Alabama Head and Spinal Cord Injury Report

January 1, 2010 – December 31, 2010

Alabama Department of Public Health
Donald E. Williamson, M.D., State Health Officer

Office of Emergency Medical Services and Trauma
Dennis Blair, Director

State Trauma Program Administrator
Choona Lang, R.N., BSN, MHA

Alabama Trauma Registry Program Coordinator
Verla Thomas, R.N., BSN

Alabama Trauma Registry Epidemiologist
Robin Moore, M.P.H.

Background

According to the National Center for Health Statistics (NCHS), traumatic injuries cause more deaths among children and young adults than any other disease. The Alabama Center for Health Statistics (ACHS) reports that, in 2008, accidental injury alone ranks fourth overall among causes of death. Moreover, when the components of traumatic injury, i.e. accidental, suicide, and homicide, are added together, they represent the third leading cause of mortality in the state. In fact, traumatic injuries result in the loss of more potential years of life than any other cause.

The Alabama Department of Rehabilitation Services (ADRS) is charged with offering rehabilitation services to patients with moderate to severe brain, spinal cord, or other debilitating injury. At times, patients are unaware of, or have difficulty understanding, state supported rehabilitation services – the result of which leads to inadequate rehabilitation, disability management, and work force re-entry assistance. Patients who have sustained debilitating injuries are identified and linked with ADRS via the Alabama Head and Spinal Cord Injury Registry (AHSCIR), a registry mandated by Alabama Act 98-611. This law, which requires all hospitals in Alabama to submit data related to head and/or spinal cord injury cases to the Alabama Department of Public Health (ADPH), was passed In May of 1998. The Alabama Trauma Registry (ATR), established shortly after AHSCIR data collection began in 1999, strives to broaden collection efforts to include data related to all types of trauma. Since the trauma registry program began providing data to the ADRS in the year 2000, patients with moderate to severe traumatic brain injury and/or spinal cord injury have been identified and contacted. Detailed analysis of 2010 data submitted to the ATR is ongoing since new cases from 2010 are still being submitted. However, enough data is contained in the ATR to perform a preliminary analysis of 2010 cases. Those requesting services have been provided appropriate, need-based, referral information.

More specifically, development of the ATR component pertains to an expansion of the head and spinal cord injury registry into a larger, more comprehensive program. Trauma registry personnel in the Office of Emergency Medical Services and Trauma (OEMST) of the ADPH collect statewide data by working with hospitals and at all levels of trauma care (acute and ancillary). The ATR is capturing data that will allow for more accurate evaluations regarding traumatic injury patterns and care. Data is received from hospitals that devote significant resources to trauma care as well as those hospitals that function to treat less severe traumatic injuries but stabilize and transfer more severe traumatic injuries. Ultimately, registry data analysis and injury pattern evaluations will permit researchers and policy makers to identify better ways of reducing injury mortality and morbidity in Alabama.

It is important to provide the public with mortality and morbidity statistics associated with motor vehicle crashes in order to accurately illustrate the impact injuries have on individuals, families, and society. Additionally, the information assists with efforts related to increasing protective equipment usage rates. Trauma registry data are used by a

variety of organizations. Emergency management agencies and emergency medical service providers use the registry information for community trauma prevention education. As previously described, the state department of rehabilitation services uses the AHSCIR data to locate patients suffering from head and/or spinal cord injuries in an effort to make them aware of state supported services and perform follow-up treatment.

Historically, the *Alabama Traffic Injury Registry (ATIR)*, which collected data from 1991 through 1998 from 18 hospital emergency departments, was able to generate and convey similar information; however, due to the small sample size and other limitations, it was not possible to draw broad conclusions with respect to statewide mortality and morbidity. Collection of *ATIR* data was labor intensive, required frequent travel to hospital emergency departments, and did not capture all moderate to severe trauma cases admitted to the 18 participating hospitals. The demographic characteristics of patients treated at hospitals from which the *ATIR* collected data were, simply put, not representative of the state as a whole. Therefore, it was not possible to accurately assess the extent of disparity in Glasgow Coma Scale (GCS) scores, the Abbreviated Injury Scale (AIS) scores, Injury Severity Scores (ISS), and functional ability at discharge of persons whose injuries were severe enough for admittance to the hospital. For obvious reasons, if hospital participation for the general trauma registry (ATR) is broad enough, more representative samples will be available which, in turn, will allow for more accurate information regarding statewide traumatic injury – especially head and spinal cord injury.

The Alabama Statewide Cancer Registry, located in the Bureau of Health Promotion and Chronic Disease at the time, provided the ATR/AHSCIR staff with a successful example of disease registry operation and management. Collaboration between the ATR/AHSCIR and cancer registry staff contributed greatly to the development and operation of the trauma registry program. Also, the ATR/AHSCIR staff has consulted with the staffs and studied the web sites of other successful state registries over the years leading to necessary updates to improve the operation of the Registry. The ATR/AHSCIR is modeled after these successful programs and strives, in cooperation with Alabama Trauma Centers and statewide Emergency Medical Service (EMS) Agencies and EMS practitioners, to establish one of the most comprehensive trauma systems in the country.

Methods

The case definition for inclusion in the ATR program denotes any patient with at least one injury ICD-9-CM diagnosis code between 800.00 and 959.9, excluding 905–909 (late effects of injury), 910-924 (blisters, contusions, abrasions, and insect bites), and 930-939 (foreign bodies). The patient must also have been admitted to the hospital for at least 24 hours, transferred into and/or out of the hospital, died after receiving any evaluation or treatment at the hospital, or were dead upon arrival. Reportable diagnoses for the Alabama Head and Spinal Cord Injury Registry include all confirmed cases of head and spinal cord injury with at least one of the following ICD-9-CM diagnoses:

800.0 – 801.9	Fracture of the vault or base of the skull
803.0 – 804.9	Other and unqualified and multiple fractures of the skull
850.0 – 854.1	Intracranial injury, including concussion, contusion, laceration
806.0 – 806.9	Fracture of vertebral column with spinal cord lesion
950.1 – 950.3	Injury to the optic chiasm, optic pathways, and visual cortex
952.0 – 952.9	Spinal cord lesion without evidence of spinal bone injury
959.01	Head Injury, unspecified
995.55	Shaken infant syndrome

Data Use and Comparability

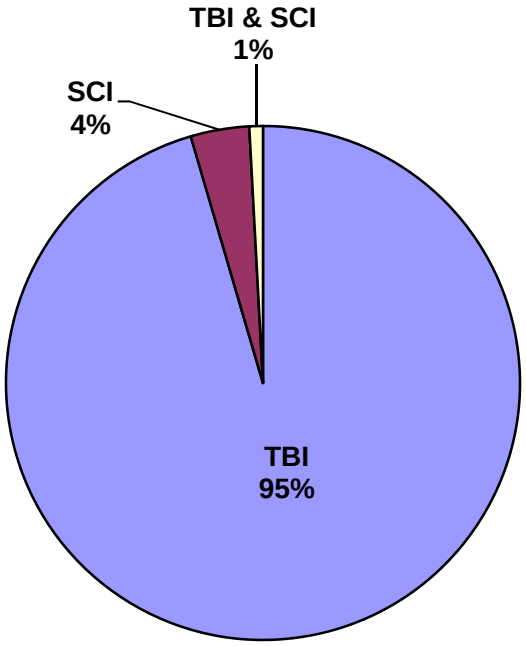
All data contained in this report must be interpreted with careful judgment. It is important to note that the information presented in this report is based on 2010 admission data submitted to the ATR on or before July 31, 2011. The data in this report is not comparable to state or federal data from other sources due to variations in collection and analytical techniques.

Less severe head and spinal cord injuries may be under-represented in this analysis since less severe injuries are not submitted to the registry by some hospitals due to the case definition specifics or registrar omission. Additionally, mortality may be under-estimated because some individuals may have expired at the scene and bypassed hospitals. The statistical significance of the summary data for the SCI and combined TBI/SCI cases is also limited by the small population size regarding some respective data subgroups. Cases admitted to a given hospital and then transferred to another hospital during the course of their treatment are counted twice in this report. More Alabama hospitals submitted data on 2010 head and spinal cord injury admissions to the Alabama Head and Spinal Cord Injury Registry than for any previous year.

