

# >> Work-related Traumatic Brain Injury in Oregon

Trauma Registry Data and Deaths, 2009–2014



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# Executive summary

## Background and purpose of the report

Traumatic brain injury (TBI) is an injury that disrupts the normal function of the brain. It can be caused by a bump, blow or jolt to the head or a penetrating head injury.<sup>1</sup> TBI can affect cognitive, behavioral, emotional, sensory and motor function. The symptoms range from a brief change of consciousness to a prolonged coma after the injury. Some may experience difficulties with memory, attention, learning and coordination. Although TBIs may resolve completely, some TBIs have chronic health effects, and some severe TBIs can result in permanent disability. Because of TBI's long-term effects on quality of life and huge cost for health care, TBI is the most debilitating outcome of injury.<sup>1</sup>

TBIs can occur everywhere, including the workplace. A cross sectional analysis of the Census of Fatal Occupational Injury (CFOI) database showed TBI accounted for 22% of all work-related injury fatalities from 2003 to 2008.<sup>2</sup> From 1998 to 2007, an estimated 586,600 work-related TBIs were treated in emergency room departments in the United States.<sup>3</sup> Although TBI is one of the leading causes of death and disability from occupational injury, there is no surveillance system of occupational TBI, and documentation of work-related TBIs is limited.<sup>4</sup>

To better understand occupational TBIs, this report presents available data from death certificates and trauma registry system in Oregon for the years 2009 through 2014. Those data did not capture all work-related TBIs but represented relatively serious TBIs. The data showed important basic facts about how many severe work-related TBIs occurred each year in Oregon, who was injured, how these TBIs occurred and which industries were at high risk. The purpose of this report is to serve as a reference for policy makers, service providers, health educators, researchers, and other interested occupational health and safety groups in Oregon.

## Highlights of the findings

### From 2009 to 2014 in Oregon:

- On average, 149 severe work-related TBIs (crude rate: 8.4 per 100,000 workers) occurred in Oregon each year. Of them, 17 died and 132 were treated and released by a trauma hospital in Oregon. Overall, about one third of severe work-related injuries involved TBIs in Oregon.
- Workers with construction, logging, fishing, farming, installation, maintenance, repair, production, transportation and material moving occupations were at increased risk to suffer TBIs.
- Overall, male workers were more likely than female workers to suffer TBIs and TBI incidence increased with workers' age. Workers aged 65 years and older had the highest rate of TBI.
- TBI incident rate was higher for workers with Hispanic ethnicity who worked with construction, logging, fishing, farming, installation, maintenance and repair occupations than for non-Hispanic workers.
- Overall, falls were the leading cause of TBI, followed by struck by or against objects and motor vehicle traffic incidents. Motor vehicle-traffic incidents were the leading cause of TBI-related injury deaths.
- Most work-related TBIs were unintentional.
- The majority of work-related TBIs occurred in industrial areas and on the road/street/highway.

## Conclusion

TBI is an important occupational injury problem. In Oregon, about one third of severe work-related injuries involved TBIs. It is critical to develop prevention programs to reduce the incidence of work-related TBIs, to implement occupational TBI surveillance and to use this data for subsequent research.

# Introduction

Traumatic brain injury (TBI) is an injury that disrupts the normal function of the brain. It can be caused by a bump, blow or jolt to the head or a penetrating head injury.<sup>5</sup> TBI can affect cognitive, behavioral, emotional, sensory and motor function. The symptoms range from a brief change of consciousness to a prolonged coma after the injury. Some may experience difficulties with memory, attention, learning and coordination. Although TBIs may resolve completely, some TBIs have chronic health effects, and some severe TBIs can result in permanent disability.<sup>5</sup> Severe TBI has long-term effects on quality of life, and a huge societal and economical toll. The estimated economic cost of TBI including direct and indirect medical costs in 2010 alone was more than \$76 billion.<sup>6</sup> TBI is the most debilitating outcome of injury.

The Centers of Disease Control and Prevention (CDC) estimated that, nationally, each year 2.5 million people suffer a TBI. Of those 2.5 million, 52,844 (2%) people will die; 283,630 (11%) will be hospitalized, and 2.21 million (87%) will be released from emergency room departments (ED). In general, the incidence of TBI is more common among men, and is more likely to occur among young children aged 0 to 5 years, youth aged 15 to 19 years, and elder adults aged 75 years and older. The leading causes are falls, motor vehicle-related injuries, and struck by or against objects for non-fatal TBIs and motor vehicle-related injuries, suicides, and falls for TBI-related deaths.<sup>5</sup>

TBIs can occur everywhere, including the workplace. A cross sectional analysis of the Census of Fatal Occupational Injury (CFOI) database showed that TBI accounted for 22% of all work-related injury fatalities from 2003 to 2008.<sup>7</sup> From 1998 to 2007, an estimated 586,600 work-related TBIs were treated in ED in the US.<sup>8</sup> Although TBI is one of leading cause of death and disability of occupational injury, there is not a surveillance system of occupational TBI, and documentation of work-related TBIs is limited.<sup>9</sup>

To better understand occupational TBIs, this report presents available data from death certificates and trauma registry system in Oregon for the years 2009 through 2014. The report describes basic facts about how many severe work-related TBIs occurred each year in Oregon, who was injured, how these TBIs occurred, and which industries were at high risk. The purpose of this report is to serve as a reference for policy makers, service providers, health educators, researchers, and other interested occupational health and safety groups in Oregon.

# Methods and Data Sources

Data for this report are from Oregon Health Authority's Public Health Division: death certificate data are from the Center of Health Statistics and trauma registry data are from Oregon Trauma Registry System.<sup>10</sup> TBI's definition is based on the recommendation of CDC, and all cases were identified by the codes of International Classification of Diseases (ICD).<sup>11</sup>

Oregon law requires a death be recorded and registered. The legal document (death certificate) has information about the person who died and the cause of his or her death. The cause of death includes immediate cause of death, underlying cause and last cause (disease or injury that initiated the events resulting in death). All causes are coded by using ICD. Injury deaths were selected through ICD-10 codes (see appendix) from the field of underlying cause of death.

