



# TBI Prevalence, Service Utilization and Costs among Medicaid Beneficiaries in Michigan



Cheribeth Tan-Schriner, PhD<sup>1</sup> ♦ Clare Tanner, PhD<sup>1</sup> ♦ Debera H. Eggleston, MD<sup>2</sup>

<sup>1</sup>Michigan Public Health Institute

<sup>2</sup>Michigan Department of Community Health

## Purpose

While much is known now about the epidemiology of traumatic brain injuries-related mortality and morbidity, there is less knowledge regarding the cost of such injuries and service utilization among the Medicaid population. This study analyzes Medicaid claims and enrollment data to provide critical information on the prevalence, characteristics, service provision, and cost of care of Medicaid beneficiaries with TBI.

## Methods

- Retrospective analysis of Medicaid paid claims, encounter files, eligibility and enrollment files of Medicaid beneficiaries in Michigan.
- Stage 1: analysis of all Medicaid claims and encounter data with any of the CDC recommended ICD-9-CM diagnosis codes identifying TBI and with dates of service within fiscal years 2002 to 2006 (October 1, 2002 to September 30, 2006).
- Stage 2: analysis of all TBI and non-TBI claims for a subgroup of Medicaid recipients with a TBI-related hospitalization during FY 2002-04 as identified from Stage 1; longitudinal analyses of these claims data conducted to determine the costs and services for these TBI population over time.

## Medicaid Beneficiaries Receiving Services for TBI in Michigan, FY2002-2006

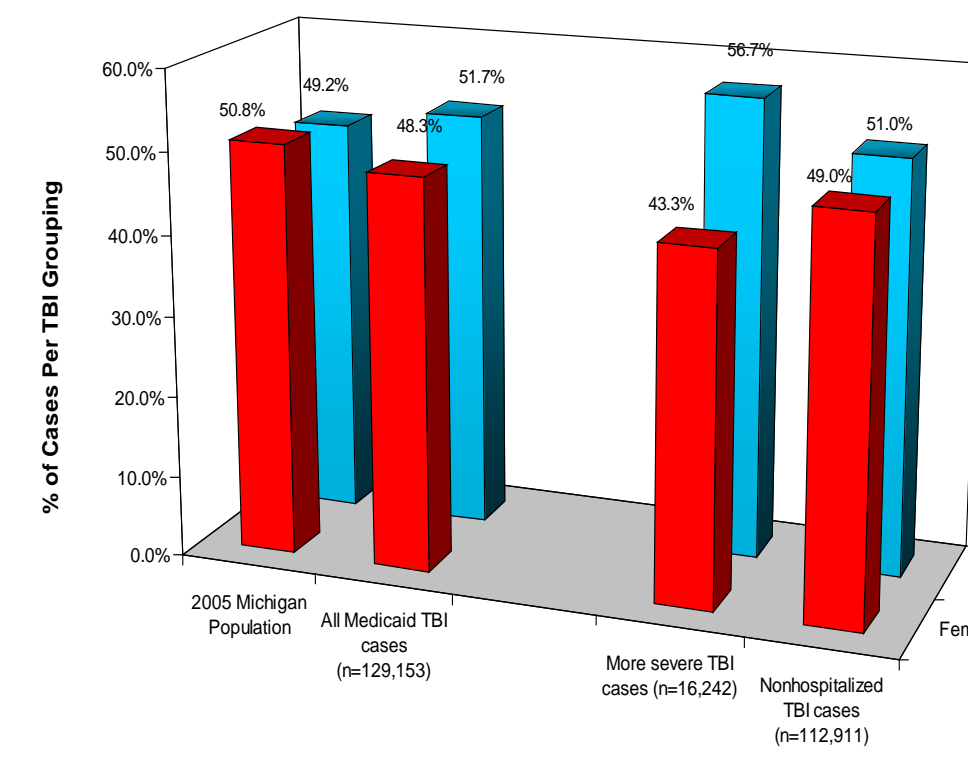
	FY2002	FY2003	FY2004	FY2005	FY2006
Distinct count of all Medicaid enrollees in Michigan	1,469,853	1,570,413	1,664,554	1,725,417	1,771,563
Number of Medicaid enrollees (FFS & MHP*) receiving services for TBI (from mild to severe cases)	24,314	25,807	27,575	31,751	35,342
Rate of TBI cases in Medicaid system per 1,000 Medicaid enrollees in Michigan	16.54	16.43	16.57	18.40	19.95