RESULTS

The ATR received reports of 5,732 head and spinal cord injury cases that were admitted to Alabama hospitals during calendar year 2010. Head injuries (TBI) constituted 95 percent (n = 5,472) of the reported cases and spinal cord injuries (SCI) constituted 4 percent (n =211). There were 49 cases (one percent) in the registry that had both head and spinal cord injuries. This document will use the term traumatic brain injury (TBI) when referring to head injuries. Separate analyses are presented for each of the three categories.

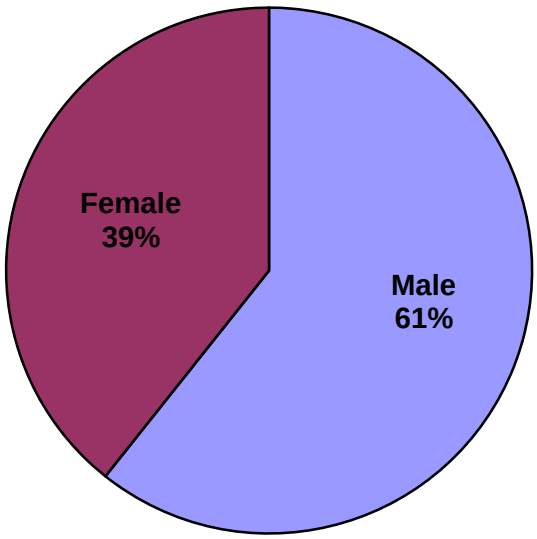
Figure 1
Type of Injury
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(N = 5,732)



Population size of each category will be noted in the caption for each graphic illustration.

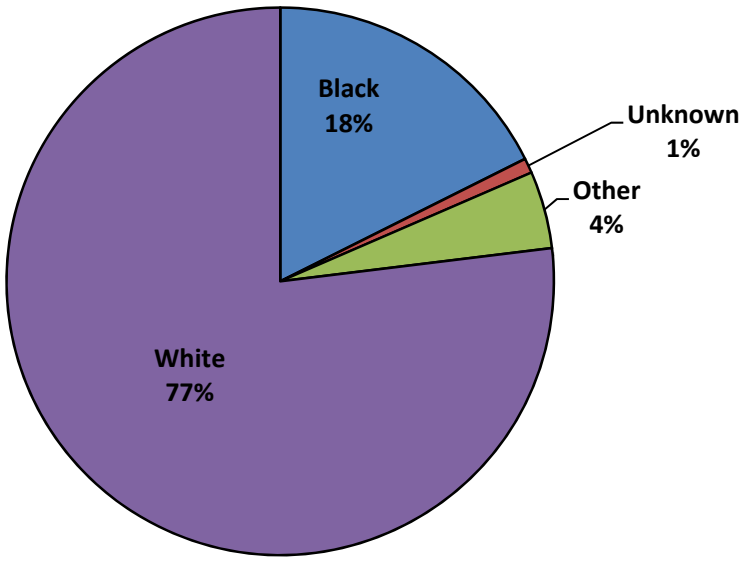
Traumatic Brain Injury

Figure 2
Proportion of TBI Cases by Gender
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n=5,472)



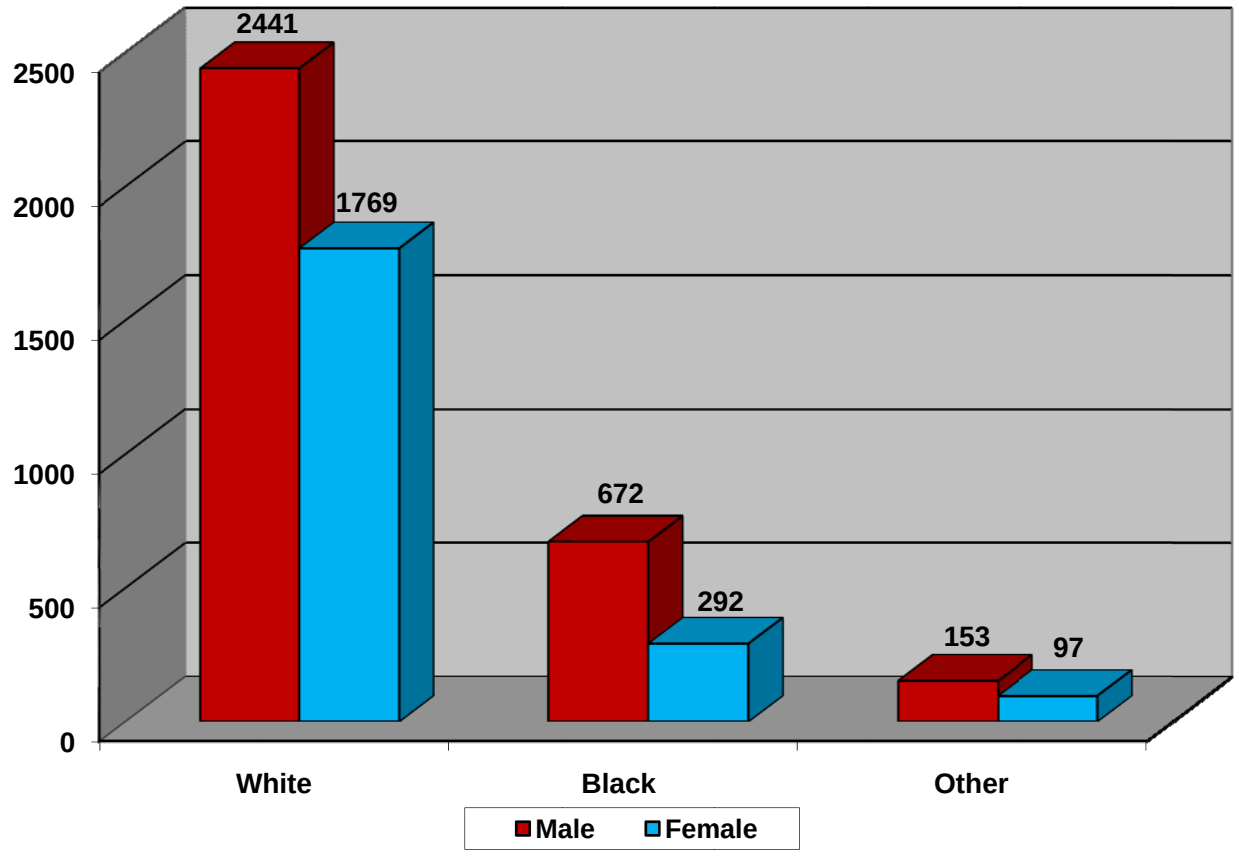
There were 1.6 times more male TBI cases (n = 3,294) than female cases (n = 2,133) reported to the ATR for calendar year 2010. Forty-five cases were missing this information.

Figure 3
Proportion of TBI Cases by Race
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010– December 31, 2010
(n = 5,472)



Whites constitute 77 percent (n = 4,210) of the cases, Blacks 18 percent (n = 964), and Others four percent (n = 250) of TBI cases. The Unknown category comprises one percent (n = 48).

Figure 4
Number of TBI Cases by Gender & Race
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 5,472)



Fifty-eight percent (n = 2,441) of TBI cases in whites were male, seventy percent (n = 672) of black cases were male, and sixty-one percent (n = 153) of Others were male. This category includes those of Asian, American Indian, and Hispanic. The overall percentages in this injury type were 61 percent male and 39 percent female (see Figure 2). Forty-eight cases were missing either one or both of these data points.