The Oregon Trauma Registry collects data from 44 trauma hospitals in Oregon. The data includes demographics of trauma patients, diagnostic code, information of injury (date, location, mechanism, severity, and outcome of injury), and briefly how a patient was injured. TBI cases were selected if an ICD-9 diagnosis code for TBI appeared in the field of diagnostic code. The selected cases included patients with TBI as the only injury and other injuries involving TBI. Each case was counted only once regardless of the number of ICD codes that met TBI's criteria. If the same person suffered injury more than once in a year, more than one TBI would be counted.

Both death certificate and trauma registry collect information if an injury was occupational trauma, and what industry/occupation the person worked in. One data element specifically asks whether the injury is work-related or not. In this report, all deaths and Oregon Trauma Registry patients were considered as occupational injury if the field of work-related injury was marked as "Yes."

Oregon trauma hospitals received and treated some patients who came from other states. Death certificates include some deaths where the injury took place out-of-state. The cases in this report are limited to the injuries that occurred in Oregon.

To provide more detailed information on cause of injury among TBIs, the external cause of TBIs are categorized by two parameters: by manner/intent (e.g., unintentional injury, homicide, suicide and undetermined) and by cause (e.g., motor vehicle crash, fall, struck by/against object, etc.).<sup>12</sup>

This report uses the number of employees as the population to calculate rates. All 2009 to 2014. rates are calculated as deaths/injuries per 100,000 workers. The employment data are from Bureau of Labor Statistics.<sup>13</sup>

# Findings

## Magnitude

On average, approximately 150 severe work-related TBIs occurred in Oregon each year. Of those, 132 were treated and released by a trauma hospital in Oregon and 17 people died. Table 1 shows numbers and crude rates of work-related TBIs from

During the period of 2009 to 2014, 277 work-related injury deaths occurred in Oregon. Of 277 deaths, 103 deaths had TBIs. Those deaths with TBIs accounted for approximately 37% of total work-related injury deaths. During the same period, there was a total of 2,447 nonfatal work-related injuries recorded in the Oregon Trauma Registry system. Of 2,447 injuries, 789 injuries had TBIs. Those trauma-registered TBIs comprised approximately 32% of all work-related injury incidents in Oregon. Overall, 892 TBIs accounted for 32.7% of total severe work-related injuries (n=2,724); the annual rate of work-related TBI incidents was 8.35 per 100,000 workers.

**Table 1. Numbers and rates of work-related TBI incidents, Oregon, 2009-2014**

Year	Death	Trauma-registered TBI	Total	Crude rate
2009	20	109	129	7.41
2010	9	151	160	8.99
2011	16	129	145	7.98
2012	14	142	156	8.74
2013	17	124	141	8.06
2014	27	134	161	8.91
Sum	103	789	892	8.35

**Notes:**

1. Data source: death certificate and Oregon Trauma Registry, OHA.
2. For trauma-registered TBI, patients who died in the hospital were excluded to void double counts.
3. A person who injured more than once in a year is counted as more than one case.
4. Persons aged less than 16 years are excluded.
5. Rates are per 100,000 workers



# Characteristics of work-related TBI

## Work-related TBI by occupation/industry

Neither death certificate nor trauma registry used North American Industry Classification System (NAICS) and/or Standard Industry Classification (SIC) to code occupation/industry of deceased/patient. According to available text information of industry/occupation from death certificates and trauma registry records, Table 2 shows the numbers and percentages of TBIs among common occupations/industries. Overall, most workers who suffered from TBIs worked at the industry of construction, logging, transportation, farming, production and building/maintenance/repair. Considering the distribution of employees by occupations in Oregon, logging had the highest TBI incident rate, which was 107.4 per 100,000 workers. People who worked with natural resources (forestry, farming and fishing); construction; and installation, maintenance and repair occupations had a higher TBI incident rate (43.2 per 100,000 workers) than those who worked with production, transportation and material moving occupations (21.0 per 100,000 workers). People who worked with management, professional, sale, office and service occupations had the lowest TBI incident rates at 1.7 per 100,000 (Figure 1).

**Table 2. Numbers and percentage of TBIs, by occupation/industry, Oregon, 2009-2014**

Occupation/Industry	Death	% of deaths	Trauma-registered TBI	% of injuries
Logging	16	15.5	7	0.9
Transportation/Material moving	15	14.6	144	18.3
Construction & Extraction	14	13.6	154	19.5
Production	13	12.6	56	7.1
Building ground/Maintenance/Repair	9	8.7	87	11.0
Farming	7	6.8	120	15.2
Sale	5	4.9	30	3.8
Health care	2	1.9	7	0.9
Education	2	1.9	5	0.6
Food preparation/serving	2	1.9	25	3.2
Legal/Art	2	1.9	21	2.7
Protective service/Law enforcement	2	1.9	19	2.4
Business/Office	4	3.9	11	1.4
Management	3	2.9	5	0.6
Other	7	6.8	21	2.7
Missing/Unknown	0	0.0	77	9.8

