

## Traumatic Brain Injury in Riverside County, 2005-2007

### Introduction

Traumatic Brain Injury (TBI) contributes substantially to the numbers of injury-related illness and death and is a leading cause of permanent disability. Caused by a bump, blow, jolt to the head, or penetrating injury, TBI diagnoses can range from mild to severe. Annually, most TBIs are concussions, a form of mild traumatic brain injury.<sup>1</sup>

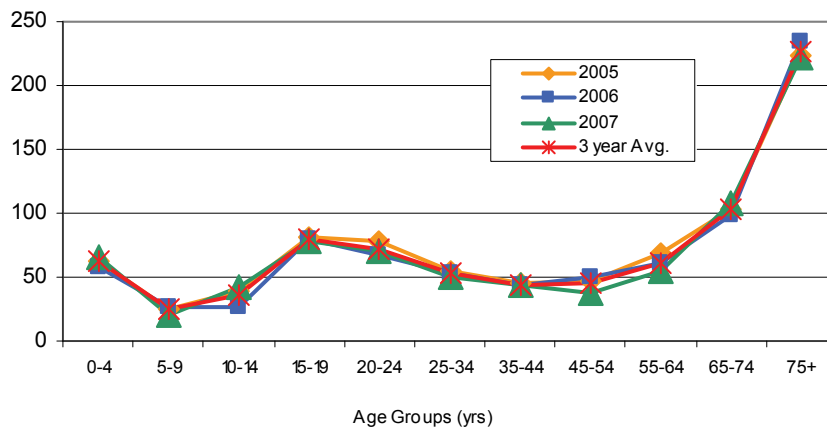
This brief will explore the incidence of TBI-related hospitalizations and trauma center admissions by age groups and external causes.

### Key Findings

- From 2005-2007, 3,859 people in Riverside County were hospitalized for TBI-related injuries.
- Nearly 70% of those hospitalized were male.
- Those aged 15-24 years experience the greatest rate of TBI-related trauma center admissions.
- Motor vehicle crash is the leading cause of TBI-related trauma care and hospital admission.

### TBI-related hospitalizations in Riverside County

**Incidence of Hospitalizations with Traumatic Brain Injury Diagnosis by Age Group and Year, Riverside County, 2005-2007**



From 2005 to 2007, an annual average of 1,286 TBI-related hospitalizations occurred, a rate of 64.5 per 100,000 population. Sixty-five percent were the result of falls and motor vehicle crashes. Those age 65 and older maintained the highest average rate of hospitalization (226.8 per 100,000 population), while 5 to 9 year olds had the lowest rate (24.3 per 100,000 population).

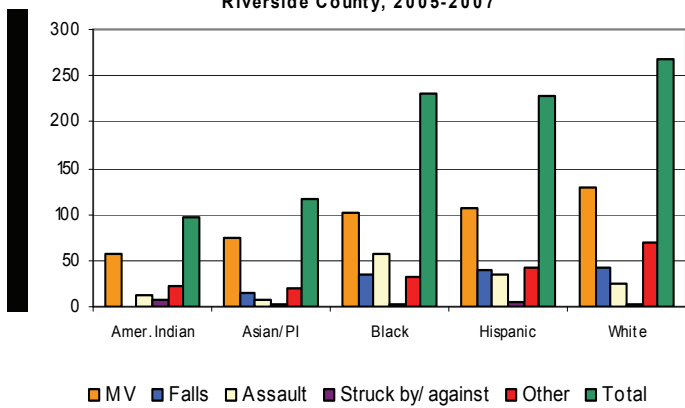
Between 2005 and 2007, there were a total of 28,863 TBI-related hospitalization days, with an eight day average length of stay (LOS). The cost of these stays totaled more than \$317 million

over the reported three years, an average of \$87,000 per hospitalization. Motor vehicle crash-related TBI hospitalizations resulted in the longest average LOS (8 days) and the highest average costs (\$120,000). On average, 25-34 year olds had the longest average hospital stay of 16 days, with children 0-4 and 10-14 years maintaining the shortest average of 5 days. Adults 55-64 years had the highest average hospitalization costs of more than \$113,000 and children 0-4 years had the lowest (\$48,000).

The average LOS was 58% lower for those age 65 and older compared to those 25-34 years, who had the highest average. The average cost of hospitalization was also 37% lower among the elderly. This may be due to higher incidence of mortality attributed to TBIs, thus decreasing the average LOS and costs for care among the elderly. Another factor could be increased care that requires a transfer to a convalescent facility. To gain a better understanding of the magnitude of TBI and the resulting medical care, future studies should include examining data on TBI-related mortality and use of skilled nursing facilities and convalescent care for Riverside County elders.