\* FFS = Michigan Medicaid Fee for Service; MHP = Medicaid Health Plan

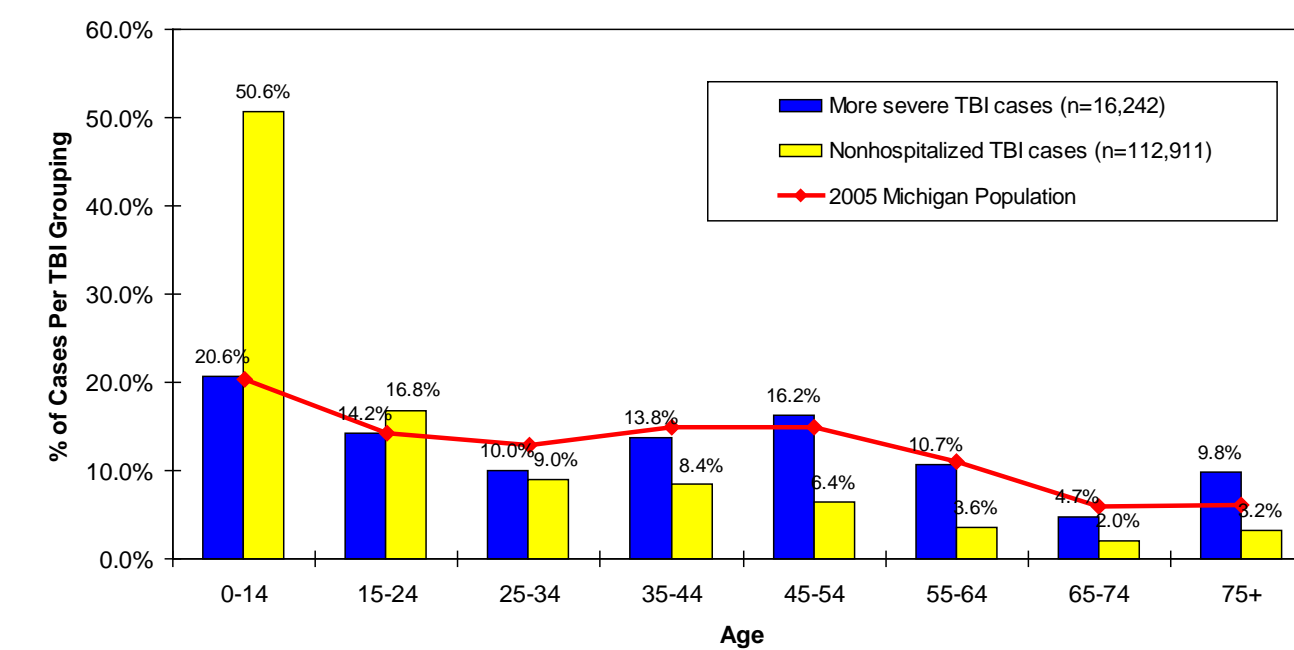
	Number of Medicaid Cases	% of TBI Medicaid Cases
Total number of Medicaid beneficiaries receiving services for TBI, FY2002-2006	129,153	
Medicaid cases with more severe TBI	16,242	12.6%
Non-hospitalized TBI Medicaid cases with or without emergency department visits	112,911	87.4%

