5 (19.1)	0.222
area poverty rate > 20%	59 (67.8)	75 (48.1)	0.003
SCI grade			
Paraplegia (all)	23 (26.4)	49 (31.4)	0.245
Tetraplegia (al)	54 (62.1)	98 (62.8)	
Unspecified	10 (11.5)	9 (5.8)	
nsurance coverage			
PEBA/Medicaid with Medicare	18 (20.7)	19 (12.2)	0.077
Place of treatment			
Home	1726 (20.3)	9463 (37.8)	<0.001
Out of state	255 (6.1)	571 (6.2)	0.732
Average number of outpatient visits (SD)*			
Physician / Mixed Specialty Clinic	10.0 (10.7)	13.8 (17.9)	0.143
Physical Medicine & Rehabilitation	7.0 (9.3)	14.5 (20.6)	0.224
Physiotherapy	71.0 (70.7)	26.2 (36.5)	0.279
Behavioral Health /			
Developmental Rehabilitation	4.0 (2.8)	11.1 (21.6)	0.444
Radiology	5.6 (7.0)	8.3 (10.2)	0.059
Internal Medicine	7.6 (9.4)	12.3 (16.8)	0.149
Claims coded as 'Other'	8.4 (13.1)	10.0 (13.3)	0.504
A other visit category types	23.9 (24.0)	26.9 (33.6)	0.232
Average distance traveled per visit (SD)*			
Physician / Mixed Specialty Clinic	59.9 (65.5)	33.4 (49.0)	<0.001
Physical Medicine & Rehabilitation	112.6 (54.8)	120.1 (111.4)	0.536
Physiotherapy	16.2 (3.8)	13.4 (5.0)	<0.001
Behavioral Health /			
Developmental Rehabilitation	135.1 (75.2)	39.3 (61.1)	<0.001
Radiology	81.2 (79.0)	39.1 (54.7)	<0.001
Internal Medicine	57.9 (58.9)	47.5 (67.0)	0.035
Claims coded as 'Other'	70.9 (79.9)	21.5 (13.1)	<0.001
A other visit category types	94.0 (86.3)	49.5 (79.0)	<0.001

rce: South Carolina Revenue and Financial Affairs (RFA)

mparisons were derived from the overall average number of services obtained and the overall average distances traveled

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Table 4: Risk ratios (RR) and 95% confidence intervals, by outpatient claim type and administrative region

	All outpatient services			Physician / Specialty Clinic			Physical Medicine /Rehabilitation			Physiotherapy			Behavioral health			Radiology			Internal Medicine			Other		
	RR	95% CI	p	RR	95% CI	p	RR	95% CI	p	RR	95% CI	p	RR	95% CI	p	RR	95% CI	p	RR	95% CI	p	RR	95% CI	p
Adjusted model*																								
Lowcountry	1.00	1.00 - 1.00	0.794	0.99	0.98 - 1.00	0.106	1.01	1.0 - 1.02	<0.001	0.27	0.06 - 1.08	0.081	--	--	--	1.00	0.99 - 1.01	0.702	0.96	0.94 - 0.99	0.005	0.99	0.97 - 1.01	0.190
Midlands	1.00	1.00 - 1.01	0.172	1.00	0.99 - 1.01	0.974	--	--	--	0.87	0.69 - 1.11	0.271	--	--	--	1.00	0.99 - 1.01	0.667	0.99	0.96 - 1.01	0.365	0.94	0.89 - 1.00	0.046
Pee Dee	1.00	1.00 - 1.00	0.067	0.98	0.97 - 1.00	0.008	1.02	1.1 - 1.03	<0.001	--	--	--	--	--	--	1.01	1.00 - 1.02	0.055	0.99	0.96 - 1.01	0.352	0.98	0.97 - 1.00	0.022
Upstate	1.00	1.00 - 1.00	0.237	1.00	1.00 - 1.01	0.904	1.01	1.0 - 1.02	<0.001	--	--	--	--	--	--	0.99	0.98 - 1.01	0.311	1.00	0.99 - 1.01	0.677	0..98	0.96 - 1.01	0.174

* Adjusted for Age, Sex, and area poverty
-- Model did not converge

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Current status of work

- Data request is under IRB review by RFA to do another pull of records. The study will look at the relationship between travel time and frequency of behavioral health service use prior to and after South Carolina allowed various licensed behavioural health practitioners to participate in SC's Medicaid program.

- Submission of all findings for ongoing investigation to NIH (February cycle) for additional funding. Most likely this will result in an R03 or R21 mechanism, depending on cost of data required to complete the project.

Final report

All components of this project that were specified in our application were completed. A manuscript and an abstract were produced from this work and should be cited as:

> Bell N, Kidanie T, Cai B, Krause J. Geographic variation in access to outpatient healthcare services following spinal cord injury. Archives of Physical Medicine and Rehabilitation 98:2, 341-346. 2017
>
> Bell N. Geographical research on spinal cord injury disparities: some thoughts on the census and street-network mapping. In Association of American Geographers Annual Meeting, Boston, Massachusetts, April 2017.

Primary effort during final term

- Grant preparation for 2017/2018 submission to expand current work using MODEL SYSTEMS database or Dr. Krause's database;

The last funds were charged on 8-15-2016. This was for used for the last check of summer salary. The remaining available balance in Finance Intranet as of 03-14-2017 is $4, 4885.90

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