Table 1
2010 TBI Cases by Age, Gender & Race
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 5,472)

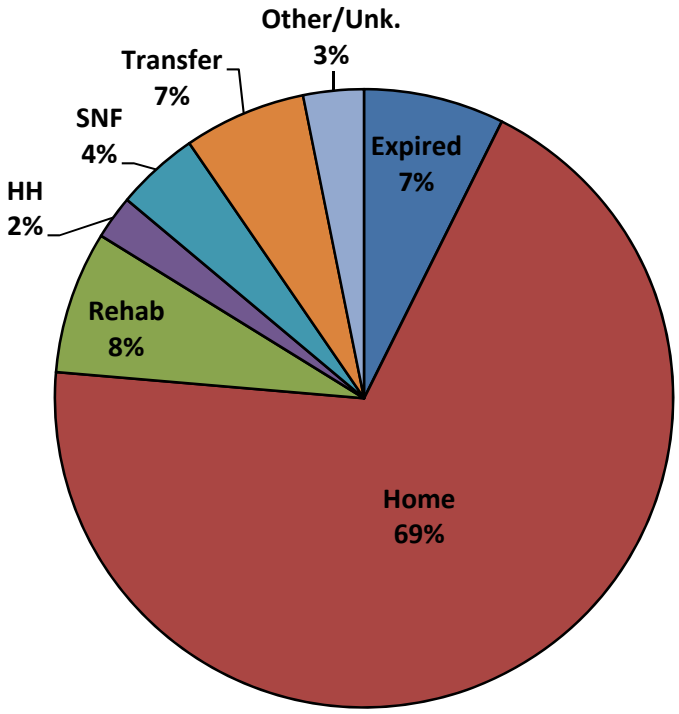
Age	White Males	White Females	Black Males	Black Females	Other Males	Other Females	Total	% Total
<5	57	33	31	25	9	14	169	3.1%
5-14	141	73	40	19	11	8	292	5.4%
15-24	561	260	167	76	44	27	1,135	20.9%
25-34	358	212	125	51	38	23	807	14.9%
35-44	271	179	96	19	22	5	592	10.9%
45-54	323	183	103	43	15	5	672	12.4%
55-64	252	181	53	21	4	3	514	9.5%
65-74	200	208	36	7	3	8	462	8.5%
75-84	180	266	12	19	5	3	485	8.9%
>84	98	174	9	12	2	1	296	5.5%
Total	2,441	1,769	672	292	153	97	5,424	100%
% Total	45.0%	32.5%	12.8%	5.3%	2.7%	1.7%	100%	

The 15-24 year old age group sustained the largest percentage of TBI cases both in 2009, 18.7 percent (n = 682), and 2010, 20.9 percent (n = 1135). In 2009, this data was missing in eight TBI cases, in 2010, this data was missing in 48 TBI cases. The percentages used here exclude the cases of unknown age from the subpopulation. The Other category in the data includes Asians, Hispanics, and others.

Table 2
2009 TBI Cases by Age, Gender & Race
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2009 – December 31, 2009
(n = 3,045)

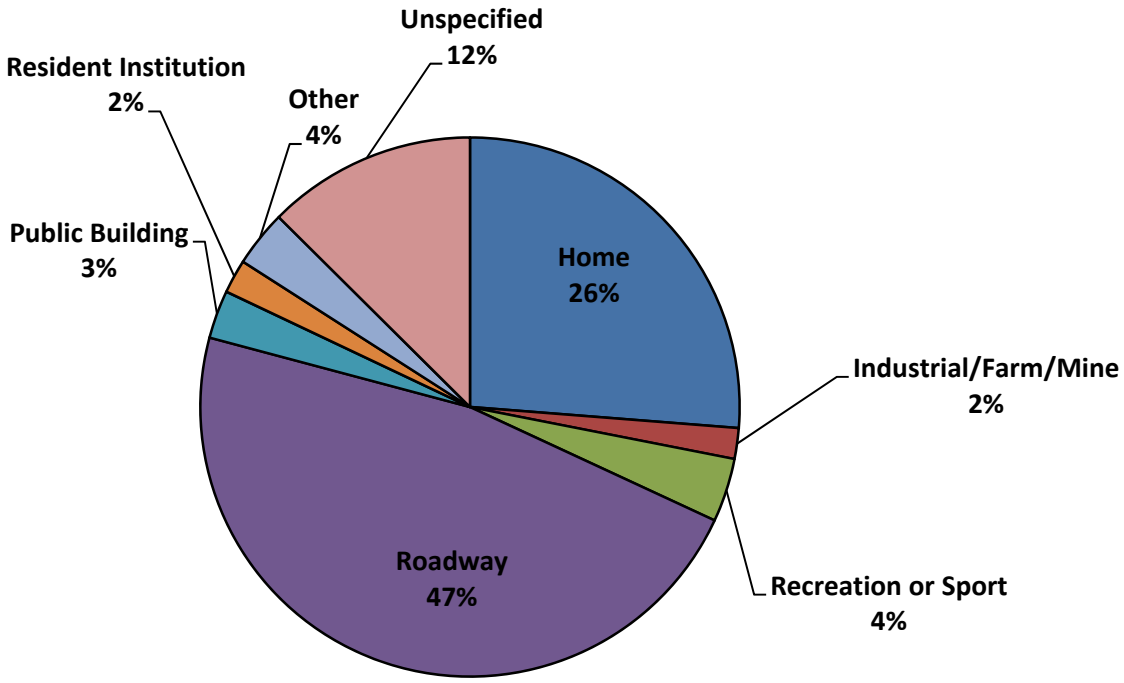
Age	White Males	White Females	Black Males	Black Females	Other Males	Other Females	Total	% Total
<5	36	25	21	7	7	2	98	3.2%
5-14	63	39	25	11	6	2	146	4.8%
15-24	309	152	113	48	29	8	659	21.6%
25-34	200	110	75	21	35	7	448	14.7%
35-44	197	108	70	19	15	4	413	13.6%
45-54	195	94	67	23	8	2	389	12.8%
55-64	165	99	39	6	4	3	316	10.4%
65-74	100	77	23	3	3	1	207	6.8%
75-84	96	129	10	11	0	2	248	8.1%
>84	45	64	3	8	0	1	121	4.0%
Total	1,406	897	446	157	107	32	3045	100%
% Total	46.2%	29.5%	14.6%	5.1%	3.5%	1.1%	100%	

Figure 5
Discharge Disposition Following TBI Cases
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n =5,472)