## Demographic Characteristics of Medicaid TBI Cases

### Medicaid TBI Cases by Sex, FY2002-2006

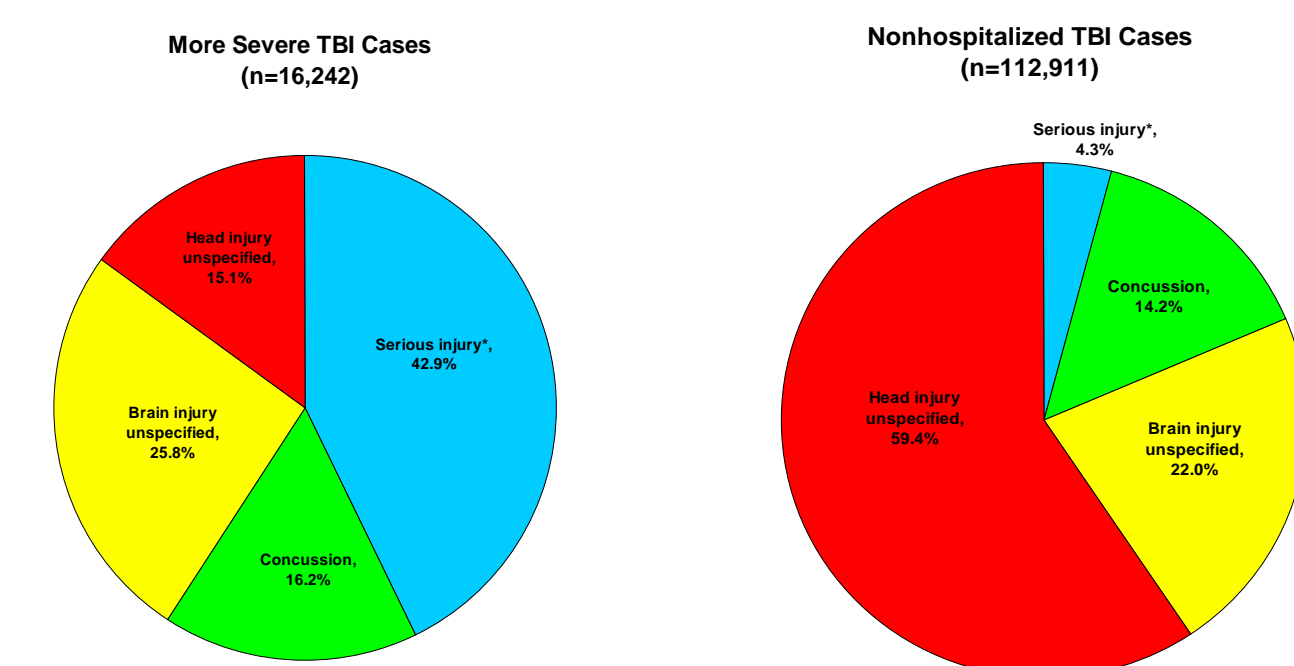


### Medicaid TBI Cases by Age, FY2002-2006



Consistent with other findings on the incidence of TBI, the differences in age ( $t=82.49$ ,  $p<.01$ ) and sex ( $\chi^2=184.86$ ,  $p<.01$ ) between more severe and nonhospitalized cases were statistically significant.

