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LINKING 2021 CRASH DATA WITH EMSTR RECORDS

TEXAS
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Texas Department of State Health Services

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INTRODUCTION

Background and Significance

Motor vehicle traffic fatalities remain a major public health concern. In 2021, Texas experienced an increase in motor vehicle fatality numbers. The 4,489 death toll was an increase of 15.22% from the 3,896 deaths recorded in 2020. In 2021, there were 15,764 serious injury crashes in Texas with 19,448 people sustaining a serious injury.[1]

This report linked three databases from two different state agencies to better understand motor vehicle crash causes and outcomes. By understanding the nature of the problem, motor vehicle traffic crash injuries can be prevented. Success in reducing crash-related deaths and injuries depends largely on a surveillance system that allows better monitoring of occurrence, causes, and impacts on society.

The Texas Department of State Health Services (DSHS) Office of Injury Prevention (OIP) Emergency Medical Services and Trauma Registries (EMSTR) epidemiologists linked the Texas Department of Transportation's (TxDOT) Crash Records Information System (CRIS) data with EMS records and trauma reported records to create a linked dataset. For this report, EMS/TR used 2021 data for all three datasets.

Project Objective

To link crash data with statutorily reportable injury and event data.

- Crash Data – TxDOT CRIS

- EMS Data – DSHS EMS records

- Trauma Hospital Data – DSHS trauma records

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[1] Texas Department of Transportation, 2022 **ftp.txdot.gov/pub/txdot-info/trf/crash_statistics/2021/01.pdf.**

Methodology

Inclusion Criteria

DSHS Trauma Data

Motor Vehicle Traffic-related International Classification of Diseases 10 Clinical Modifications (ICD10-CM) in Cause of Injury Field: V1-V89, X81, X82, X83, Y02, Y08, Y32, Y36, Y37, Y38

DSHS EMS Data

Motor Vehicle Traffic-related ICD10-CM in Cause of Injury Field: V1-V89, X81, X82, X83, Y02, Y08, Y32, Y36, Y37, Y38

TxDOT Crash Data

Chief Complaint: Traffic Transportation Incident, Automated Crash Notification

Exclusion Criteria

Records with transfers were excluded from both trauma and EMS data.

Data Linkage Process

Overview

DSHS conducted a probabilistic data linkage using Match*Pro. The **National Cancer Institute** developed Match*Pro and it is available for free. Match*Pro conducts probabilistic linkages based on the Fellegi-Sunter model. The Fellegi-Sunter Model uses a decision-theoretic approach establishing the validity of principles. The model's goal is to estimate a 'match probability' for each dataset comparison, which quantifies the likelihood the two records represent the same entity.

DSHS first linked CRIS data to the EMS registry database, then CRIS data was linked to the trauma registry. These datasets were then combined to create the final linked Crash-EMS-Trauma dataset.

Matching Variables Used for Probabilistic Data Linkage

	Matching Variables*
Crash to Trauma	First Name, Last Name, Middle Name, Birth Date, Incident County, Incident Date, Age
Crash to EMS	First Name, Last Name, Middle Name, Birth Date, Incident County, Incident Date, Age
Crash to EMS to Trauma	Unique ID (created by linking crash_ID, unit_nbr, and prsn_nbr)

*Matching variables are variables EMSTR used as criteria for data linkage.

2021 Date Linkage Summary

Dataset	N total (in full dataset before linkage)	N total (transportation related injuries subset)	N linked pairs (based on the data linking algorithm)	N linked de-duplicated pairs
Crash	1,591,148	1,480,738	-	-
EMS	4,567,864	184,025	110,191	-
Trauma	153,135	26,081	16,071	-
Crash to EMS to Trauma	-	-	10,501	10,469

Number of pairs (records) in linking data sets, by year

Dataset	2014	2015*	2016	2018**	2019	2020	2021
Crash to EMS	28,806	63,179	72,304	118,029	175,896	99,618	110,191
Crash to Trauma	11,886	16,262	17,829	15,283	16,587	17,379	16,071
Crash to EMS to Trauma	3,119	5,075	6,367	6,667	10,418	12,047	10,501

*In 2015, passengers were added to the crash data.

