

Statewide Health Data and Tracking of Motor Vehicle Traffic Injuries

Illinois Emergency Medical Services for Children
(EMSC)



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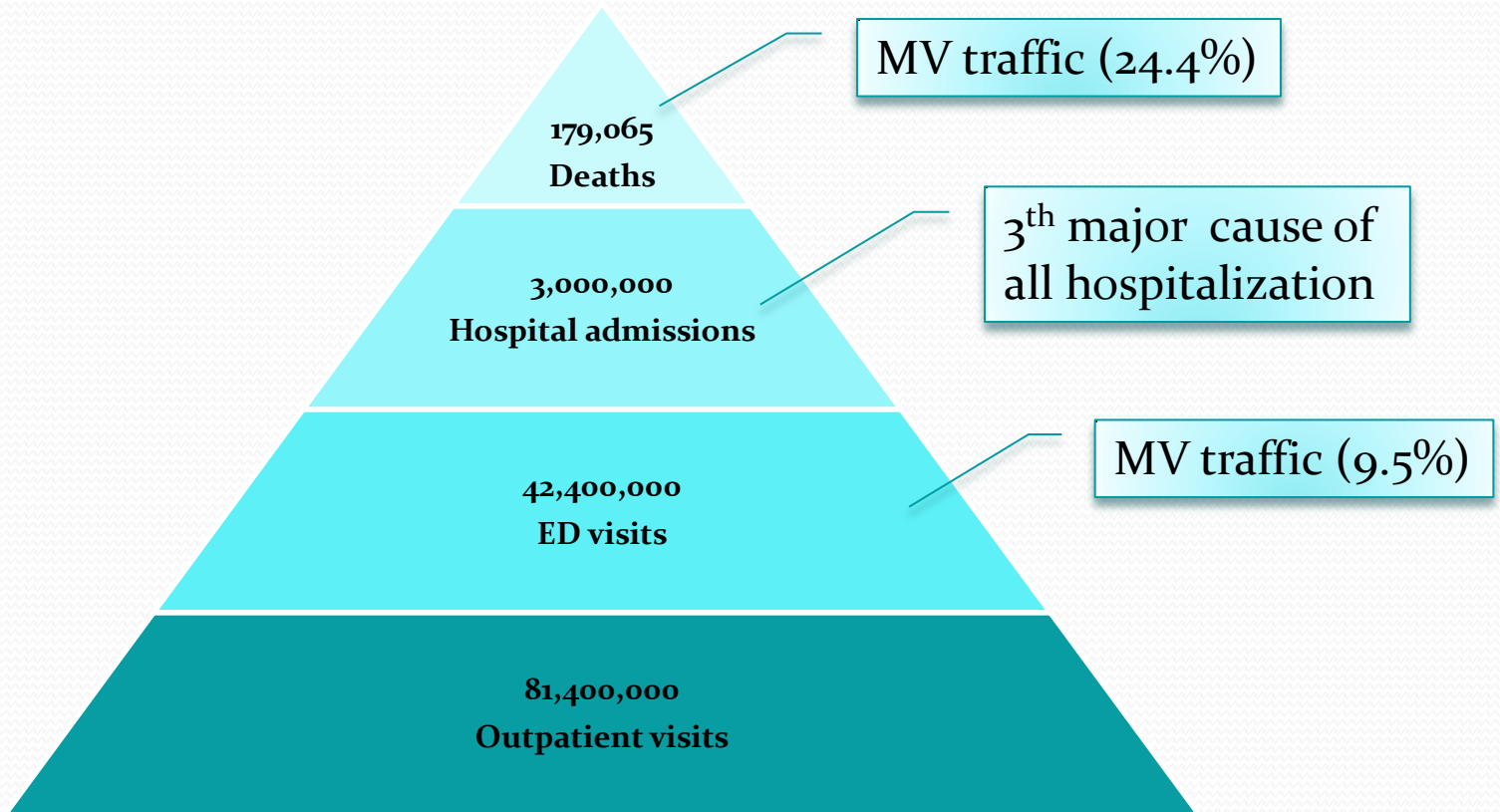
Acknowledgements