**Note:** Primary ICD-9 diagnosis codes of 800.0-801.9, 803.3-804.9, 850.0-854.1, 959.01, and 995.55, as well as additional codes for external causes of injury, were analyzed using data from the Office of Statewide Health Planning and Development (OSHPD) and the DICorp Collector Trauma Registry

**Incidence of Trauma Admission with Traumatic Brain Injury  
Diagnosis by Race/Ethnicity and Cause,  
Riverside County, 2005-2007**



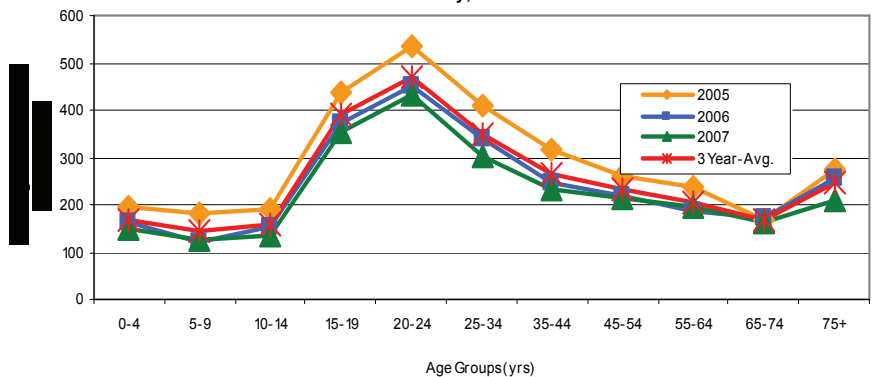
### TBI-related trauma center admissions

From 2005-2007, motor vehicle crash was the leading cause of trauma admissions with TBI diagnosis, representing nearly half of all trauma admissions. Whites had a trauma rate (267.7 per 100,000), higher than all other racial/ethnic groups and the county overall (241.9 per 100,000). Whites also maintain higher incidence rates of most external causes, with the exception of assaults and incidents of “struck by/ against”. The rate of assault admissions was highest among blacks, with an incidence eight times higher than Asians who maintain the lowest rate (6.5 per 100,000). Falls are an area of particular concern as they lead the way for external causes of TBIs among children and the elderly. The rate of falls was highest among whites followed by Hispanics (43.0 and 40.6 per 100,000, respectively).

### Age groups with an increased risk of trauma admission with a TBI diagnosis

TBI-related trauma incidence is substantially higher among those 15-24 years. From 2005 to 2007, on average, one of every 234 youth ages 15-24 was at risk for trauma admission with a TBI diagnosis. This is due to the increased participation in higher risk taking behaviors such as drinking and driving, speeding, extreme sport play, and violence. The risk of trauma admission begins to drop among those in the older age groups, yet incidence increases among those age 75 and above. In this advanced age group, one in every 296 adults were admitted to a trauma center and received a TBI diagnosis. The leading cause of these incidents among the elderly are falls. One in every three falls among the elderly (35%) that led to trauma center admission resulted in a TBI diagnosis. Among all falls treated at trauma centers, 12% were among the elderly, who make up just 6% of the County population. Our very young are also of particular concern. Children four and under had a fall-related TBI diagnosis rate of 48%, yet they constitute only 7% of the County population.

**Incidence of Trauma Admission with Traumatic Brain Injury  
Diagnosis by Age Group and Year,  
Riverside County, 2005-2007**



### From the desk of — Cindi Marlin-Stoll, RN, Emergency Medical Services Trauma Manager

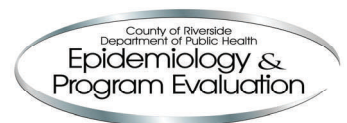
Unlike a stroke or an ischemic event, TBI involves kinetic energy, a force that causes either a direct or indirect injury. Even the mildest of brain/head injuries can cause disruption to the individual and their family. A slight bump to the head can lead to headaches, visual and balance disturbances, changes in moods and normal responses. Simple calculations, reading and verbal replies can be challenging tasks. A strong impact can cause irreparable damage that can cause major lifestyle changes to the individual and to those around them. While pre-hospital responders continue to use the reliable tools of assessment; Glasgow Coma Scale and pupil response, in-hospital cutting edge treatments are experimenting with hypothermia, reducing or eliminating steroid use and monitoring cerebral perfusion pressures. It all points to the same thing- most TBI's are preventable. Safety helmets in sports and athletic activities, watching where and how you walk, heavy objects on precarious supports and safe driving practices are just a few areas of prevention. I encourage you to educate yourselves and those around you. Be good to your head, it's the only one you will ever have.

**Suggested Citation:** Penny M and Gardner A. Traumatic Brain Injury in Riverside County, Riverside County 2005-2007: Riverside County Department of Public Health, Epidemiology and Program Evaluation, 2010.

**Contributing Staff:** Wendy Betancourt, Cindy Marlin-Stoll, Sarah Mack, Michael Osur

**References:**

- Centers for Disease Control and Prevention (2010). Traumatic Brain Injury. <http://www.cdc.gov/TraumaticBrainInjury/index.html>



4065 County Circle Drive  
Riverside, CA 92503  
Phone: 951-358-5557  
Fax: 951-358-5348