

# **Incidence, Causes and Outcomes of Injury Related Traumatic Brain Injury, Wisconsin, 1996**

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# Goal:

- To ascertain the number and incidence of Traumatic Brain Injury (TBI) hospitalizations for Wisconsin in 1996.
- To evaluate the causes of TBI related hospitalizations.
- To determine the outcomes (discharge status) of TBI related hospitalizations.
- To determine the additional number and costs of TBI related hospitalizations, and deaths, associated with not wearing helmets or seat belts for motor vehicle crash related TBI injuries.

# Data Used

- 1996 Wisconsin Inpatient Hospital Discharge Data
- 1996 Wisconsin Population Estimates (Census Bureau Data)
- 1996 Wisconsin Crash Outcome Data Evaluation System (CODES) data.

Links together Wisconsin crash report data and hospital discharge data using probabilistic linkage techniques.

# Criteria Used To Select Cases

## Cases included if:

- Wisconsin Resident
- Hospital Diagnostic Code of:
  - ❖ 800.00-801.99
  - ❖ 803.00-804.99
  - ❖ 850.00-854.99
  - ❖ 873.00-873.99 and an injury Ecode

## Cases excluded if:

- Hospital Diagnostic Code of:
  - ❖ 905.00-905.99
  - ❖ 907.00-907.99
  - ❖ 996.00-999.99
- Newborn admissions