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This Presentation

- How medical and public health related data systems can be used to understand the population burden of motor vehicle traffic (MVT) injuries.
- From the epidemiologist perspective we will examine:
 - The evolution of the **concept of injury in epidemiology**
 - A **framework** to study MVT injury epidemiology
 - How we capture MVT injuries in statewide population-based **data sources**
 - **Limitations and opportunities** of current data systems

BURDEN OF INJURIES IN THE US, 2006



Source: National Center for Health Statistics data sources and surveys

10 Leading Causes of Death, United States 2006, All Races, Both Sexes

Rank	Age Groups										All Ages
	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	
1	Congenital Anomalies 5,819	<u>Unintentional Injury</u> 1,610	<u>Unintentional Injury</u> 1,044	<u>Unintentional Injury</u> 1,214	<u>Unintentional Injury</u> 16,229	<u>Unintentional Injury</u> 14,954	<u>Unintentional Injury</u> 17,534	Malignant Neoplasms 50,334	Malignant Neoplasms 101,454	Heart Disease 510,542	Heart Disease 631,636
2	Short Gestation 4,841	Congenital Anomalies 515	Malignant Neoplasms 459	Malignant Neoplasms 448	<u>Homicide</u> 5,717	<u>Suicide</u> 4,985	Malignant Neoplasms 13,917	Heart Disease 38,095	Heart Disease 65,477	Malignant Neoplasms 387,515	Malignant Neoplasms 559,888
3	SIDS 2,323	Malignant Neoplasms 377	Congenital Anomalies 182	<u>Homicide</u> 241	<u>Suicide</u> 4,189	<u>Homicide</u> 4,725	Heart Disease 12,339	<u>Unintentional Injury</u> 19,675	Chronic Low. Respiratory Disease 12,375	Cerebro-vascular 117,010	Cerebro-vascular 137,119
4	Maternal Pregnancy Comp. 1,683	<u>Homicide</u> 366	<u>Homicide</u> 149	<u>Suicide</u> 216	Malignant Neoplasms 1,644	Malignant Neoplasms 3,656	<u>Suicide</u> 6,591	Liver Disease 7,712	<u>Unintentional Injury</u> 11,446	Chronic Low. Respiratory Disease 106,845	Chronic Low. Respiratory Disease 124,583
5	<u>Unintentional Injury</u> 1,147	Heart Disease 161	Heart Disease 90	Heart Disease 163	Heart Disease 1,076	Heart Disease 3,307	HIV 4,010	<u>Suicide</u> 7,426	Diabetes Mellitus 11,432	Alzheimer's Disease 71,660	<u>Unintentional Injury</u> 121,599
6	Placenta Cord Membranes 1,140	Influenza & Pneumonia 125	Chronic Low. Respiratory Disease 52	Congenital Anomalies 162	Congenital Anomalies 460	HIV 1,182	<u>Homicide</u> 3,020	Cerebro-vascular 6,341	Cerebro-vascular 10,518	Diabetes Mellitus 52,351	Diabetes Mellitus 72,449
7	Respiratory Distress 825	Septicemia 88	Cerebro-vascular 45	Chronic Low. Respiratory Disease 63	Cerebro-vascular 210	Diabetes Mellitus 673	Liver Disease 2,551	Diabetes Mellitus 5,692	Liver Disease 7,217	Influenza & Pneumonia 49,346	Alzheimer's Disease 72,432
8	Bacterial Sepsis 807	Perinatal Period 65	Influenza & Pneumonia 40	Cerebro-vascular 50	HIV 206	Cerebro-vascular 527	Cerebro-vascular 2,221	HIV 4,377	<u>Suicide</u> 4,583	Nephritis 37,377	Influenza & Pneumonia 56,326
9	Neonatal Hemorrhage 618	Benign Neoplasms 60	Septicemia 40	Septicemia 44	Influenza & Pneumonia 184	Congenital Anomalies 437	Diabetes Mellitus 2,094	Chronic Low. Respiratory Disease 3,924	Nephritis 4,368	<u>Unintentional Injury</u> 36,689	Nephritis 45,344
10	Circulatory System Disease 543	Cerebro-vascular 54	Benign Neoplasms 38	Benign Neoplasms 38	Complicated Pregnancy 179	Influenza & Pneumonia 335	Septicemia 870	Viral Hepatitis 2,911	Septicemia 4,032	Septicemia 26,201	Septicemia 34,234

Produced By: Office of Statistics and Programming, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention

Data Source: National Center for Health Statistics (NCHS), National Vital Statistics System

What is Injury?

