

# Developing and Using Costs in CODES data Using Diagnostic Codes and NHTSA's MVS

Wayne Bigelow, Wisconsin CODES Project  
Center for Health Systems Research and Analysis  
University of Wisconsin – Madison

Presented at the 2007 Int. Traffic Records Forum,  
St. Louis, MO July 25, 2007

# Why Use Cost Estimates

1. Hospital/ED charges are difficult to evaluate since they don't necessarily represent either the hospital's cost or what an insurer is willing to pay.
2. Hospital/ED charges do not necessarily include professional and other fees.
3. Hospital/ED charges do not include rehabilitation and long term care costs.

# Diagnostic Based Cost Estimates

- **Were developed as an elaboration of a study done for NHTSA: “The Economic Impact of Motor Vehicle Crashes, 2000”. A number of national health expenditure databases were used in estimating costs including:**



- **National Hospital Discharge Survey (1996-1997)**
- **National Health Interview Survey (1990-1996)**
- **Maryland/New York hospital cost/charge information (194-1995)**
- **CHAMPUS data on physician costs (1992-1994)**
- **National Medical Expenditure Survey (1987)**

# Diagnostic Based Cost Estimates

- ❑ **Model was based on the model and methods employed in the U.S. Consumer Product Safety Commission's injury cost model.**
- ❑ **Specific methodology used in developing CODES cost estimates were reported in "Crash costs by body part injured, fracture involvement and threat-to-life severity, United States, 2000 (Accid Anal Prev 2004, 415-427)**
- ❑ **NHTSA's Motor Vehicle System (MVS) software are used to develop costs for crash victims who were not linked to an ED visit or Hospital Inpatient stay. The MVS cost estimates are also based on the results of the study done for NHTSA indicated above.**

## Medical Costs:

Professional Fees      Hospital Costs      ED Costs  
Drugs      Rehabilitation      Long Term Care

## Other Costs:

Police/Fire/Ambulance      Loss of Wage Work  
Insurance Administration      Loss of Household Work  
Legal/Court Costs      Property Damage

## Quality of Life Costs:

Based on QALYs (Quality Adjusted Life Years),  
valued at \$92,000 per loss of one QALY

# Medical Cost Estimates From Diagnostic Codes Are Derived From:

- Body Region or Part
- Presence of a Fracture
- Maximum Abbreviated Injury Score (generated by ICDMAP90)

All components of the cost model are based on diagnostic codes (ICD9 = 80000 to 95999) which are only available in linked crash/hospital or crash/ED Data.

# Figure 1.

## Determination of Cost Estimate Group for Knee Injuries

Step 1. ICD9 codes = 878xx, 9224x, 9260x, 942x5

↓ Knee Injury

Step 2. ICD9 codes = of 800-829 or 925-929 ⇒ Knee Injury w/ Fracture (FX):  
(GROUP A)

↓ Knee Injury, No FX

Step 3. MAIS = 1 ⇒ (GROUP B)  
MAIS = 2 ⇒ (GROUP C)  
MAIS = 3 ⇒ (GROUP D)

**Example of Cost Estimates  
for Neck/Spinal Cord Injury  
– Non Fracture**

<b><u>MAIS</u></b>	<b><u>MEDICAL</u></b>	<b><u>OTHER</u></b>	<b><u>QOL</u></b>
3	\$ 359,615	\$ 783,914	\$ 185,337
4	\$ 914,56	\$ 1,572,199	\$ 1,733,084
5	\$ 1,195,428	\$ 1,977,748	\$ 2,394,187



# PROCESS OF SELECTING INJURY GROUPING

- With multiple ICD-9 diagnostic codes it is possible that an MVC victim will have multiple diagnostic groups assigned to them.
- To resolve this, the diagnostic group **WITH THE HIGHEST MEDICAL COST** was selected as the assigned diagnostic group.

# PDO or Unlinked Cases

- Cases not linked to an ED or hospital inpatient stay have their estimated costs derived from the MVS cost estimation software.
- The MVS's cost estimates are also derived from the major NHTSA study mentioned above.
- Costs are estimated based on the KABCU/0 injury element contained in virtually all state crash data.
- The large majority of cases in any year are PDO cases and their cost estimates are thus derived from the MVS software.

# Adjustments

- All estimates of Medical costs are adjusted for federal medical cost deflation/inflation estimates
- All estimates of Other costs are adjusted for CPI deflation/inflation estimates
- All cost estimates are adjusted for state specific cost of living adjustments (obtained through the MVS software)
- Multiple imputation was used to model missing data values in the crash data.

# Results: Non-Motorcycle Crashes, Wisconsin, 2003-2004

	Number	Average Charges	Average Estimated Medical Costs	Average Estimated Other Costs
<b>Impaired Drivers</b>	18,510	\$ 2,140	\$ 6,680	\$ 41,512
<b>Other Drivers and All Occupants</b>	643,647	\$ 360	\$ 1,202	\$ 7,382
<b>Persons Not Wearing Restraints</b>	58,814	\$ 1,822	\$ 5,171	\$ 29,563
<b>Persons Wearing Restraints</b>	584,823	\$ 269	\$ 976	\$ 6,231

# Results: Motorcycle Crashes, Wisconsin, 2003-2004

	Number	Average Charges	Average Estimated Medical Costs	Average Estimated Other Costs
<b>Non-Helmet Rider</b>	2,958	\$ 7,765	\$ 18,081	\$ 77,157
<b>Helmet Wearing Riders</b>	3,403	\$ 7,964	\$ 19,827	\$ 82,340
<b>No TBI</b>	5,654	\$ 4,952	\$ 8,862	\$ 56,857
<b>Potential TBI</b>	117	\$ 4,576	\$ 5,908	\$ 59,491
<b>Mild TBI</b>	21	\$ 20,546	\$ 138,694	\$ 191,950
<b>Moderate TBI</b>	264	\$ 12,231	\$ 64,601	\$ 117,265
<b>Severe TBI</b>	305	\$ 58,625	\$ 164,609	\$ 475,500