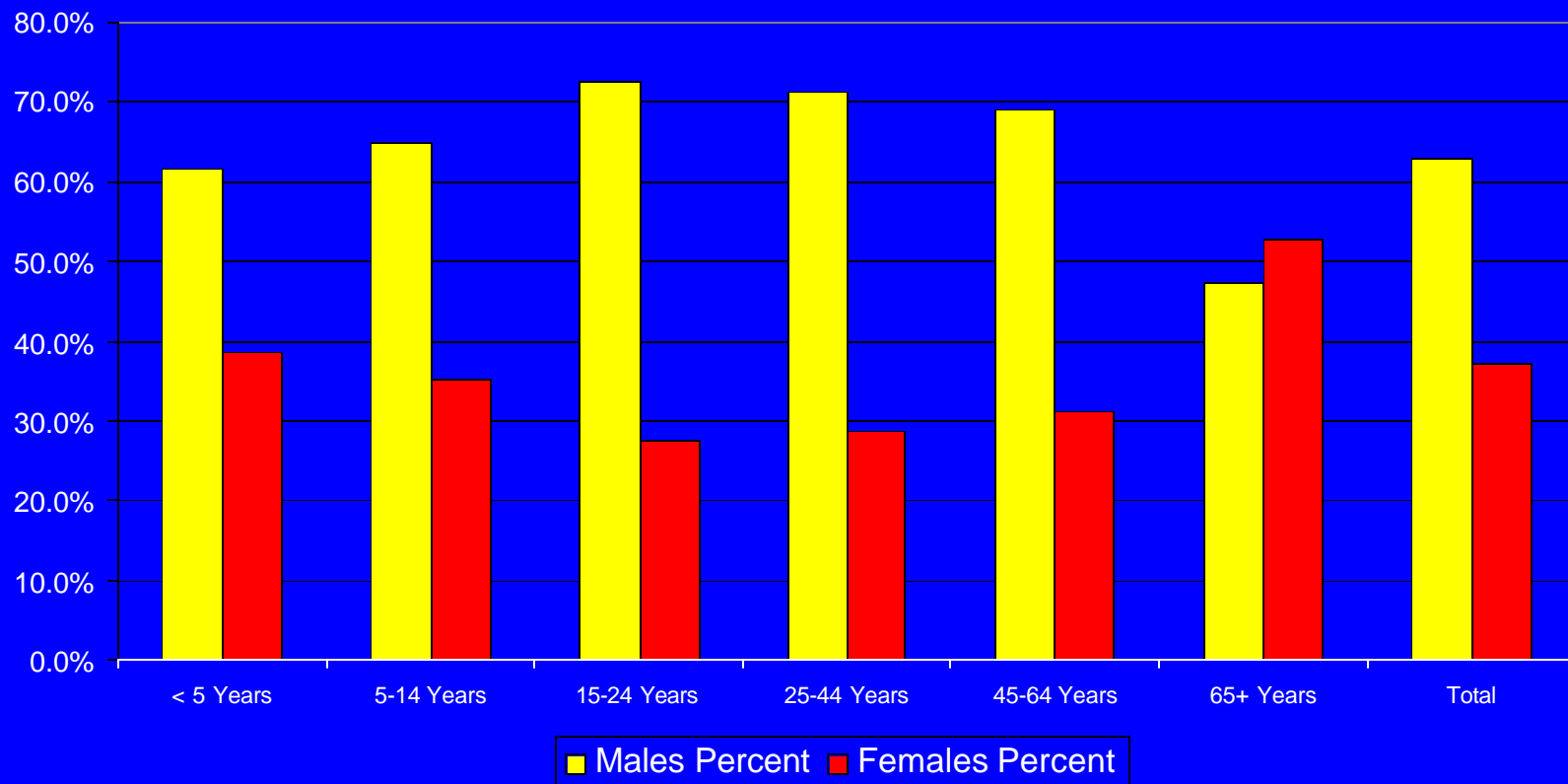
# Variables Used in Analysis

- Sex
- Age
- Discharge Status
  - ❖ Home
  - ❖ Other Institution
  - ❖ Died
- Seat Belt Worn (Y/N)
- Helmet worn (cycles,mopeds)
- Cause
  - ❖ Motor Vehicle Crash
  - ❖ Falls
  - ❖ Suicide
  - ❖ Homicide/Assault
  - ❖ Other
- Vehicle Type (Passenger, Motorcycle, Moped)
- Hospitalized (linked records)
- Died (combines Hospital and Crash Data Information)

**Table 1.**  
**Number and Percent of Hospitalized Persons**  
**with Traumatic Brain Injury by Age and Sex,**  
**Wisconsin, 1996**

	Males	Males	Females	Females	Total	Total
	Number	Percent	Number	Percent	Number	Percent
<b>&lt; 5 Years</b>	193	61.5%	121	38.5%	314	100.0%
<b>5-14 Years</b>	294	64.9%	159	35.1%	453	100.0%
<b>15-24 Years</b>	764	72.6%	289	27.4%	1,053	100.0%
<b>25-44 Years</b>	1,080	71.3%	435	28.7%	1,515	100.0%
<b>45-64 Years</b>	582	69.0%	262	31.0%	844	100.0%
<b>65+ Years</b>	871	47.3%	969	52.7%	1,840	100.0%
<b>Total</b>	<b>3,784</b>	<b>62.9%</b>	<b>2,235</b>	<b>37.1%</b>	<b>6,019</b>	<b>100.0%</b>