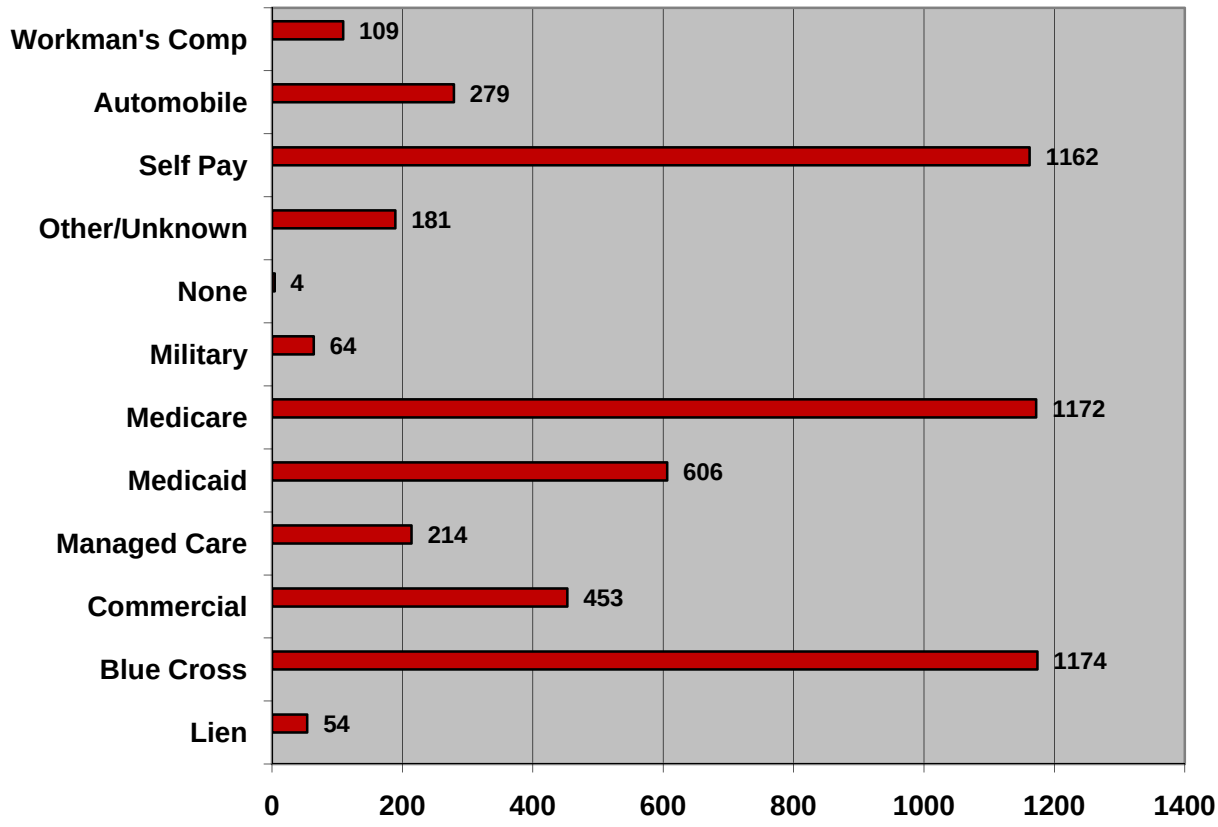
By far the greatest portion, sixty-nine percent (n = 3,746), were discharged home. From the data it cannot be determined how many of these were referred to outpatient rehab facilities. Two percent (n = 124) were discharged to home health services. Seven percent (n = 399) of TBI cases died. Seven percent (n = 347) were transferred to other acute care hospitals. Eight percent (n = 405) were transferred to inpatient rehab facilities. Four percent (n = 236) were sent to skilled nursing facilities (SNF). The Other/Unk. category, three percent (n = 172), includes psychiatric hospitals, hospices, and assisted living facilities, as well as “against medical advice,” and “undocumented" discharge destinations. This data point was missing in 43 cases.

Figure 6
Site of Injury Occurrence in TBI Cases
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n =5,472)



Most traumatic brain injuries, forty-seven percent (n = 2,585), reported to the ATR occurred on roads, streets, and highways; twenty-six percent (n = 1,436) occurred in the home; four percent (n = 209) in places for sports and recreation, three percent in public buildings (n = 158), two percent (n = 111) in residential institutions such as hospitals and nursing homes, two percent (n = 101) in industrial or farming settings, and four percent (n = 185) in a variety of other settings. Twelve percent (n = 687) of cases had no site specified.

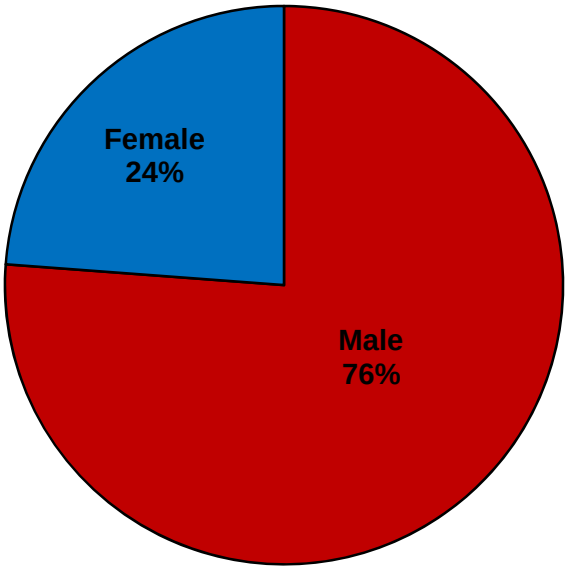
Figure 7
Payer Source for TBI Cases
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 5,472)



Individuals paid for their own care in twenty-one percent (n = 1,162) of cases according to information sent to the ATR. Twenty-four percent (n = 1,174) were paid for by various Blue Cross/Blue Shield plans. Medicare and Medicaid paid in 21 percent (n = 1,172) and 11 percent (n = 606), respectively. Various commercial insurance companies were primary payers in 8 percent (n = 453) of TBI cases reported to the Registry. Military insurance plans paid in 1 percent (n = 64), workman's compensation was the primary payer in 2 percent (n = 109), and hospital liens were held in 0.9 percent (n = 54). There was no payment in less than 1 percent (n = 4) of cases. Similarly, payment source was indicated as other or not documented in less than four percent (n = 189) of these cases. Automobile insurance was the primary payer in 5.1 percent (n = 279). The source of payment data sent to the ATR is particularly subject to misclassification for various reasons, e.g., the commercial group might include some managed care organizations or the primary payment source may not be properly submitted when there are multiple sources of payment.

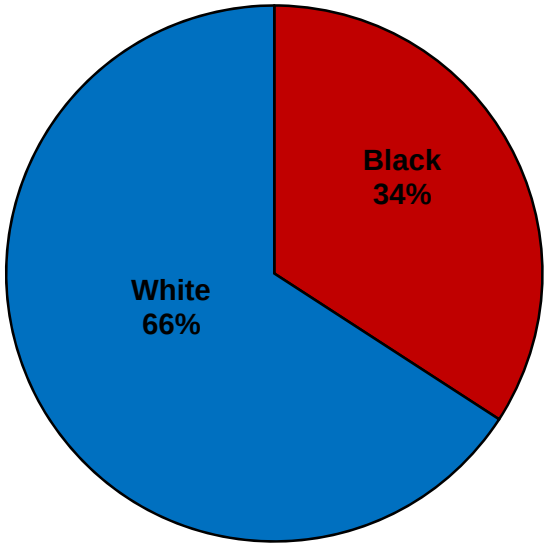
Spinal Cord Injury

Figure 8
Proportion of SCI Cases by Gender
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 211)



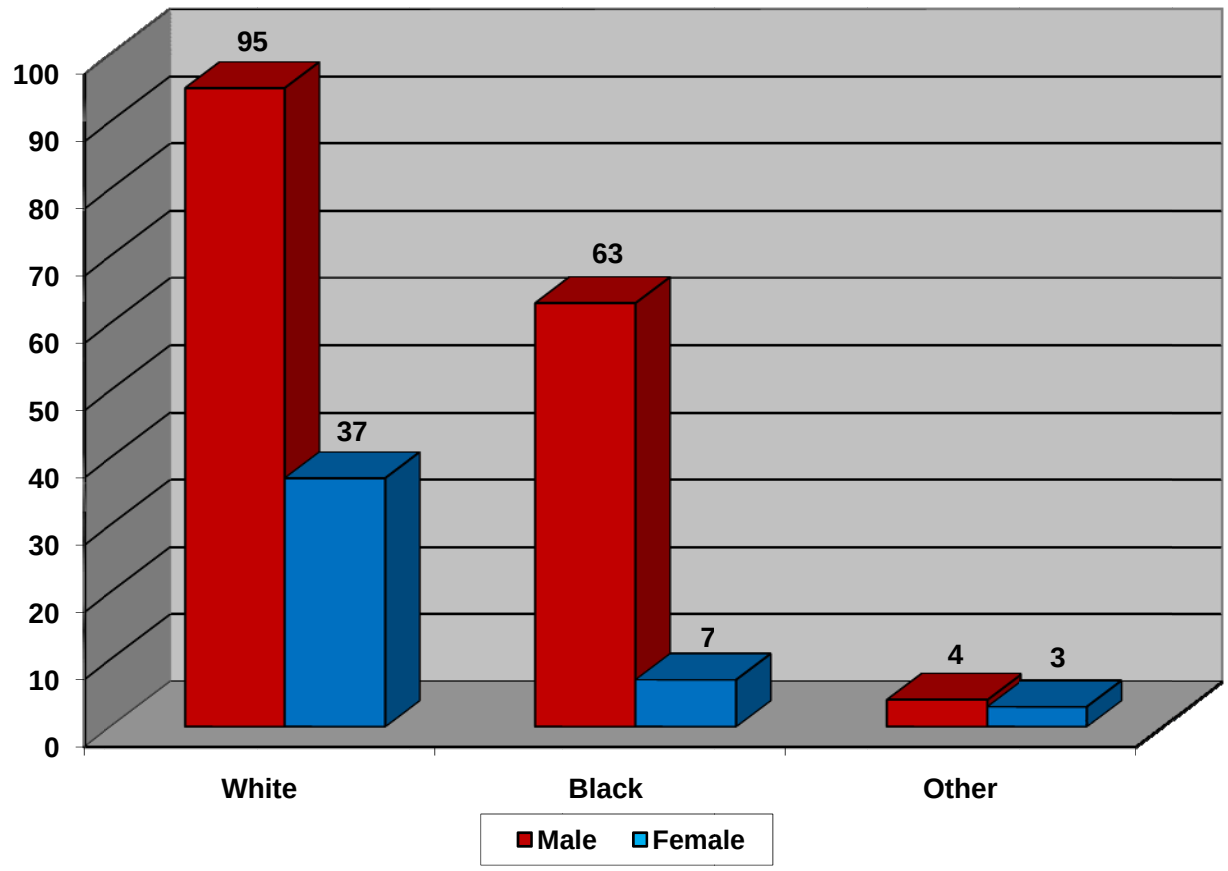
There were 3.2 times more male SCI cases (n = 160) than female cases (n = 50) reported to the Alabama Trauma Registry for calendar year 2010. Gender was missing in one case.