- Historically referred as “accidents” → singular, individualized and unrelated event
- Industrialization (19th century) → injury becomes more apparent and clustered along the new environmental risks posed by industrialization.
- 1942 – Dugh De Haven → Studied the **structural conditions** in which injuries occurred
- Mid 20th century and later → Development of injury epidemiology and prevention

1950's – John Gordon → Applied the classic framework of Epidemiology to the study of Injury

Host

Agent (e.g., MV, Guns)

Environment



1961 – James Gibson → Defined the “agent” of Injury occurrence as abnormal/excessive energy interchange

Host

Agent as “energy interchange”

Environment



1968 – William Haddon → Incorporated the absence of energy elements, such as oxygen and heat, to the definition of “agent”

Host

Agent as “energy interchange” or “absence of necessary energy elements”

Environment

Historical Highlights

- Policy Development:

1965 – *Unsafe at Any Speed* (Ralph Nader)

1966 – US Highway Safety Act

1966 – NAS/NRC: *Accidental Death and Disability: The Neglected Disease of Modern Society*

1970 – Occupational Safety and Health Act

1972 – Consumer Product Safety Act

1973 – EMS System Act

1985 – *Injury in America: A Continuing Public Health Problem*

1992 – National Center for Injury Prevention and Control, CDC

What is injury?

- **Current definition:**

“any unintentional or intentional damage to the body resulting from acute exposure to thermal, mechanical, electrical, or chemical energy or from the absence of such essentials as heat or oxygen”.

(National Committee for Injury Prevention and Control, 1989)