**Chart 1.**  
**Percent of Hospitalized TBI Cases**  
**Wisconsin, 1996, by Sex**

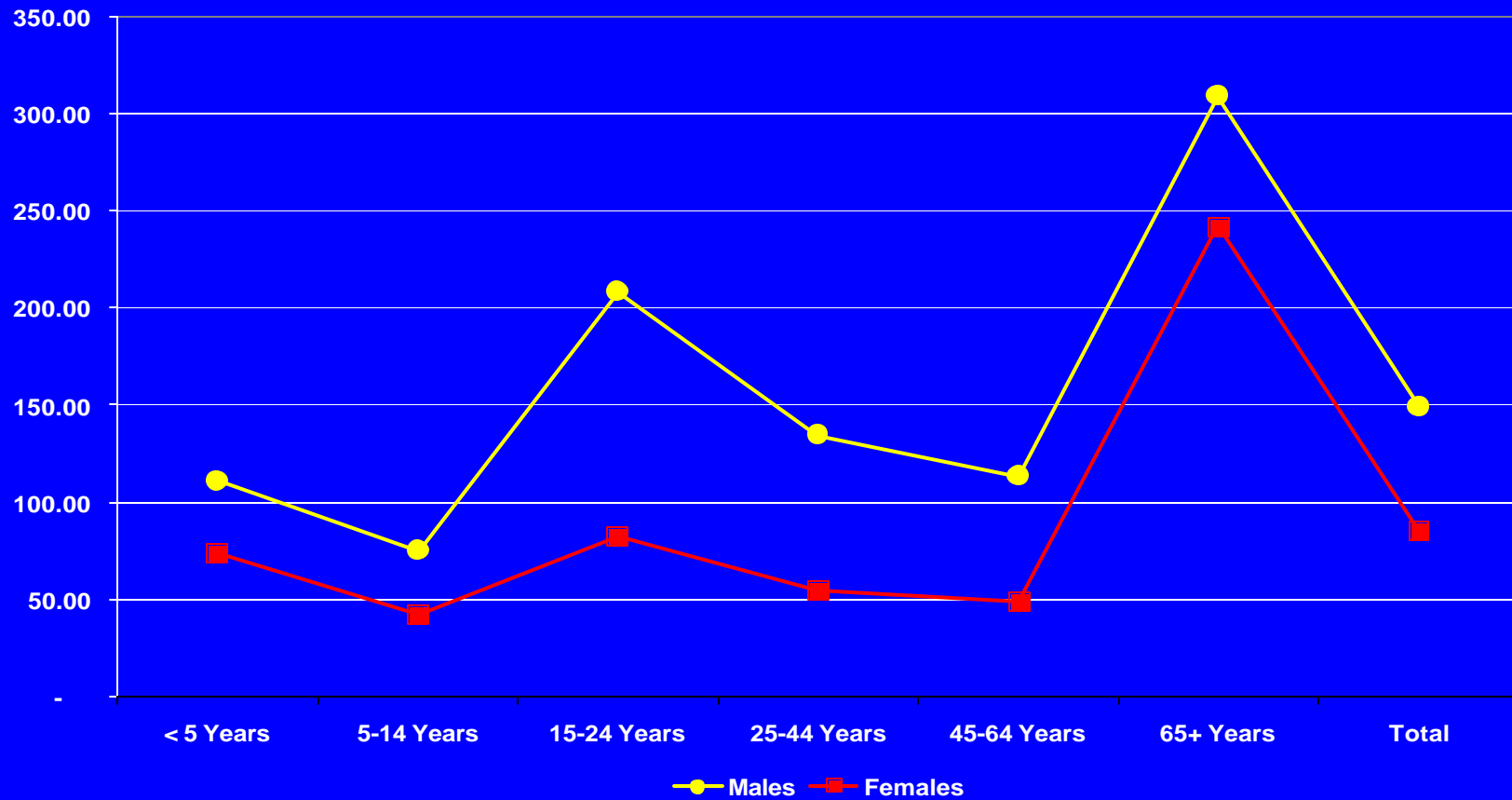


## Table 2.

Rate of Traumatic Brain Injury Hospitalization,  
per 100,000 by Age and Sex, Wisconsin, 1996