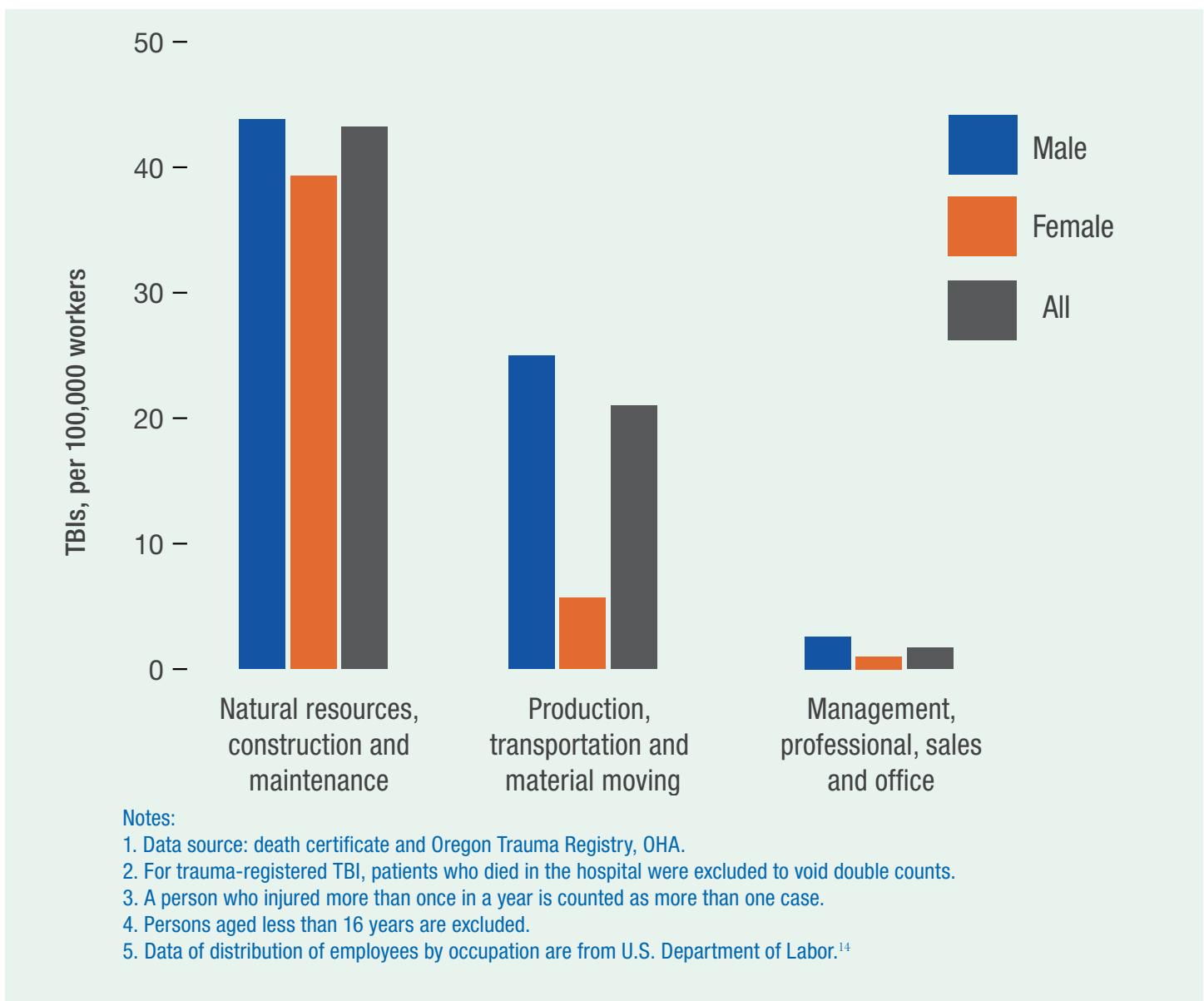
**Notes:**

1. Data source: death certificate and Oregon Trauma Registry, OHA.
2. For trauma-registered TBI, patients who died in the hospital were excluded to void double counts.
3. A person who injured more than once in a year is counted as more than one case.
4. Persons younger than 16 years of age were excluded.

## Work-related TBI by sex and age

There was a total of 892 work-related TBIs recorded in death certificates and the Oregon Trauma Registry System during the six-year period. Of them, 785 (88%) incidents occurred among men. Overall, male workers were almost seven times more likely to have TBIs than female workers. In every age group, TBI rates were higher for males than females. The higher TBI rate for male workers may be because they work in more dangerous industries and/or they have more dangerous jobs than women even within the same industry (Figure 1). In addition, work-related TBI incidence increased with age. The workers aged 65 years and older had the highest rate of work-related TBI (Table 3). We do not have the data of occupation by sex and age to assess whether increase of TBI incidence with age is associated with occupation.

**Figure 1. Work-related TBI incident rates by sex and occupation, Oregon, 2009-2014**



**Table 3. Numbers and rates (per 100,000 workers) of work-related TBIs, by sex and age group, Oregon, 2009-2014**

Ages, year	Males				Females			
	Death	Case of trauma registry	Total	Rate	Death	Case of trauma registry	Total	Rate
16-19	1	10	11	7.0	0	5	5	3.1
20-24	2	56	58	12.6	0	5	5	1.1
25-34	16	128	144	11.6	0	13	13	1.1
35-44	20	142	162	12.4	2	11	13	1.2
45-54	19	177	196	16.7	2	28	30	2.7
55-64	24	133	157	16.0	2	29	31	3.4
>= 65	12	45	57	20.5	3	7	10	4.3
All	94	691	785	14.0	9	98	107	2.1

**Notes:**

1. Data source: death certificate and Oregon Trauma Registry, OHA.
2. For trauma-registered TBI, patients who died in the hospital were excluded to void double counts.
3. A person who injured more than once in a year is counted as more than one case.
4. Persons aged less than 16 years are excluded.
5. Rates are per 100,000 workers