## Medicaid TBI Cases by Diagnostic Categories, FY2002-2006



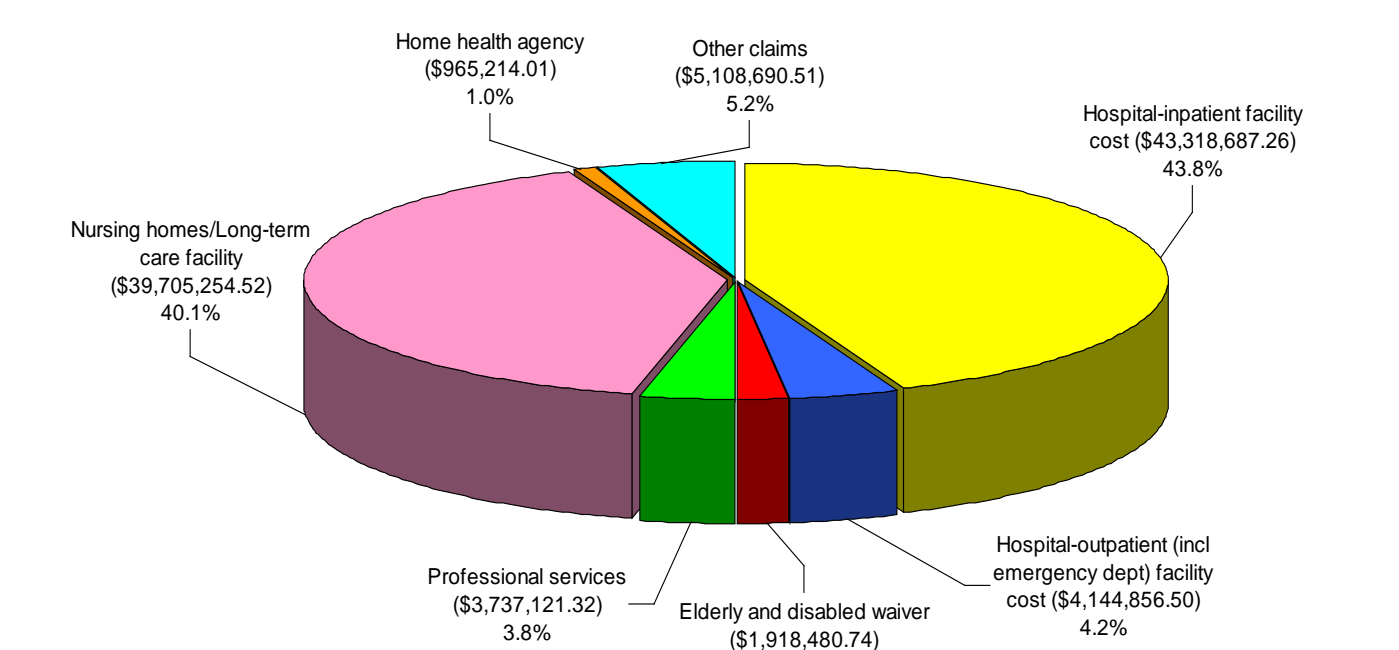
\* Serious injuries: skull fracture, laceration or contusion of the brain and brain hemorrhage

## TBI-related Cost and Service Information

### Selected TBI-Related Services Received, FY2002-2006

Procedure/Service Received	% of More Severe TBI Cases (n=16,242)	% of Nonhospitalized TBI Cases (n=112,911)
Cat Scan (brain) - computerized axial tomography of the head or brain.	77.2%	44.3%
Brain surgery - surgery to repair skull and/or brain, CSF shunt or shunt maintenance.	6.7%	0%
Central nervous systems assessment— testing of the cognitive function of the central nervous system including processing, visual motor responses, and abstract abilities	0.7%	0.1%
Physical therapist/occupational therapist/rehabilitation services - PT, OT evaluation, therapeutic procedures & testing, therapeutic/osteopathic/ chiropractic manipulation, physical medicine & rehabilitation services	20.0%	0.5%
Neurology & neuromuscular procedures - sleep testing, and muscle and range of motion testing.	8.3%	0.5%
Special otorhinolaryngologic services (i.e. speech, language, voice, communication, and/or auditory processing related)	11.0%	0.4%
Ambulance	14.1%	8.1%