Figure 9
Proportion of SCI Cases by Race
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 211)



Whites constituted 66 percent (n = 133) of the SCI cases and Blacks 25 percent (n = 69) in calendar year 2010. Nine Race values were missing.

Figure 10
Number of SCI Cases by Race and Gender
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 211)



Seventy-two percent (n = 95) of SCI cases in whites were male and ninety-nine percent (n = 63) in blacks were male. Two observations were missing.

Table 3
2010 SCI Cases by Age, Gender & Race
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 211)

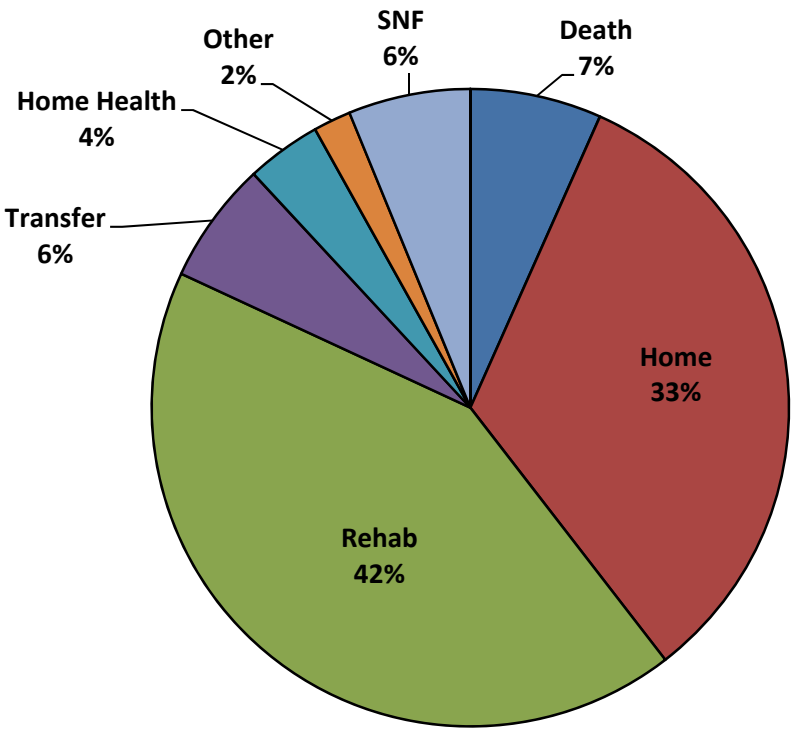
Age	White Males	White Females	Black Males	Black Females	Other Males	Other Females	Total	% Total
<5	0	2	0	0	0	0	2	1.0%
5-14	0	0	2	0	0	0	2	1.0%
15-24	18	4	16	3	1	0	42	20.1%
25-34	13	6	9	1	0	0	29	13.8%
35-44	14	1	11	1	1	2	30	14.3%
45-54	18	7	13	1	2	1	42	20.1%
55-64	10	4	7	0	0	0	21	10.0%
65-74	17	6	0	1	0	0	24	11.5%
75-84	4	7	4	0	0	0	15	7.2%
>84	1	0	1	0	0	0	2	1.0%
Total	95	37	63	7	4	3	209	100%
% Total	45.5%	17.7%	30.2%	3.3%	1.9%	1.4%	100%	

The 15-24 year old and the 45-54 year age groups experienced the largest percentage of spinal cord injuries in 2010, 19.9 percent (n = 42). The Other category in the table on this page includes Asians, Hispanics, and other ethnic groups. Ages were missing in 2 cases.

Table 4
2009 SCI Cases by Age, Gender & Race
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2009 – December 31, 2009
(n = 133)

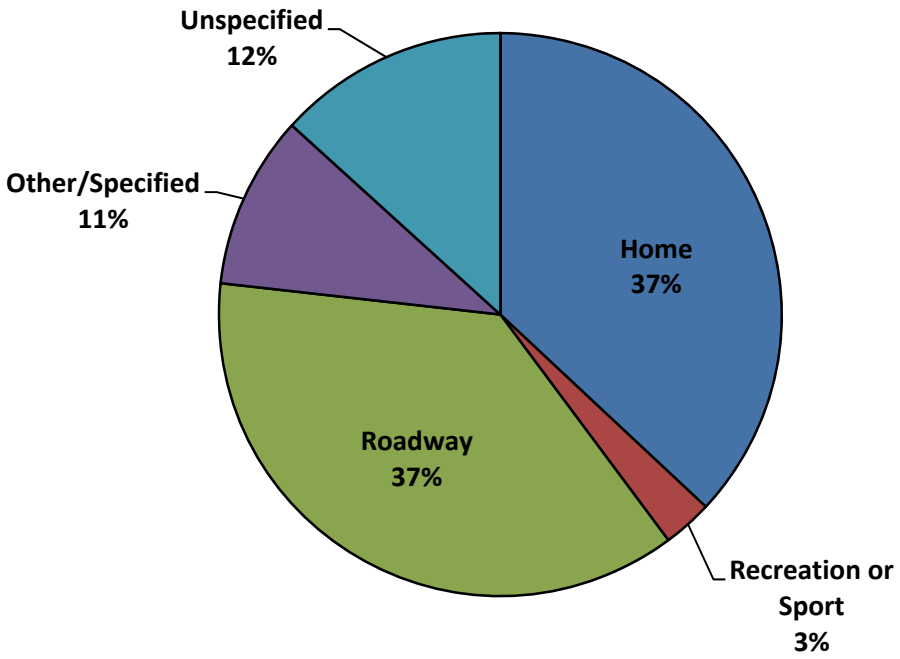
Age	White Males	White Females	Black Males	Black Females	Other Males	Other Females	Total	% Total
<5	0	0	0	0	1	0	1	00.7%
5-14	0	1	0	0	0	0	1	00.7%
15-24	15	5	7	2	2	0	31	21.8%
25-34	12	1	12	1	1	0	27	19.0%
35-44	8	2	4	1	0	0	15	10.6%
45-54	15	6	2	0	0	0	23	16.2%
55-64	10	2	4	1	1	0	18	12.7%
65-74	9	1	0	0	0	0	10	7.0%
75-84	6	4	0	1	0	0	11	7.8%
>84	4	0	1	0	0	0	5	3.5%
Total	59	25	41	7	1	0	133	100%
% Total	44.4%	18.8%	30.8%	5.3%	0.7%	0.00	100%	

Figure 11
Discharge Disposition Following SCI Cases
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 211)