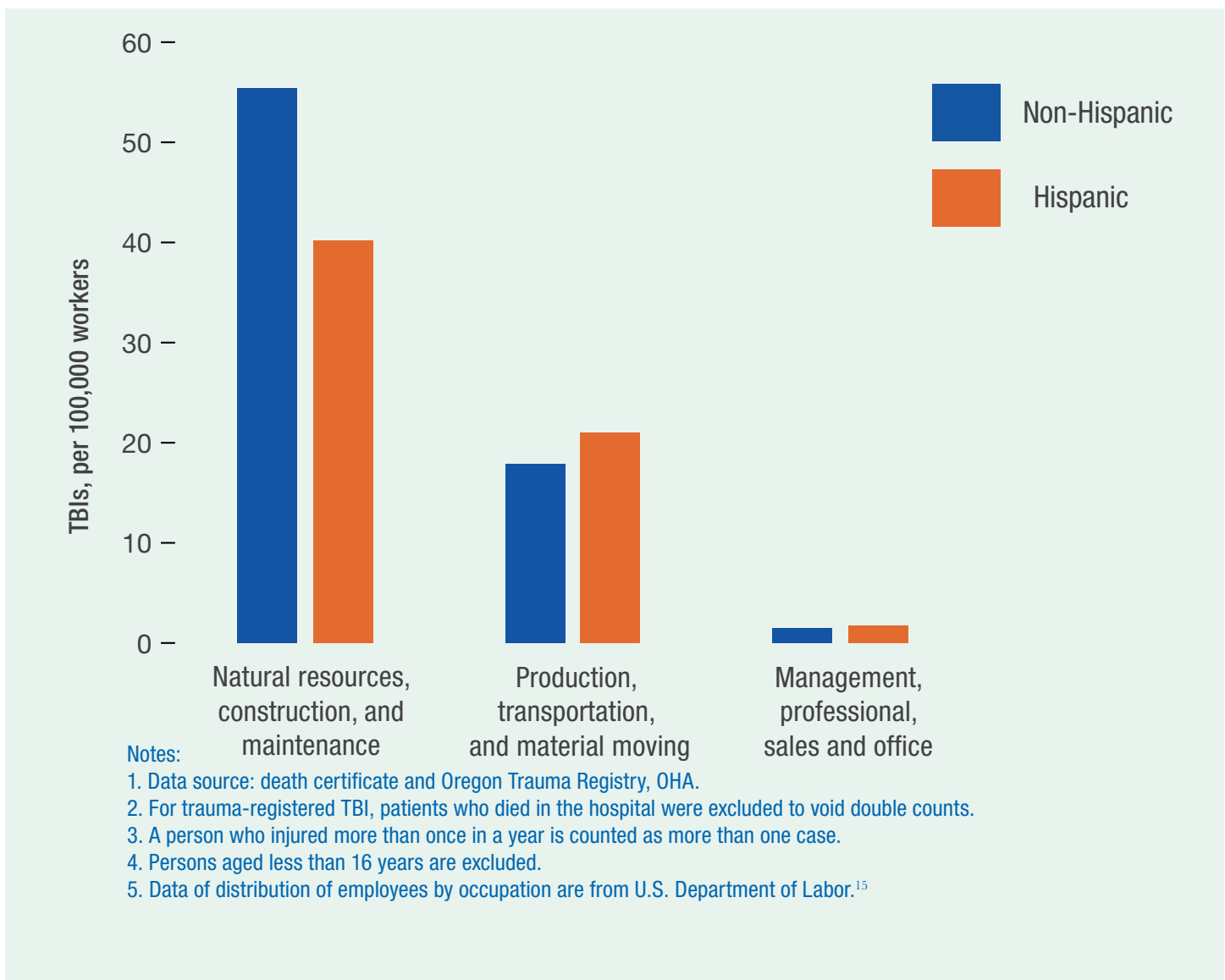
## Work-related TBI by race/ethnicity

The trauma registry does not record patient’s race and ethnicity separately so current data could not compare work-related TBI rates among races. Of 892 work-related TBIs, eight deaths and 146 trauma-registered TBIs occurred among persons with Hispanic ethnicity. Overall, the TBI rate of 16.1 per 100,000 among Hispanic workers was significantly higher than the state average rate of 8.4 per 100,000. Comparing TBI incident rates by occupation, the rate was higher for Hispanic workers than non-Hispanic persons who worked with natural resources (forestry, farming and fishing); construction; and installation, maintenance and repair occupations.

## Work-related TBI by mechanism

Of 892 work-related TBIs, more than 95% were unintentional injuries. The most common mechanisms of TBIs resulted from fall (43.8%), struck by or against object (20.6%) and motor vehicle traffic incident (19.4%). Motor vehicle-traffic incident resulted in the greatest number of TBI-related deaths; however, fall resulted in the greatest number of trauma-registered TBIs (Table 4). The common mechanisms of work-related TBIs were different among different occupations. People in natural resources (forestry, farming and fishing); construction; and installation, maintenance and repair occupations often suffered TBI from falls or were struck by or against an object. Persons who worked with production, transportation and material moving occupations commonly suffered TBI from motor vehicle-traffic incidents and falls (Figure 3).

**Figure 2. Work-related TBI incident rates by occupation and ethnicity, Oregon, 2009-2014**



## Work-related TBI by injury place

Table 1 indicates that between 2009 and 2014, a total of 892 work-related injuries occurred in Oregon. This total represents 103 injury deaths and 789 trauma-registered injuries. Table 5 shows where TBIs occurred based on the injury place description from death certificates and ICD-9 codes from the Oregon Trauma Registry. TBIs could occur anywhere, but more than half of those injuries took place at industrial areas, manufacturing facilities and street/road/highways. Table 6 shows the numbers of TBIs occurring by county.

**Table 4. Numbers and percentages of work-related TBIs, by intent and mechanism, Oregon, 2009-2014**

Intent	Death	% of deaths	Trauma-registered TBI	% of injuries	Total	%, total
Unintentional	85	82.5	767	97.2	852	95.5
Homicide/Assault	10	9.7	20	2.5	30	3.4
Suicide/self-inflicted	8	7.8	0	0	8	0.9
Undetermined/Other	0	0	2	0.3	2	0.2
Mechanism						
Fall	21	20.4	370	46.9	391	43.8
Struck by/against object	23	22.3	161	20.4	184	20.6
Motor vehicle traffic related	27	26.2	146	18.5	173	19.4
Other transportation	6	5.8	38	4.8	44	4.9
Machinery	5	4.9	34	4.3	39	4.4
Firearm	17	16.5	1	0.1	18	2.0
Other	4	3.9	39	4.9	43	4.8