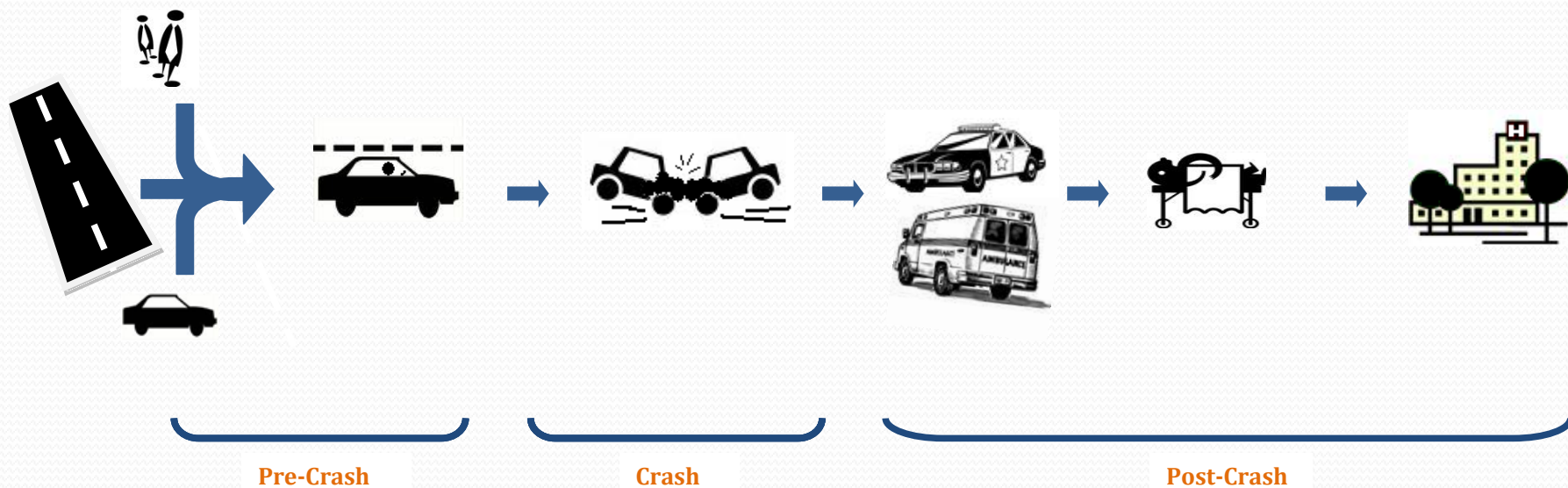
Types of Harmful Energy Transfer

Energy Type	Example
Mechanical (Kinetic)	Unrestrained MV occupant ejection
Thermal	Heat and flames of a fire
Chemical	Ingestion of cleaning fluid
Electrical	Contact with exposed high-voltage wire
Radiation	Severe sunburn
Absence of Energy Elements	Example
Oxygen	Drowning
Heat	Hypothermia

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“Natural” History of MVT Injuries



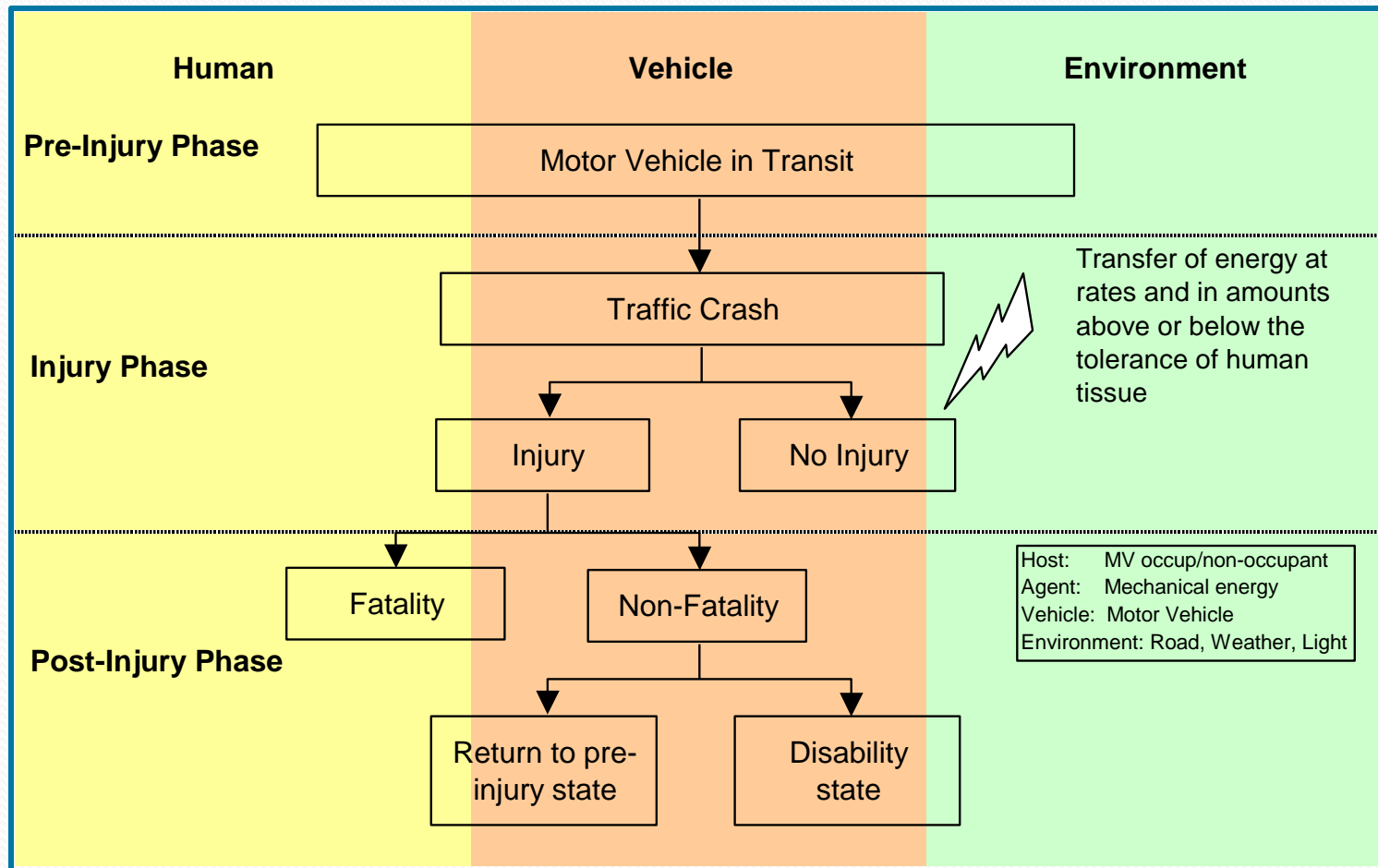
- Crash Information System
- Other traffic records data sources