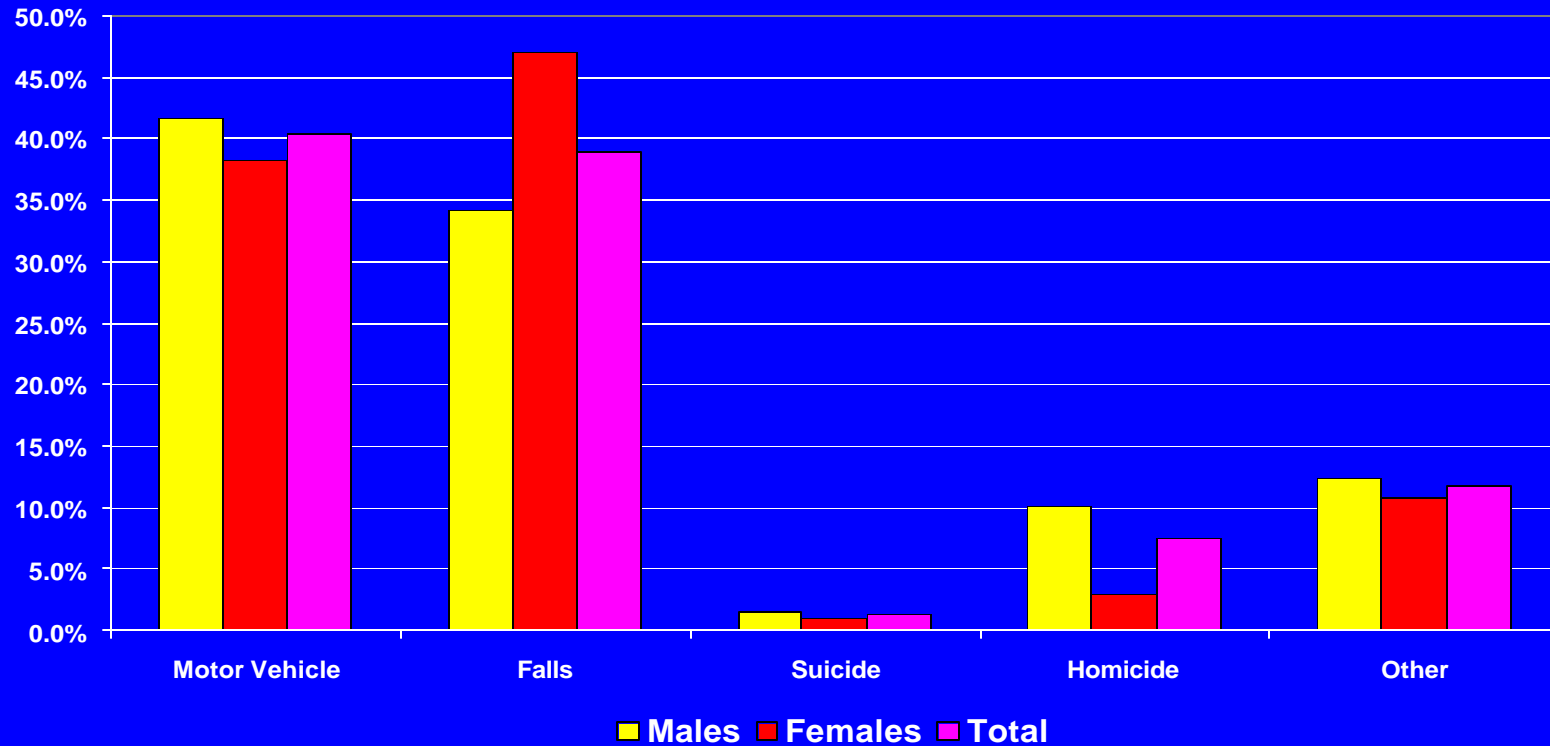
		Wisconsin					
		Males	Females	Population, 1996		Rate per 100,000	
		Number	Number	Males	Females	Males	Females
<b>&lt; 5 Years</b>		193	121	173,495	165,201	111.24	73.24
<b>5-14 Years</b>		294	159	392,991	372,569	74.81	42.68
<b>15-24 Years</b>		764	289	367,532	352,228	207.87	82.05
<b>25-44 Years</b>		1,080	435	803,502	796,095	134.41	54.64
<b>45-64 Years</b>		582	262	512,805	528,273	113.49	49.60
<b>65+ Years</b>		871	969	282,223	400,871	308.62	241.72
<b>Total</b>		3,784	2,235	2,532,548	2,615,237	149.41	85.46