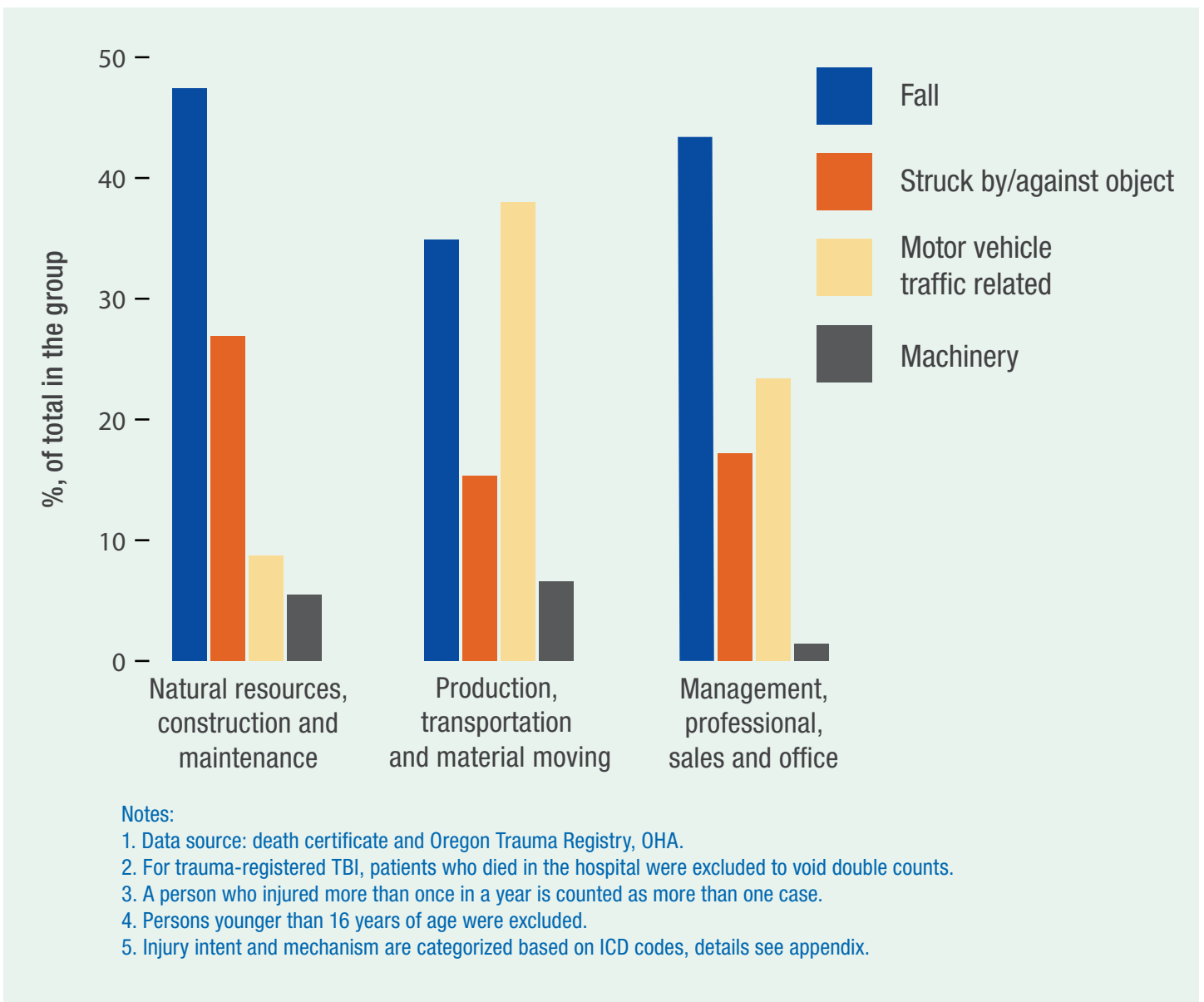
**Notes:**

1. Data source: death certificate and Oregon Trauma Registry, OHA.
2. For trauma-registered TBI, patients who died in the hospital were excluded to void double counts.
3. A person who injured more than once in a year is counted as more than one case.
4. Persons aged less than 16 years are excluded.
5. Injury intent and mechanism are categorized based on ICD codes, details see appendix.

# Limitations

Work-related injury deaths and trauma-registered injuries do not capture all occupational traumas; they only represent the tip of the iceberg. The Oregon Trauma Registry System collects data from 44 trauma hospitals in Oregon. Only the injuries that meet trauma care criteria and are treated in those 44 trauma hospitals enter the system. In general, the cases in the system are injuries that are serious, required a surgeon’s evaluation and treatment, and/or injured patients with pre-existing serious medical condition(s). (Details of entry criteria can be found in the appendix.) Therefore, the data for this report do not include

**Figure 3. Common causes of work-related TBIs by occupation, Oregon, 2009-2014**



injured persons receiving care at a nontrauma hospital in Oregon, those who received care in an ED but whose case did not enter the Oregon Trauma Registry System, and those receiving outpatient care or no care. This report may capture severe occupational TBIs, but not all work-related TBIs. To illustrate how those 892 TBIs represented all work-related TBIs, Figure 4 shows what the data include and what the data miss. All emergency department and urgent care data and further research are needed to get a complete picture of occupational TBI in Oregon.

**Table 5. Injury places of work-related TBIs, Oregon, 2009-2014**

Place	Death	% of deaths	Trauma-registered TBI	% of injuries
Home	7	6.8	46	5.8
Farm	8	7.8	48	6.1
Mine or quarry	0	0.0	0	0.0
Industrial/manufacturing facility	27	26.2	326	41.3
Recreation/sport	0	0.0	19	2.4
Street/highway/road	29	28.2	158	20.0
Public building	1	1.0	99	12.5
Residential institution	0	0.0	6	0.8
Other specified place	17	16.5	56	7.1
Other unspecified	3	2.9	16	2.0
Missing/unknown	11	10.7	15	1.9

**Notes:**

1. Data source: death certificate and Oregon Trauma Registry, OHA.
2. For trauma-registered TBI, patients who died in the hospital were excluded to void double counts.
3. A person who injured more than once in a year is counted as more than one case.
4. Persons younger than 16 years of age were excluded.

**Table 6. Numbers and percentage of work-related TBIs, by county of injury, Oregon, 2009-2014**

County	Death	Trauma-registered TBI	Total	%, total
Baker	2	3	5	0.6
Benton	1	15	16	1.8
Clackamas	6	61	67	7.5
Clatsop	1	18	19	2.1
Columbia	4	8	12	1.3
Coos	4	11	15	1.7
Crook	1	6	7	0.8
Curry	0	7	7	0.8
Deschutes	6	21	27	3.0
Douglas	8	31	39	4.4
Gilliam	1	3	4	0.4
Grant	1	2	3	0.3
Harney	1	1	2	0.2
Hood River	0	11	11	1.2
Jackson	3	22	25	2.8
Jefferson	0	5	5	0.6
Josephine	1	10	11	1.2
Klamath	5	21	26	2.9
Lake	0	1	1	0.1
Lane	7	86	93	10.4
Lincoln	2	15	17	1.9
Linn	3	12	15	1.7