- Prehospital Care Report
- Outpatient ED visit data
- Trauma Registry
- Hospital Inpatient admission data
- Death Certificate data system
- Fatality Analysis Reporting System


Injury Epidemiology and Prevention Framework: Haddon Matrix (1970)

Phases	Factors		
	Human	Agent/Vehicle	Environment
Pre-event			
Event			
Post-event			

Haddon Matrix (Applied to MVT)

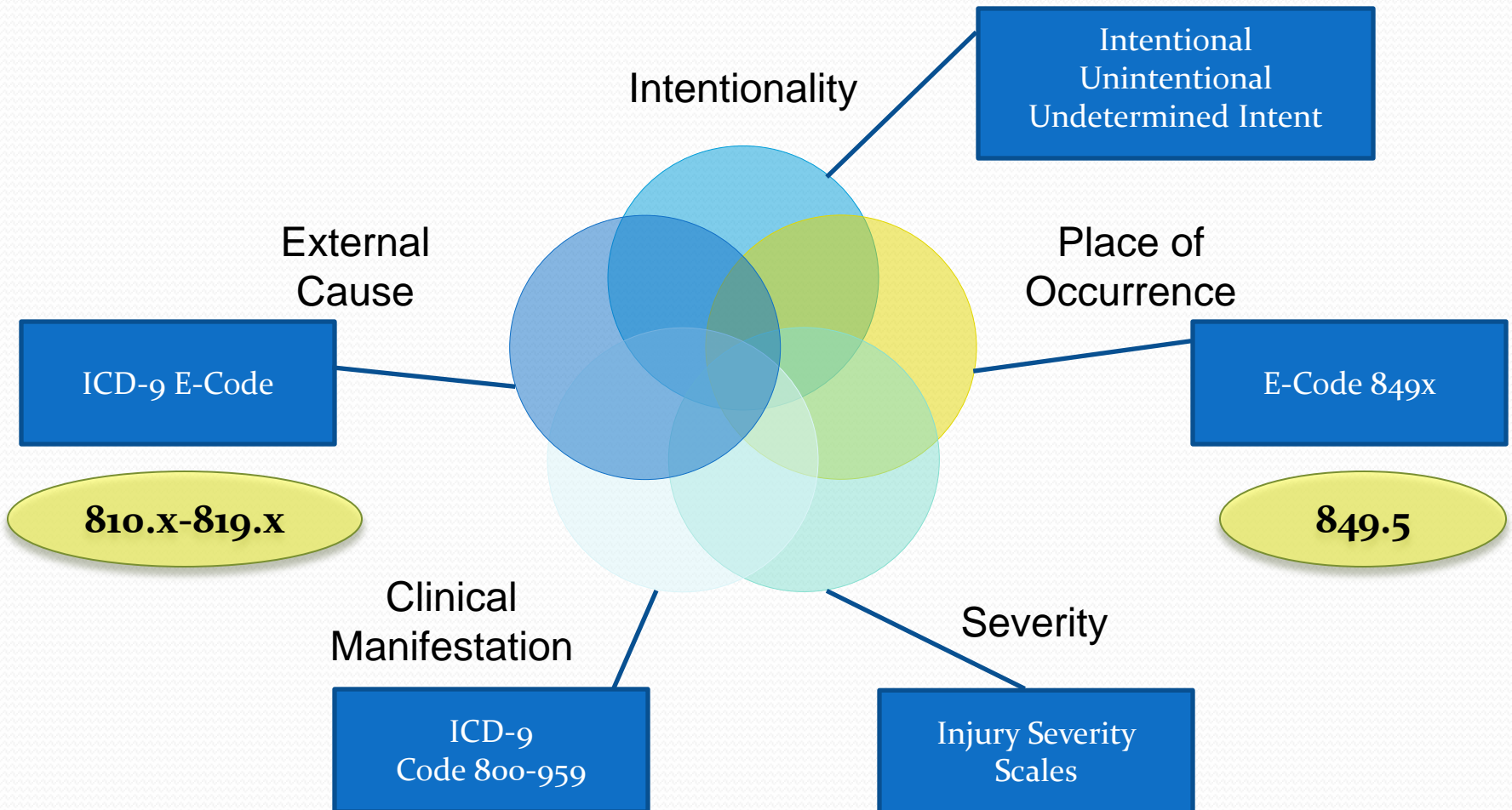


Injury Epidemiology and Prevention Framework: Haddon Matrix (1970)

Phases	Factors		
	Human	Agent/Vehicle	Environment
Pre-event		Primary Prevention 	