**Chart 2.**  
**Rate of Traumatic Brain Injury Hospitalization**  
**per 100,000, by Age and Sex, Wisconsin, 1996**



<b>Table 3.</b>						
<b>External Cause Associated with</b>						
<b>Traumatic Brain Injury</b>						
<b>by Sex, Wisconsin, 1996</b>						
	<b>Males</b>	<b>Males</b>	<b>Females</b>	<b>Females</b>	<b>Total</b>	<b>Total</b>
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
<b>Motor Vehicle</b>	1,578	64.9%	855	35.1%	2,433	100.0%
<b>Falls</b>	1,294	55.3%	1,048	44.7%	2,342	100.0%
<b>Suicide</b>	61	72.6%	23	27.4%	84	100.0%
<b>Homicide</b>	381	85.0%	67	15.0%	448	100.0%
<b>Other</b>	470	66.0%	242	34.0%	712	100.0%
<b>Total</b>	<b>3,784</b>	<b>62.9%</b>	<b>2,235</b>	<b>37.1%</b>	<b>6,019</b>	<b>100.0%</b>

**Chart 3.**  
**Percent of Traumatic Brain Injury Hospitalizations**  
**by Sex and Cause, Wisconsin, 1996**



<b>Table 4.</b>							
<b>External Cause of Traumatic Brain Injury</b>							
<b>Related Hospitalizations, by Age and Sex,</b>							
<b>Wisconsin, 1996</b>							
		Motor			Homicide/		
		Vehicle	Falls	Suicide	Assault	Other	Total
<b>Males</b>							
< 5 Years		34	100	1	28	30	193
5-14 Years		162	73	-	12	47	294
15-24 Years		474	69	10	127	84	764
25-44 Years		547	182	33	181	137	1,080
45-64 Years		207	245	7	32	91	582
65+ Years		152	625	10	1	83	871
<b>Total</b>		<b>1,576</b>	<b>1,294</b>	<b>61</b>	<b>381</b>	<b>472</b>	<b>3,784</b>
<b>Females</b>							
< 5 Years		27	67	-	2	25	121
5-14 Years		95	24	1	1	38	159
15-24 Years		236	16	6	11	20	289
25-44 Years		261	86	12	42	34	435
45-64 Years		109	108	4	7	34	262
65+ Years		127	747	-	14	91	979
<b>Total</b>		<b>855</b>	<b>1,048</b>	<b>23</b>	<b>77</b>	<b>242</b>	<b>2,245</b>

<b>Table 5.</b>						
<b>Rate per 100,000 Persons for</b>						
<b>External Cause of Traumatic Brain Injury</b>						
<b>Related Hospitalizations, by Age and Sex,</b>						
<b>Wisconsin, 1996</b>						
	<b>Motor Vehicle</b>	<b>Falls</b>	<b>Suicide</b>	<b>Homicide/ Assault</b>	<b>Other</b>	<b>Total</b>
<b>Males</b>						
<b>&lt; 5 Years</b>	19.60	57.64	0.58	16.14	17.29	111.24
<b>5-14 Years</b>	41.22	18.58	-	3.05	11.96	74.81
<b>15-24 Years</b>	128.97	18.77	2.72	34.55	22.86	207.87
<b>25-44 Years</b>	68.08	22.65	4.11	22.53	17.05	134.41
<b>45-64 Years</b>	40.37	47.78	1.37	6.24	17.75	113.49
<b>65+ Years</b>	53.86	221.46	3.54	0.35	29.41	308.62
<b>Total</b>	62.23	51.09	2.41	15.04	18.64	149.41
<b>Females</b>						
<b>&lt; 5 Years</b>	16.34	40.56	-	1.21	15.13	73.24
<b>5-14 Years</b>	25.50	6.44	0.27	0.27	10.20	42.68
<b>15-24 Years</b>	67.00	4.54	1.70	3.12	5.68	82.05
<b>25-44 Years</b>	32.79	10.80	1.51	5.28	4.27	54.64
<b>45-64 Years</b>	20.63	20.44	0.76	1.33	6.44	49.60
<b>65+ Years</b>	31.68	186.34	-	3.49	22.70	241.72
<b>Total</b>	32.69	40.07	0.88	2.94	9.25	85.46

Chart 4.  
 Rate of Traumatic Brain Injury Hospitalizations per 100,000, by  
 Cause and Age, for Males, Wisconsin, 1996