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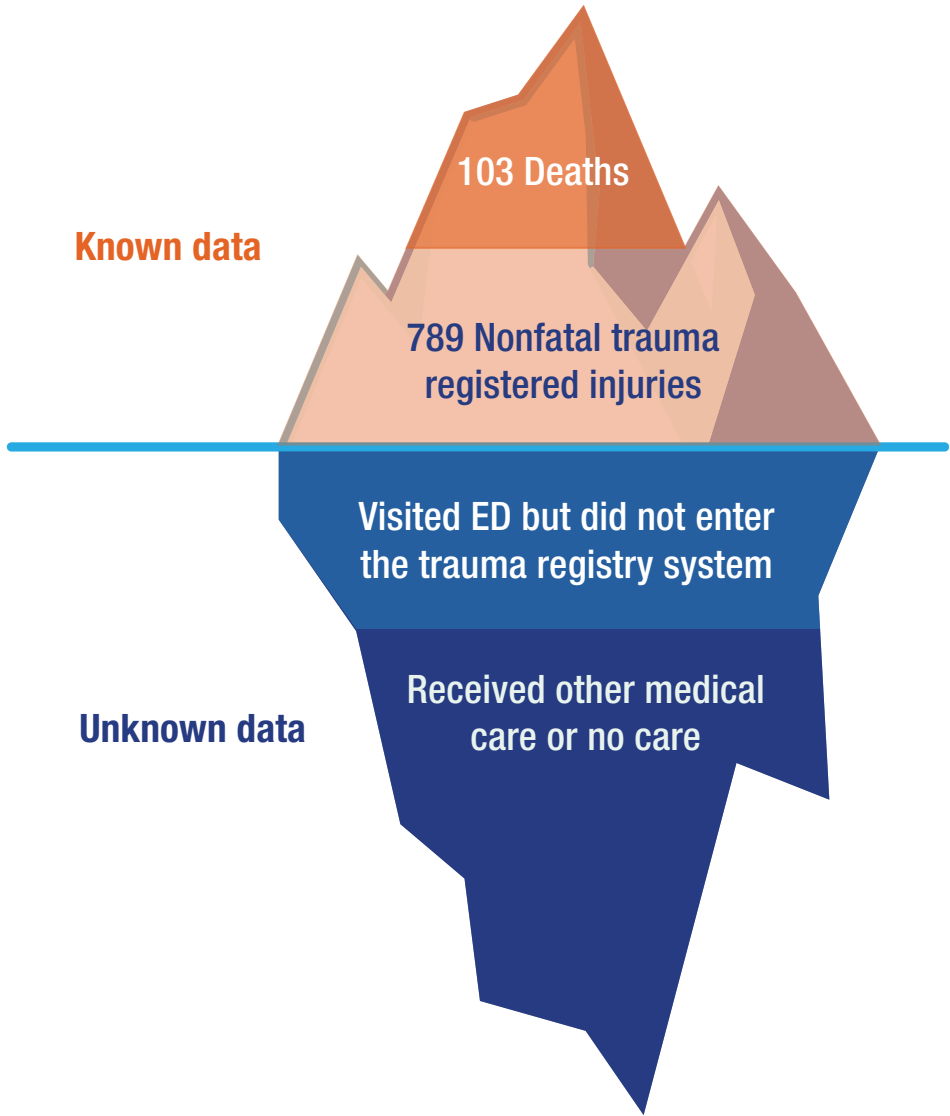
County	Death	Trauma-registered TBI	Total	%, total
Malheur	0	4	4	0.4
Marion	7	69	76	8.5
Morrow	0	4	4	0.4
Multnomah	12	165	177	19.8
Polk	3	12	15	1.7
Sherman	0	1	1	0.1
Tillamook	2	9	11	1.2
Umatilla	9	10	19	2.1
Union	1	7	8	0.9
Wallowa	1	0	1	0.1
Wasco	2	11	13	1.5
Washington	7	75	82	9.2
Wheeler	1	2	3	0.3
Yamhill	1	25	26	2.9
Unknown	0	25	25	2.8
<b>Total</b>	<b>103</b>	<b>789</b>	<b>892</b>	<b>100</b>

Notes:

1. Data source: death certificate and Oregon Trauma Registry, OHA.
2. For trauma-registered TBI, patients who died in the hospital were excluded to void double counts.
3. A person who injured more than once in a year is counted as more than one case.
4. Persons aged less than 16 years are excluded.

Identifying work-related injury in this report is solely based on the record of death certificate and trauma registry. It is not clear how “work-relatedness” was determined among hospitals (e.g., through patient interview, injured while on duty, and/or workplace). This may result in an inaccurate number of work-related cases. Work-related TBIs are associated with occupation. It is necessary to collect detailed and valid information on occupation/job/classification of industry for a TBI surveillance system.

**Figure 4: Total number of work-related TBI, Oregon, 2009–2014**



# Conclusion

The death certificate and trauma registry data do not provide information of work environment and factors associated with incidence, which are important to prevention efforts. Understanding work-related TBI risk factors, occupational association, risk behaviors for male workers and developing prevention strategies need to be explored and further researched.

Despite limitations described above, this report found approximately one third of severe work-related injuries involved TBIs, and TBI was involved in 37% of work-related injury deaths in Oregon. It is critical to develop prevention programs to reduce the incidence of work-related TBIs, to implement occupational TBI surveillance and to use this data for subsequent research.

# Endnotes

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# Appendix

## ICD-9-CM codes for traumatic brain injury –related cases of trauma registry

Description	ICD-9-CM
Fracture of the vault or base of skull	800.0-801.9
Other and unqualified multiple fractures of the skull	803.0-804.9
Intracranial injury, including concussion, contusion, laceration, and hemorrhage	850.0-854.1
Injury to optic nerve and pathways	950.1-950.3
Shaken baby syndrome	995.55
Head injury, unspecified	959.01

Source: Marr AL, Coronado VG. (Eds.). Central nervous system injury surveillance data submission standards—2002. Atlanta,GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. 2004

## ICD-10 codes for traumatic brain injury-related deaths

Description	ICD-10
Open wound of the head	S01.0-S01.9
Fracture of the skull and facial bones	S02.0, S02.1, S02.3, S02.7-S02.9
Injury to optic nerve and pathways	S04.0
Intracranial injury	S06.0-S06.9
Crushing injury of head	S07.0, S07.1, S07.8, S07.9
Other unspecified injuries of head	S09.7-S09.9
Open wounds involving head with neck	T01.0
Fractures involving head with neck	T02.0
Crushing injuries involving head with neck	T04.0
Injuries of brain and cranial nerves with injuries of nerves and spinal cord at neck level	T06.0
Sequelae of injuries of head	T90.1, T90.2, T90.4, T90.5, T90.8, T90.9