Event		Human: driver education Agent/Vehicle: Vehicle maintenance	
Post-event		Human: Seat belt Agent/Vehicle: Crashworthiness (crush space, forgiving windshield, no dashboard protrusions) Human: Crash victim underlying health status Agent/Vehicle: Gas tanks designed to minimize chance of post-crash fire Environment (Physical): Effective EMS/Trauma system Environment (Sociocultural): Public support for EMS	

How do we capture MVT injury data?

(1) Multidimensional Concept of Injury:



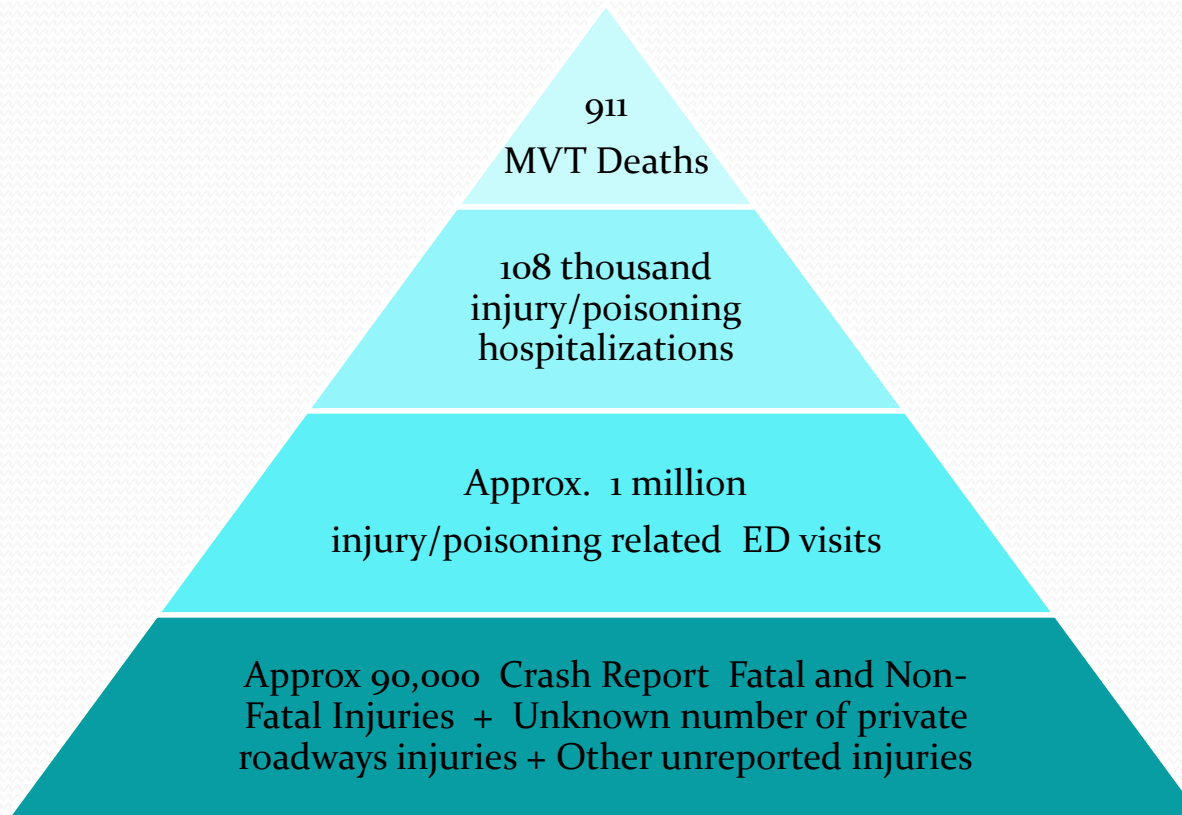
How do we capture MVT injury data?