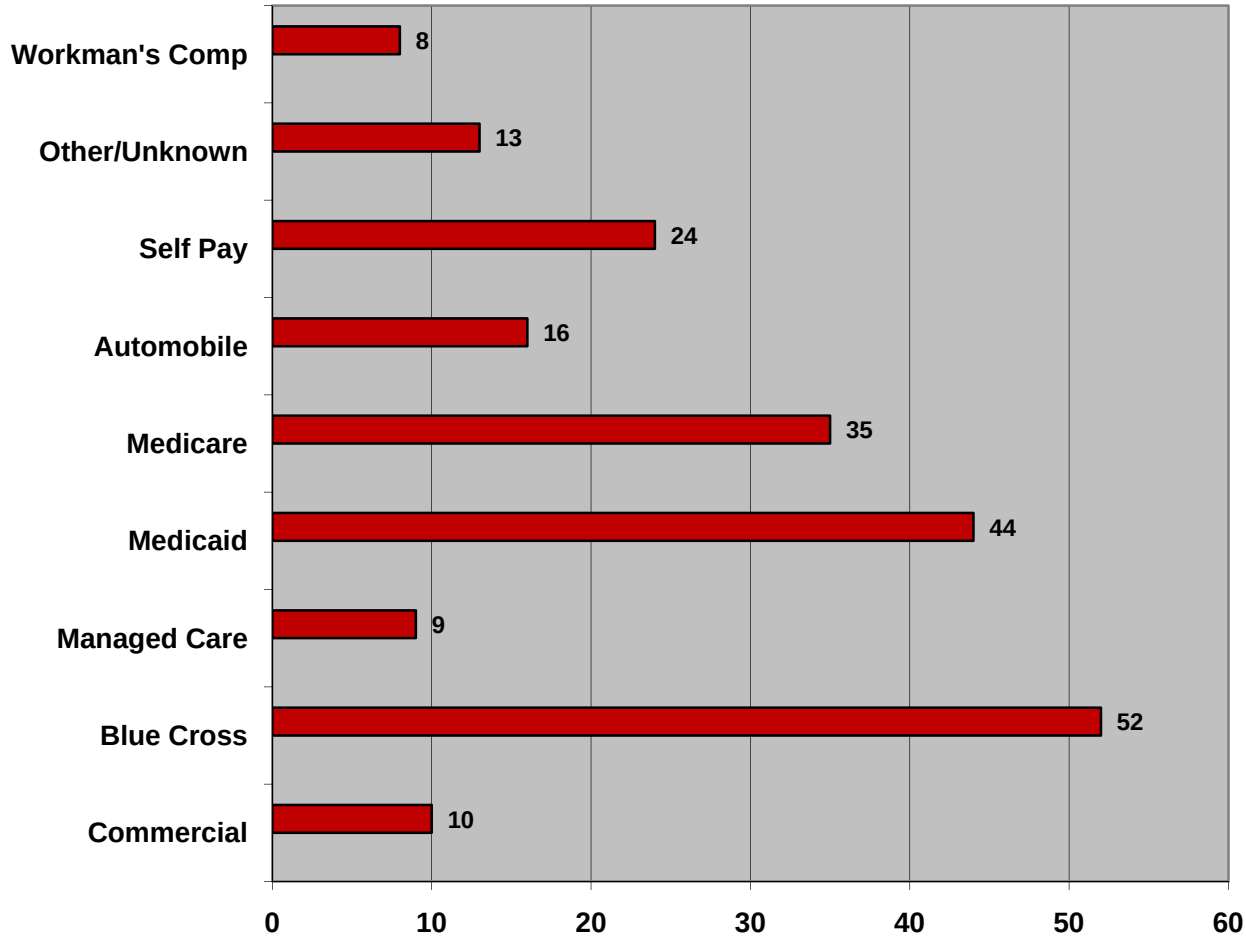
Forty-two percent (n = 89) of SCI cases went to residential rehabilitation facilities and six percent (n = 13) went to skilled nursing facilities (SNFs) after discharge. Thirty-three percent (n = 69) were discharged home. Four percent (n = 8) were referred to home health services. Six percent (n = 13) were transferred to other acute care facilities. Seven percent (n = 14) of SCI cases expired. Individuals were discharged to various Other destinations in two percent of cases (n = 4). There was one case in which the discharge disposition was not noted.

Figure 12
Site of Injury Occurrence in SCI Cases
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 211)



Most spinal cord injuries reported to the ATR occurred on roadways or in private residences, thirty-seven percent each (n = 78). Three percent (n = 6) in places for sports and recreation. Twelve percent (n = 28) had no injury setting documented. The remaining eleven percent (n = 21) were in various other specified settings.

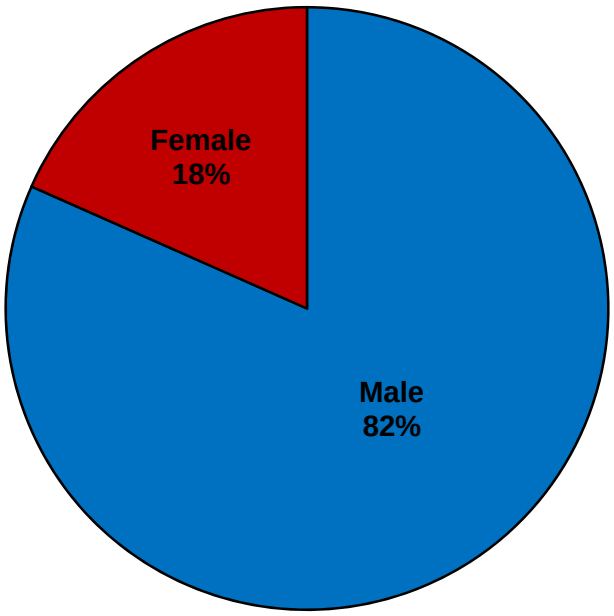
Figure 13
Payer Source for SCI Cases
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 211)



Blue Cross/Blue Shield was the primary payer in 25 percent (n = 52) of SCI cases and was the second frequent primary reimbursement source in this subgroup. Individuals and/or their families covered 11 percent (n = 24) of documented SCI's in 2010. Medicare and Medicaid were the primary payers in 17 percent (n = 35) and 21 percent (n = 44), respectively. The primary payer was private commercial insurance in 5 percent (n = 10) of cases. Managed Care was the primary payer in 4 percent (n = 9) of cases. Workman's compensation was the primary payer in 4 percent (n = 8) of cases. Automobile insurance was the primary payer in 8 percent (n = 16). The source of payment was not reported or there were other payment sources, e.g. military, municipal governments, with 6 percent (n = 13) of the total.

Cases with Both Head and Spinal Cord Injuries

Figure 14
Proportion of Cases with Both Traumatic Brain and Spinal Cord Injuries by Gender
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 49)

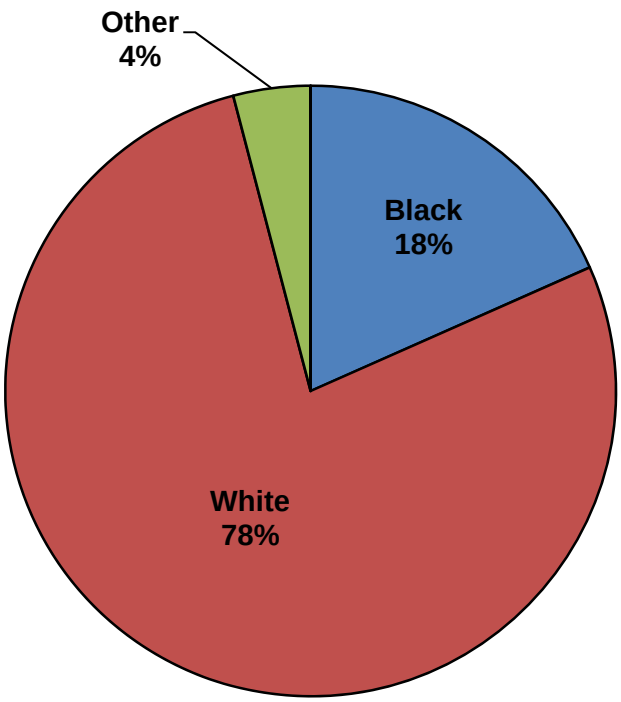


There were 4.6 times more male cases (n = 40) with simultaneous head and spinal cord injury admissions than female cases (n = 9) reported to the Alabama Trauma Registry for calendar year 2010.