Source: Marr AL, Coronado VG. (Eds.). Central nervous system injury surveillance data submission standards—2002. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. 2004

External cause of injury categorization for ICD-9-CM codes (*cases of trauma registry*) and ICD-10 codes (*deaths*)

Description	ICD-9-CM	ICD-10
<b>Intent</b>		
Unintentional	E800-E869, E880-E929	V01-X59, Y85-Y86
Homicide/assault	E950-959	X85-Y09, Y85.1, U01-U02
Suicide/self-inflicted	E960-969	X60-X84, Y87.0, U03
Undetermined/other	E970-E978, E980-E999	Y10-Y34, Y87.2, Y89.9, Y35-Y36, Y89(.0,.1)
<b>Mechanism</b>		
Motor vehicle traffic-related	E800-E807 (.2-.3), E810-E819, E820-E825 (.6-.7), E826 (.0-.2,.9), E827-E829 (.0-1)	V01, V02-V04 (0,.1, .9), V05, V06, V09 (.0-.3,.9), V10-v11, V12-V14 (.0-.09), V15-V18, V19 (.0-.3,.8,.9), V20-V28 (.3-.9), V29 (.0-.9), V30-V79 (.4-.9), V80 (.3-.5), V81.1, V82.1, V83-V86 (.0-.3), V87 (.0-.8), V89.2
Fall	E880.0-E886.9, E888, E957.0-9, E968.1, E987.0-9	W00-W19, X80, Y01, Y30
Struck by and struck against	E916-E917.9	W20-W22, W50-W52, X79, Y00, Y04, Y29, Y35.3
Other transportation	E800-E807 (.0,.1,.8,.9), E820-E825 (.0,.5,.8,.9), E826.2-8, E827.2-9, E831.0-9, E830.0-E845.9, E958.6, E988.6	V20-V28 (.0-.2), V29 (.0-.3), V30-V79 (.0-.3), V80(.0-.2,.6-.9), V81-V82 (.0,.2-.9), V83-V86 (.4-.9), V87.9, V88 (.0-.9), V89 (.0,.1,.3,.9), X82, Y03,Y32, V90-V99, Y36.1, U01.1
Firearm	E922.0-9, E955.0-4, E965.0-4, E985.0-4, E970	W32-W34, X72-X74, X93-X95, Y22-Y24, Y35.0, U01.4
Machinery	E919.0-0	W24, W30-W31
Other	All other cause codes	All other cause codes

Source: CDC, Recommended Framework for Presenting Injury Mortality Data  
[http://www.cdc.gov/injury/wisqars/ecode\\_matrix.html](http://www.cdc.gov/injury/wisqars/ecode_matrix.html)  
[http://www.cdc.gov/nchs/injury/ice/injury\\_matrix10.htm](http://www.cdc.gov/nchs/injury/ice/injury_matrix10.htm)

## Oregon Trauma Registry Case Definition

A trauma system hospital shall submit data to the Oregon Trauma Registry(OTR) for each and every patient.as defined below:

1. Patients cnte«-d into the trauma system by field personnel (Exhibit 2) ; or
2. Any patient for whom the trauma team is activated (Exhibit 3) ; or
3. A patient whose injuries re<luire a surgeon’s evaluation awl treatment; or
4. Patients transfen-ed to a trauma center for trauma system care (Exhibit S) ; or
5. Patients who mcl triage criteria or inter-hospital transfer guidelines at the transferring facility. (E.,hibits 2, S); or
6. Patients who did not receive a trauma team response but retrospectively, at either the transferring or receiving facility, have any of the-following:
  - A. ISS>8
  - B. Death
  - C. Major operative procedure within 6 hours of hospital arrival
  - D. ICU admission within 24 :hours of hospital arrival; or
7. Any patient previously treated within the trauma system (al any trauma center) who required unplanned readmission from treatment of injuries or complications resulting from the initial injuries.

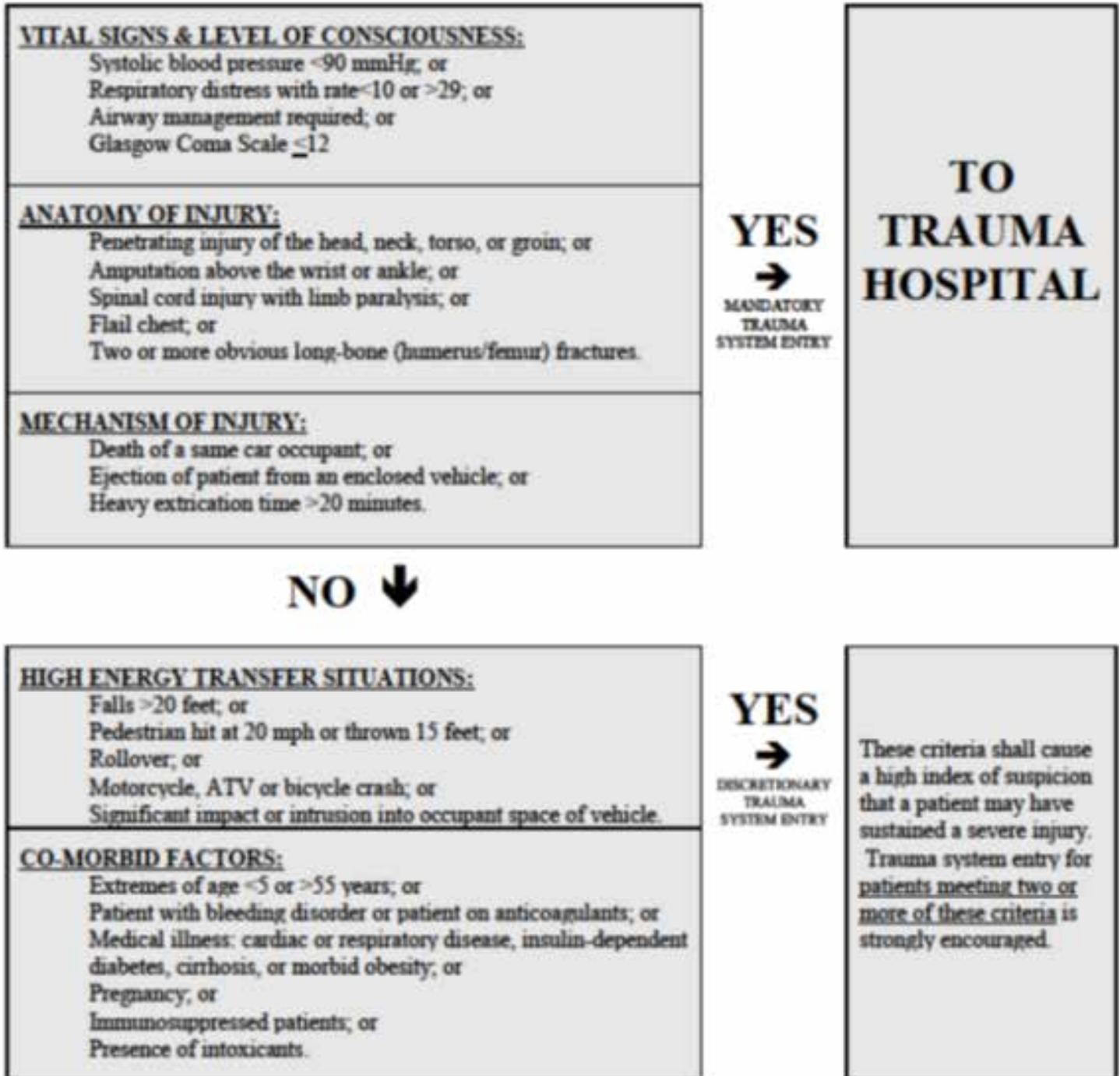
### Exclusions:

- any injured patient with an isolated hip fracture resulting from a fall from the same height
- mechanisms without accompanying anatomical injuries:
  - » poisoning
  - » drowning/near drowning
  - » suffocation/asphyxiation

## EXHIBIT 2

Referenced in OAR 333-200-0080(4)

### TRIAGE CRITERIA AND DECISION SCHEME





## EXHIBIT 3

Referenced in OAR 333-200-0080(5)(b)

### HOSPITAL TRAUMA TEAM RESPONSE CRITERIA

<p>Systolic blood pressure &lt;90 mmHg; or Respiratory distress with rate &lt;10 or &gt;29; or Airway management required; or Glasgow Coma Scale <math>\leq</math> 10; or Penetrating injury of the neck, torso, or groin; or Flail chest; or Two or more obvious long-bone (humerus/femur) fractures; or Spinal cord injury with limb paralysis.</p>	<p><b>YES</b> <b>6</b> Activate Full Trauma Team</p>	<p><b>Full Trauma Team</b></p> <ul style="list-style-type: none"><li>- General Surgeon</li><li>- Emergency Physician</li><li>- Anesthesiologist</li><li>- Emergency Nurse(s)</li><li>- Laboratory</li><li>- Radiology</li><li>- Respiratory Therapist</li></ul>
<p>Glasgow Coma Scale of 11 or 12; or Isolated penetrating injury above base of skull; or Isolated amputation above the wrist or ankle; or Death of a same car occupant; or Ejection of patient from an enclosed vehicle; or Heavy extrication time &gt;20 minutes; or EMT suspects life threatening injuries related to high energy transfer situations or to the presence of co-morbid factors.</p>	<p><b>YES</b> <b>6</b> Activate Modified Trauma Team</p>	<p><b>Modified Trauma Team</b></p> <ul style="list-style-type: none"><li>- Emergency Physician</li><li>- Emergency Nurse(s)</li><li>- Laboratory</li><li>- Radiology</li></ul>

### HIGH ENERGY TRANSFER SITUATION/CO-MORBID FACTORS

- X Falls >20 feet; or
- X Pedestrian hit at 20 mph or thrown 15 feet; or
- X Rollover; or
- X Motorcycle, ATV or bicycle crash; or
- X Significant impact or intrusion into occupant space of vehicle; or
- X Extremes of age <5 or >55 years; or
- X Patient with bleeding disorder or patient on anticoagulants; or
- X Medical illness: cardiac or respiratory disease, insulin-dependent diabetes, cirrhosis, or morbid obesity; or
- X Pregnancy; or
- X Immunosuppressed patients; or
- X Presence of intoxicants.

Trauma system hospitals are responsible for eliciting either a full or modified trauma team response based on information obtained from the on-line prehospital report, as set forth in Exhibit 3 and 4 of these rules.

*Full Trauma Team* activation means the entire trauma team is activated, including the general surgeon as prescribed by OAR 333-200-0090, Exhibit 4.

*Modified Trauma Team* activation allows for the general surgeon to be activated at the discretion of the emergency physician at Level II, III and IV (if applicable) facilities. At Level I facilities, a modified response allows for anesthesia to be activated at the discretion of the emergency physician or trauma surgeon.

Effective Date: May 4, 2000

## EXHIBIT 5

Referenced in OAR 333-200-0080(6)(a)

### INTER-HOSPITAL TRANSFER CRITERIA

<b>CENTRAL NERVOUS SYSTEM</b>	<b>Head Injury:</b> Penetrating injury Depressed skull fracture Open injury CSF leak Deterioration in GCS 2 or more points Lateralizing signs <b>Spinal Cord Injury:</b> Major vertebral injury Spinal cord injury
<b>CHEST</b>	Wide superior mediastinum Major chest wall injury or pulmonary contusion Cardiac injury Patients who require protracted ventilation
<b>PELVIS</b>	Unstable pelvic ring disruption Pelvic fracture with shock Evidence of continued hemorrhage Open pelvic injury
<b>MULTIPLE SYSTEM INJURY</b>	Head injury combined with significant face, chest, abdominal, or pelvic injury Burns with associated injuries Multiple long-bone (humerus/femur) fractures Significant injury to more than two body regions
<b>SECONDARY DETERIORATION (LATE SEQUELAE)</b>	Patients requiring long term ventilation Sepsis Single or multiple organ system failure (deterioration in CNS, cardiac, pulmonary, hepatic, renal or coagulation systems) Major tissue necrosis



You can get this document in other languages, large print, braille or a format you prefer. Contact Oregon Occupational Public Health Program at 971-673-0977 or email [ophp.program@dhsoha.state.or.us](mailto:ophp.program@dhsoha.state.or.us) We accept all relay calls or you can dial 711.