(2) Statewide health/medical data sources

Can MVT injury be captured by...	Prehospital Care Report	Emergency Department visits and Hospital admissions	Trauma Registry	Death Certificate	Traffic Crash Report
External Cause?	<ul style="list-style-type: none"> Complaint Reported By Dispatch Cause of Injury 	<ul style="list-style-type: none"> E-code fields (3 fields) 	<ul style="list-style-type: none"> E-code (3 fields) 	<ul style="list-style-type: none"> Underlying Cause of Death 	<ul style="list-style-type: none"> MVT exclusively
Clinical Manifestation?	<ul style="list-style-type: none"> Possible Injury Provider's Impression (Primary and Secondary) 	<ul style="list-style-type: none"> Principal Diagnosis Other Diagnoses (24 fields) 	<ul style="list-style-type: none"> Nature of Injury (20 fields) 	<ul style="list-style-type: none"> Other causes of death (4 fields) 	No
Severity?	<ul style="list-style-type: none"> Glascow Coma Scale 	(ISS can be calculated)	<ul style="list-style-type: none"> Glascow Coma Scale Pediatric Trauma Score Abbreviated Injury Scale (AIS) Injury Severity Score (ISS) 		<ul style="list-style-type: none"> KABCO scale
Place of Occurrence?	<ul style="list-style-type: none"> Incident Location Type 	<ul style="list-style-type: none"> Recorded mostly in 2nd or 3rd E-code field 	<ul style="list-style-type: none"> Place of injury 	<ul style="list-style-type: none"> Place of Injury Code 	<ul style="list-style-type: none"> Public roadway
Intentionality?	No	Yes	Yes	Yes	No
Other?	<ul style="list-style-type: none"> Use of Occupant Safety Equipment Airbag Deployment Vehicular Injury Indicators Law Enforcement/Crash Number 		<ul style="list-style-type: none"> Safety Equipment Vehicle Seat Position Ejection from Vehicle Crash Record Number 	<ul style="list-style-type: none"> County of Injury City of Injury Community Area of Injury Month of Injury 	