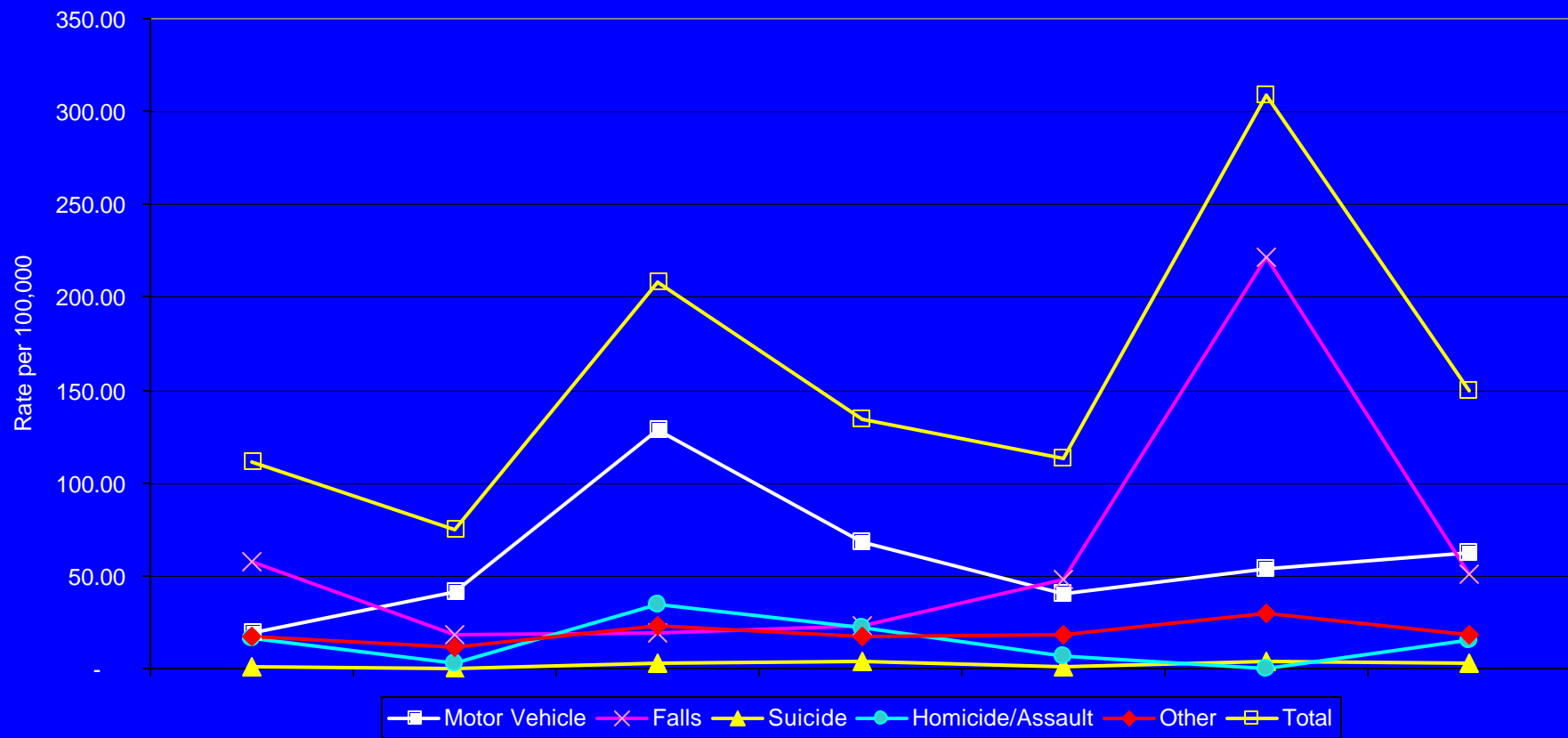