Figure 15

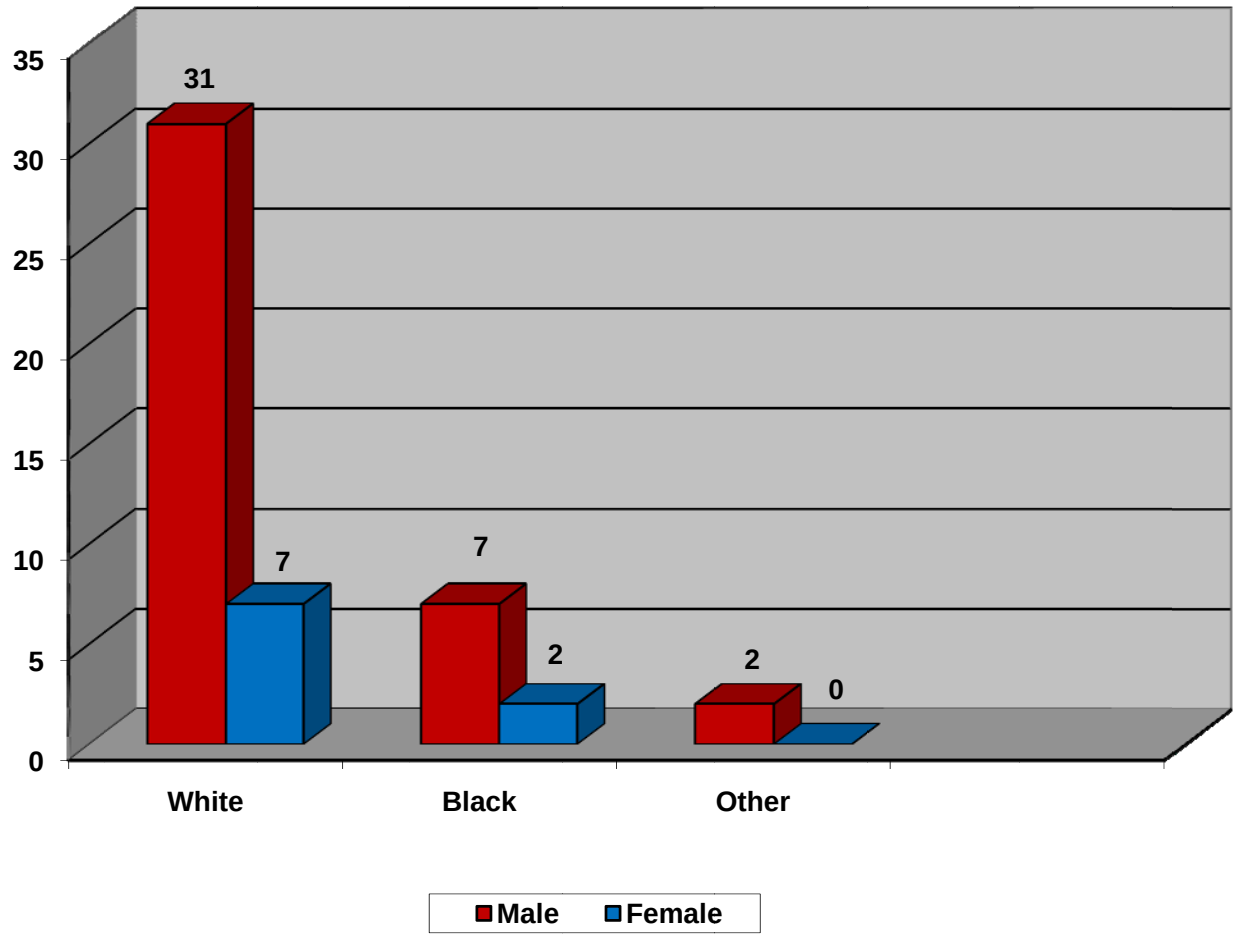
Proportion of Cases with Both Traumatic Brain and Spinal Cord Injuries by Race

Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 49)



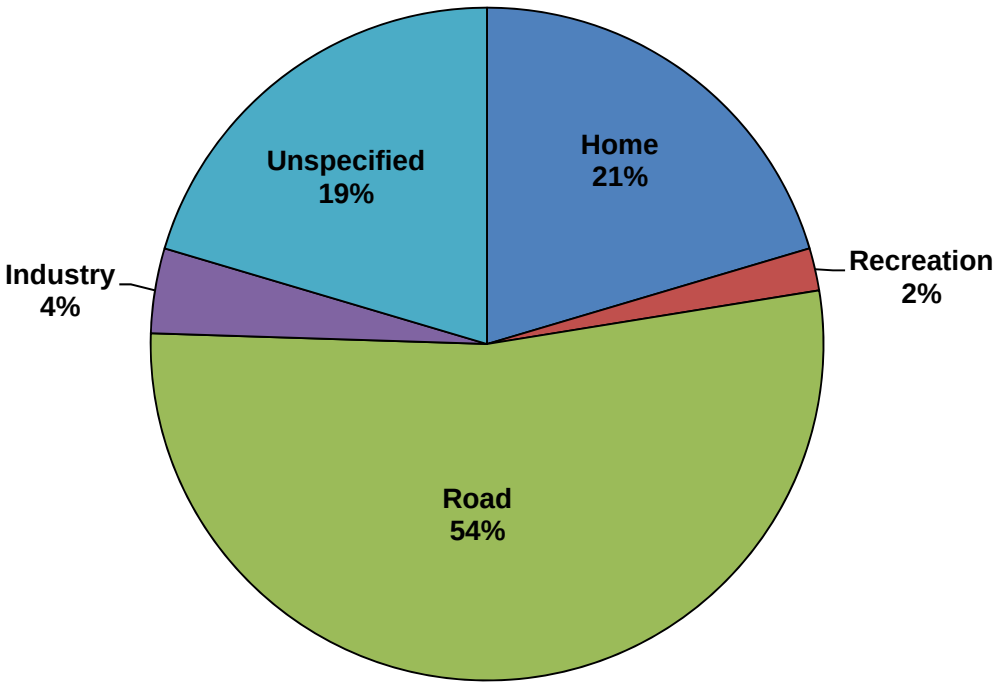
Whites constitute 78 percent (n =38) of the cases with both head and spinal cord injuries, Blacks 18 percent (n = 9), and Others four percent (n =2).

Figure 16
Number of Cases with Both TBI and SCI by Gender and Race
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 49)