### TBI-Related Cost Information by Provider Category - Medicaid-FFS (only!), FY2002-2006



- Total amount paid for TBI-related FFS claims from FY2002-06 = **\$98,898,304.86**.
- Cost data, however, are contained only in the FFS claims since the MHP contracts are capitated and therefore bills are not submitted for each service; actual TBI-related costs to the state are much higher as Medicaid beneficiaries covered by Medicaid Health Plans accounted for 61% of all the identified cases of TBI.
- TBI-related costs are also underestimated to the extent that TBI is not listed as a diagnosis on medical claims. Hospital claims may have fairly accurate diagnoses as diagnosis is important for billing and receiving payment; other types of claims (e.g. professional claims and long term care claims) are not reimbursed on the basis of diagnostic codes. Diagnostic information on these types of claims would more likely be incomplete.
- Some people may also have been missed entirely if their initial medical care for TBI was paid for by a source other than Medicaid, and follow-up medical care had not been identified with a TBI diagnosis. In addition, TBI-related services and cost information were likely to have been missed if the beneficiary had comorbid conditions that may have been listed instead of the TBI.

## Service Use Within 2-year Period after TBI-Related Hospitalization, FY2002-2004 Cohort (n=6,472)

Service Category	Number of Individuals	Percent of Cohort
At least 1 re-hospitalization with TBI diagnosis	1,015	15.7%
At least 1 re-hospitalization with no TBI diagnosis	2,896	44.7%
Nursing home/long term care use	1,058	16.3%
Physical therapist/occupational therapist/rehabilitation services; osteopathic/ chiropractic manipulation	2,911	45.0%
Psychiatric or psychological care	1,507	23.3%
Neurology and neuromuscular procedures	1,759	27.2%
Special otorhinolaryngologic services (i.e. speech, language, voice, communication, and/or auditory processing related)	1,932	29.9%

## Service Use Within 2-years Pre- & 2-years Post- TBI-Related Hospitalization, FY2004 Cohort Only with Claims Data Pre- and Post-TBI Hospitalization (n=1,697)

Service Category	Pre-TBI hospitalization		Post-TBI hospitalization	
	Number of Individuals	Percent of Cohort	Number of Individuals	Percent of Cohort
At least 1 non-TBI hospitalization	841	49.6%	888	52.3%
Nursing home/ long-term care **	160	9.4%	288	17.0%
Cat scan (head/brain) **	509	30.0%	1,455	85.7%
Physical therapist/occupational therapist/ rehabilitation services; osteopathic/chiropractic manipulation **	356	21.0%	698	41.1%
Psychiatric or psychological care	392	23.1%	416	24.5%
Central nervous system assessments/ tests **	15	0.9%	52	3.1%
Neurology & neuromuscular procedures **	207	12.2%	442	26.0%
Vision outpatient care or services **	294	17.3%	355	20.9%
Special otorhinolaryngologic services **	275	16.2%	479	28.2%
Cardiology/pulmonary outpatient care **	832	49.0%	1,106	65.2%

\*\* statistically significant change from pre-TBI hospitalization to post-TBI hospitalization ( $p<.01$ ).

## Conclusions

- The rate of diagnosed TBI among Medicaid beneficiaries is rising relative to the number of enrollees.
- Comparing actual diagnostic coding for beneficiaries with and without hospital claims confirms expected patterns; namely: 43% of hospitalized cases of TBI have serious injuries, including skull fractures, lacerations and contusions and hemorrhages. The majority of non-hospitalized cases have a diagnosis of 'unspecified head injury'. ICD-9-CM codes for unspecified brain injury and concussion are common among both hospitalized and non-hospitalized cases.
- The minimum cost figure for Medicaid FFS payments related to a TBI is almost \$20 million per year. Calculation of true costs for all of Medicaid is limited because ICD-9-CM codes for TBI are likely to be most accurate for acute care, and not utilized as much for long-term care. Moreover, TBI related costs born by Medicaid Health Plans were not submitted.
- As expected, 44% of the direct TBI-related FFS costs are for hospitalization. However, the second highest TBI related expense is for nursing home care. This presents an opportunity to both improve the setting of care and save costs.
- Longitudinal analysis of TBI and non-TBI claims for a subset of beneficiaries is being examined to determine how TBI affects service utilization.