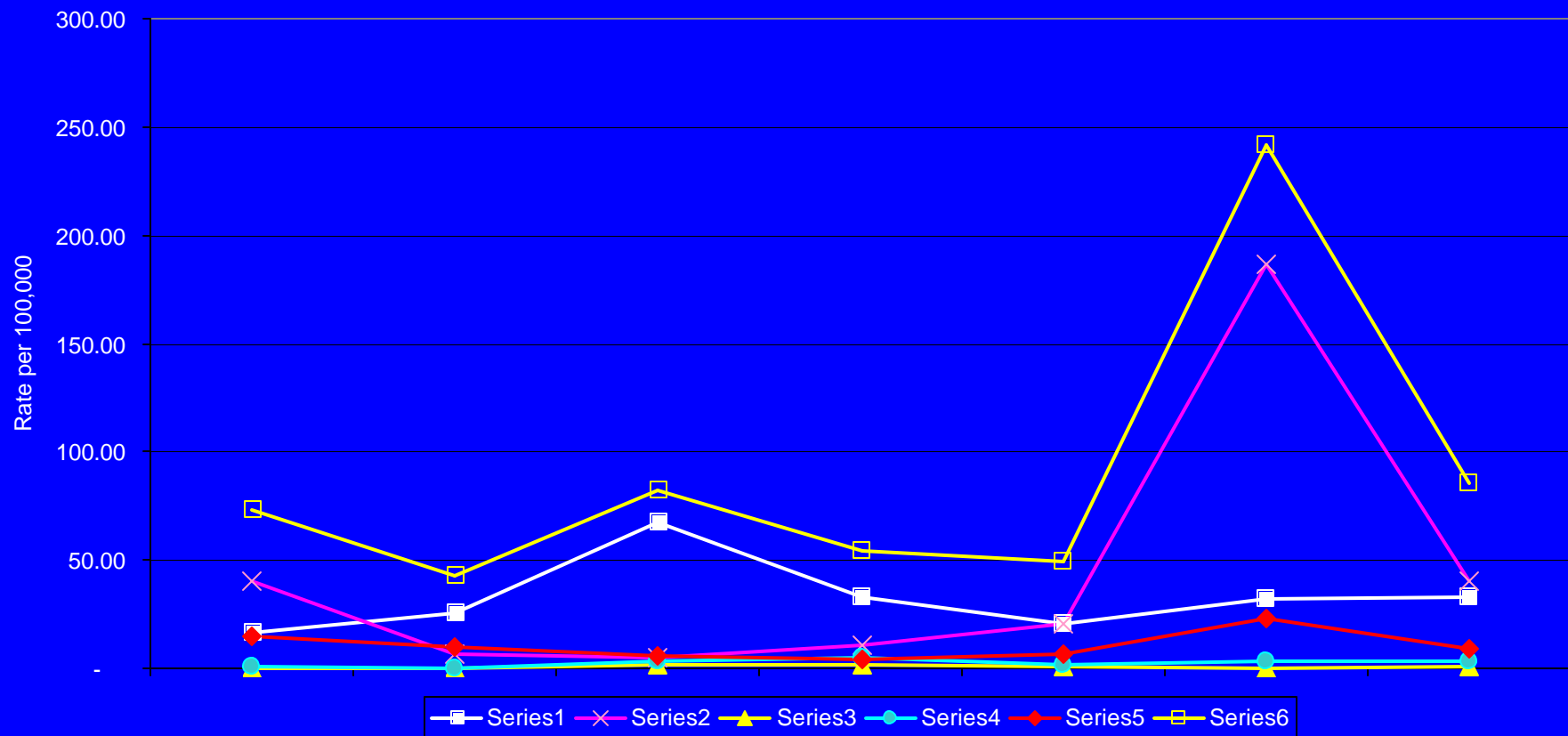