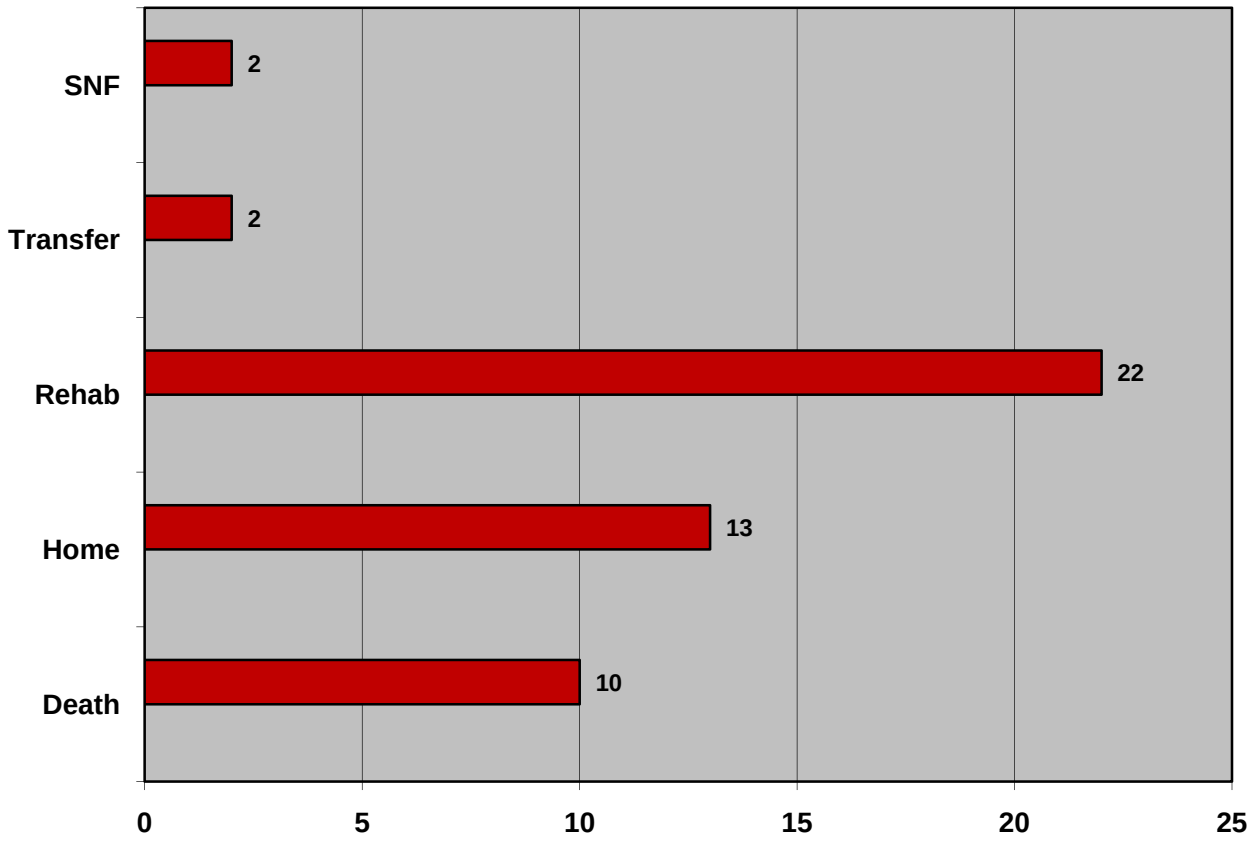
Eighty-two percent (n = 31) of cases with both head and spinal cord injuries in whites were male, seventy-eight percent (n = 7) in Blacks were male, and the only two cases in the Other category were male. The overall percentages in this injury type were 82 percent male and 18 percent female.

Figure 17
Site of Injury Occurrence in Cases with Both TBI and SCI
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 49)



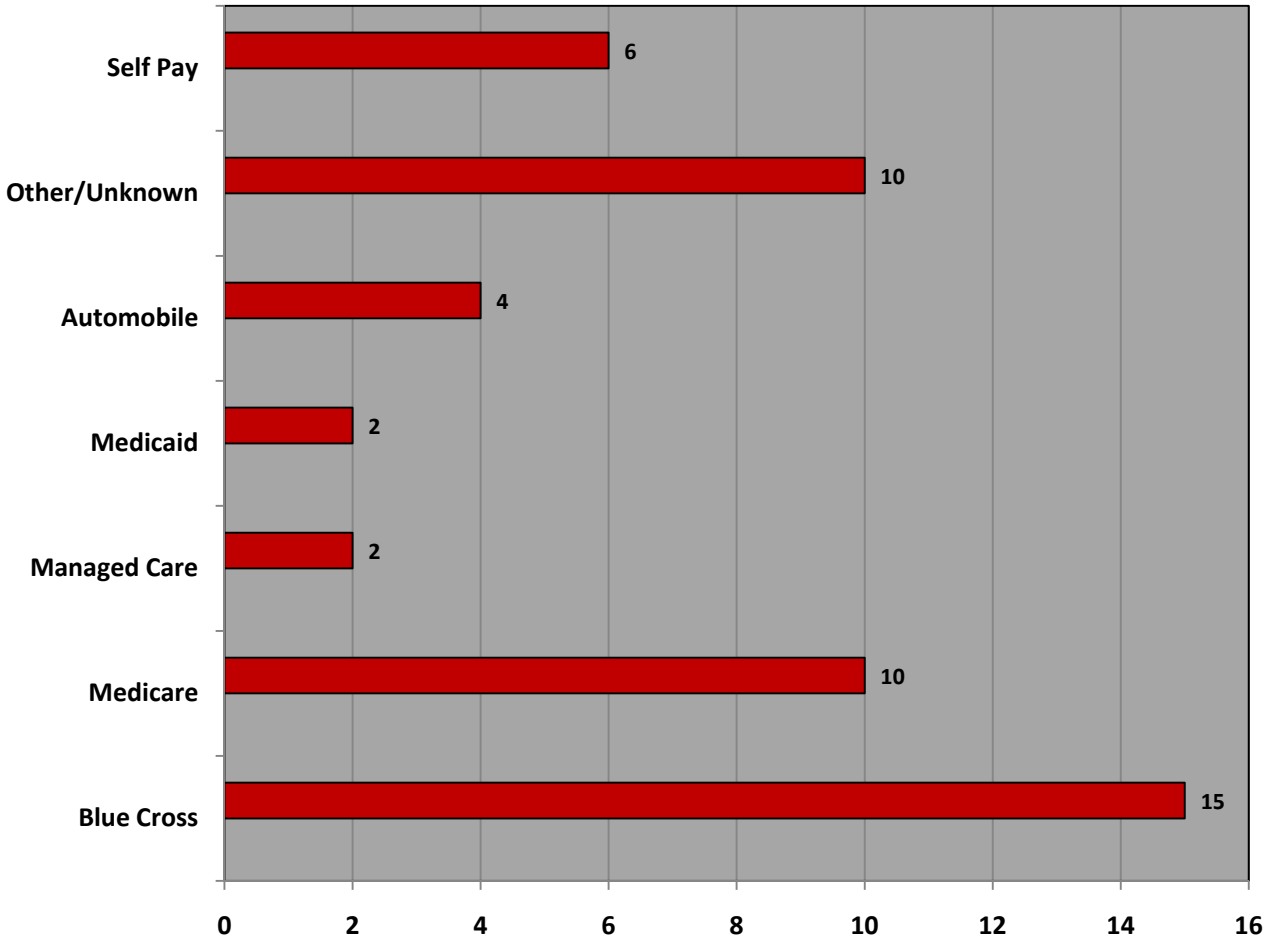
Fifty-four percent (n = 26) of ATR cases that had both TBI and SCI occurred on roadways. Twenty percent (n = 10) occurred in the home. Four percent (n = 2) occurred in industrial settings. Two percent (n = 1) occurred in sites for sports and recreation. The place of injury was not specified in nineteen percent of cases (n = 10).

Figure 18
Discharge Disposition Following Cases with Both TBI and SCI
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 49)



Twenty-two cases (45 percent) were discharged to residential rehabilitation facilities. Thirteen cases (27 percent) were discharged home. Ten cases (20 percent) with both head and spinal cord injuries died. Notably, this is the highest percent of mortality among all three categories. Two cases (4 percent) were discharged to skilled nursing facilities (SNFs). Also, two cases (4 percent) were transferred to other acute care facilities.

Figure 19
Payer Sources for Cases with Both TBI and SCI
Alabama Head and Spinal Cord Registry (AHSCIR)
January 1, 2010 – December 31, 2010
(n = 49)



Blue Cross/Blue Shield paid in 15 cases (31 percent) that had both head and spinal cord injuries. Individuals or their families paid for their own medical care in six cases (12 percent). The source of payment in ten cases (20 percent) was Medicare. Medicaid paid in two cases (4 percent). Automobile insurance was the primary payer in four cases (8 percent). Commercial insurance and managed care companies paid in two cases (4 percent). In the remaining ten cases (20 percent), the primary payer was either not documented or payment was made by other sources not represented in the above graphic.