BURDEN OF MVT INJURIES

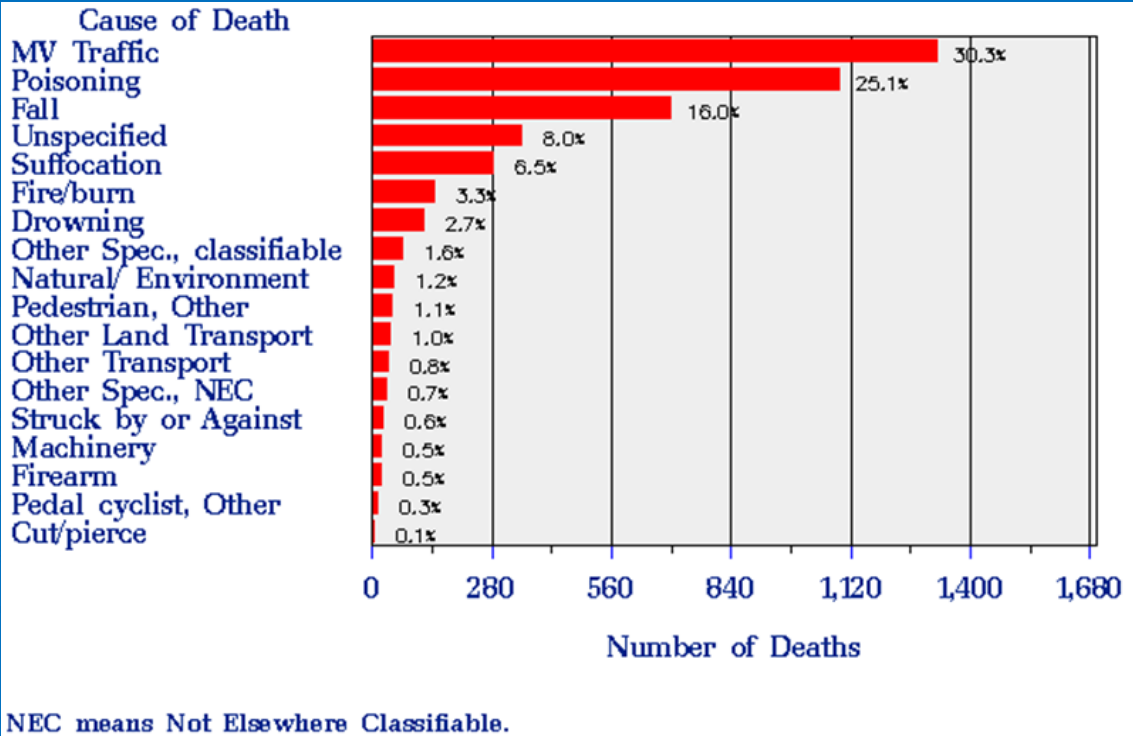
Illinois, 2009



Sources: 2009 Illinois Crash Facts and Statistics, IDOT; and 2009 Inpatient & Outpatient data, IHA.

10 Leading Causes of Death, Illinois 2007, All Races, Both Sexes

Rank	Cause of Death	Age Groups									All Ages
		<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	
1	Short Gestation 295	Unintentional Injury 55	Unintentional Injury 42	Unintentional Injury 54	Unintentional Injury 554	Unintentional Injury 504	Unintentional Injury 606	Malignant Neoplasms 2,137	Malignant Neoplasms 4,336	Heart Disease 20,578	Heart Disease 25,813
2	Congenital Anomalies 216	Congenital Anomalies	Malignant Neoplasms	Homicide 24	Homicide 300	Homicide 327	Malignant Neoplasms	Heart Disease	Heart Disease	Malignant Neoplasms 16,840	Malignant Neoplasms 24,115
3	Maternal/Pregnancy Complications 79	MV Traffic	Poisoning	Fall	Unspecified	Suffocation	Fire/burn	Drowning	Other Spec., classifiable	Cerebrovascular 5,076	Cerebrovascular 5,864
4	SIDS 54	Unintentional Injury 50	Natural/Environment	Pedestrian, Other	Other Land Transport	Other Transport	Other Spec., NEC	Struck by or Against Machinery	Firearm	Chronic Low. Respiratory Disease 4,092	Chronic Low. Respiratory Disease 4,742
5	Placental Cord Membrane 43	Respiratory Distress 31	Neonatal Hemorrhage 30	Bacterial Sepsis 27	Circulatory System Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Unintentional Injury 2,692	Unintentional Injury 4,367
6	Respiratory Distress 31	Neonatal Hemorrhage 30	Bacterial Sepsis 27	Circulatory System Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Influenza & Pneumonia 2,207	Diabetes Mellitus 2,851
7	Neonatal Hemorrhage 30	Bacterial Sepsis 27	Circulatory System Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Nephritis 2,127	Alzheimer's Disease 2,734
8	Bacterial Sepsis 27	Circulatory System Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Diabetes Mellitus 2,097	Influenza & Pneumonia 2,550
9	Circulatory System Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Septicemia 1,595	Nephritis 2,536
10	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Heart Disease 27	Unintentional Injury 1,407	Septicemia 2,099



Limitations:

- Within data systems:
 - Practice of e-coding injury data
 - Granularity of MVT injury data
 - Missing information
- Across data systems:
 - Data fragmentation
 - Need for better partnerships among agencies

Opportunities:

- Data integration efforts (CODES)
- Mandatory E-coding in inpatient data (as of 2008)
- Mandatory reporting of Emergency Department visits (as of 2009)
- Other data collection efforts



Questions?