Chart 5.  
 Rate of Traumatic Brain Injury Hospitalizations per 100,000, by  
 Cause and Age, for Females, Wisconsin, 1996



<b>Table 6.</b>						
<b>Discharge Status for Traumatic Brain Injury</b>						
<b>Related Hospitalizations, by Age and Sex,</b>						
<b>Wisconsin, 1996</b>						
	<b>Home Release</b>		<b>Other Institution</b>		<b>Died</b>	<b>Died</b>
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
<b>Males</b>						
< 5 Years	183	94.8%	6	3.1%	4	2.1%
5-14 Years	273	92.9%	17	5.8%	4	1.4%
15-24 Years	621	81.3%	100	13.1%	43	5.6%
25-44 Years	813	75.3%	227	21.0%	40	3.7%
45-64 Years	420	72.2%	124	21.3%	38	6.5%
65+ Years	400	45.9%	372	42.7%	99	11.4%
<b>Total</b>	<b>2,710</b>	<b>71.6%</b>	<b>846</b>	<b>22.4%</b>	<b>228</b>	<b>6.0%</b>
<b>Females</b>						
< 5 Years	115	95.0%	4	3.3%	2	1.7%
5-14 Years	148	93.1%	4	2.5%	7	4.4%
15-24 Years	249	86.2%	35	12.1%	5	1.7%
25-44 Years	343	82.7%	57	13.7%	15	3.6%
45-64 Years	201	76.7%	54	20.6%	7	2.7%
65+ Years	412	42.5%	492	50.8%	65	6.7%
<b>Total</b>	<b>1,468</b>	<b>66.3%</b>	<b>646</b>	<b>29.2%</b>	<b>101</b>	<b>4.6%</b>

**Table 7.**

**Number and Percent of TBI Related  
Hospitalizations, by Age and Sex,  
for CODES and Hospital Discharge Data,  
(Vehicle Crash Related Only) Wisconsin, 1996**

	CODES DATA		HOSPITAL DATA	
	Number	Percent	Number	Percent
	<b>Males</b>			
< 5 Years	13	1.4%	34	2.2%
5-14 Years	35	3.8%	162	10.3%
15-24 Years	309	33.6%	474	30.0%
25-44 Years	356	38.7%	549	34.8%
45-64 Years	125	13.6%	207	13.1%
65+ Years	82	8.9%	152	9.6%
<b>Total</b>	<b>920</b>	<b>100.0%</b>	<b>1,578</b>	<b>100.0%</b>
<b>Females</b>				
< 5 Years	13	2.3%	27	3.2%
5-14 Years	31	5.4%	95	11.1%
15-24 Years	184	32.2%	236	27.6%
25-44 Years	192	33.6%	261	30.5%
45-64 Years	75	13.1%	109	12.7%
65+ Years	77	13.5%	127	14.9%
<b>Total</b>	<b>572</b>	<b>100.0%</b>	<b>855</b>	<b>100.0%</b>



# Results (1)

- Males Comprise 63% of all TBI related hospitalizations, ranging from 72.6% for ages 15-24, down to 47.3% for ages 65+.
- Overall rate of TBI related hospitalizations per 100,000 is 149.4 for males and 85.8 for females.

## External Causes of TBI Hospitalizations

- For males, motor vehicle crash related TBI is first, with a rate of 62.2 per 100,000, followed by falls with a rate of 51.1.
- For females, falls are the most common cause of TBI hospitalizations, with a rate of 40.1 per 100,000. Motor vehicle crash related TBI is second, with a rate of 32.7.
- Homicide and assault related TBI is an important factor for males, who have an overall rate of 18.6 per 100,000, but not for females (with a rate of less than 3 per 100,000)

## Results (2)

- 6% of all TBI related hospitalizations for males result in death, but only 4.6% for females.
- Persons not wearing helmets and involved in a motorcycle crash are almost 5 times as likely to have a TBI hospitalization as persons wearing a helmet.
- Although almost 9% of TBI hospitalizations for persons not wearing a helmet resulted in death, no deaths occurred for persons wearing a helmet.
- Persons reported as not wearing a seatbelt are 13 times as likely to have a TBI related hospitalization as those wearing a seatbelt.
- The relative risk of a TBI hospitalization dying or being transferred to another institution are slightly higher for persons not wearing seatbelts compared to those reported to be wearing a seatbelt.