**In 2018, chief complaint was added to select traffic-related records along with ICD codes.

Missing Records in Datasets Before and After Linkage

	Before Linking (Crash-EMS-Trauma)					
	Trauma Linking Subset		EMS Linking Subset		Crash Linking Subset	
Matching Variable	Count	%	Count	%	Count	%
Last Name	0	0	1	0.0005	5045	0.34
First Name	0	0	1	0.0005	4247	0.29
Birth Date	11	0.04	3,112	1.69	444,481*	30.02*
Incident Date	21	0.08	27,024	14.68	0	0.00

*Birth data among passengers in the crash data is not captured.

	After Linking (Crash-EMS-Trauma)					
	Trauma		EMS		Crash	
Matching Variable	Count	%	Count	%	Count	%
Last Name	0	0	0	0	0	0
First Name	0	0	0	0	1	0.01
Birth Date	8	0.08	8	0.08	1844	17.61
Incident Date	0	0	1	0.01	0	0

Descriptive Statistics of Linked Dataset (Crash-EMSTR)

Percentages in some tables may not equal 100% due to rounding. Values less than 5 are suppressed to reduce the likelihood of a breach of confidentiality. Suppressed is noted with an asterisk (*).

Demographic Variables

SEX	COUNT	% of all Linked Records
Male	6,574	62.81
Female	3,882	37.09
Not Recorded	13	00.12
Total	**10,469**	**100.00**

RACE/ETHNICITY	COUNT	% of all Linked Records
White (non-Hispanic)	4,895	46.76
Hispanic	2,861	27.33
Black (non-Hispanic)	1,860	17.77
Other (non-Hispanic)	195	01.86
Missing	658	06.29
Total	**10,469**	**100.00**

AGE GROUP (YEARS)	COUNT	% of all Linked Records
0-17	778	07.43
18-24	1,729	16.52
25-44	3,777	36.08
45-64	2,604	24.87
65+	1,573	15.03
Missing	8	00.08
Total	**10,469**	**100.00**

Trauma Variables

PRIMARY METHOD PAYMENT	COUNT	%
Medicaid	899	08.59
Medicare	1,256	12.00
Other Government	272	02.60

PRIMARY METHOD PAYMENT	COUNT	%
Private/Commercial Insurance	3,872	36.99
Self- Pay	2,717	25.95
Not Known/Not Recorded	465	04.44
Other	984	09.40
Missing	*	*
Total	**10,469**	**100.00**

HOSPITAL DISPOSITION	COUNT	%
Deceased/Expired	238	02.27
Discharged to home or self-care	5,822	55.61
Transferred to other short-term facility	100	00.96
Transferred to inpatient rehabilitation	800	07.64
Transferred to skilled nursing facility	306	02.92
Transferred to long term care hospital	84	00.80
Left against medical advice or discontinued care	117	01.12
Other	410	03.92
Not Applicable**	2,591	24.75
Not Recorded	*	*
Total	**10,469**	**100.00**

**Not Applicable for hospital disposition is reported if emergency department (ED) disposition is: left against medical advice, deceased, discharged home or self-care, hospice, court / law enforcement, or inpatient rehab.

LOCALLY CALCULATED INJURY SEVERITY SCORE (ISS)***	COUNT	%
Very Low (0-8)	4,200	40.12
Low (9-15)	3,686	35.21
High (16-24)	1,607	15.35
Very High (25-75)	976	09.32
Total	**10,469**	**100.00**

***Decided by the **Association for the Advancement of Automotive Medicine**.

When establishing the ISS criteria, the AAAM mapped a series of anatomically defined injury descriptions according to:

      i.   Energy dissipation
     ii.   Threat to life
    iii.   Treatment period
    iv.   Incidence
     v.   Permanent impairment

EMS Variables

CHIEF COMPLAINT	COUNT	%
Traffic transportation incident	8,535	81.53
No other appropriate choice	394	03.76
Traumatic injury	256	02.45
Air medical transport	445	04.25
Transfer/Interfacility/Palliative Care	418	03.99
Other	421	04.02
Total	**10,469**	**100.00**

CHIEF COMPLAINT LOCATION	COUNT	%
Abdomen	200	01.91
Back	404	03.86
Chest	444	04.24
Extremity-Lower	1,156	11.04
Extremity-Upper	532	05.08
General/Global	2,718	25.96
Genitalia	7	00.07
Head	786	07.51
Neck	206	01.97
Not Applicable	26	00.25
Not Recorded	3,990	38.11
Total	**10,469**	**100.00**

EMS TRANSPORT METHOD	COUNT	%
Air Medical-Fixed Wing	17	00.16
Air Medical-Rotor Craft	763	07.29
Ground-Ambulance	8,105	77.42
Ground-Bariatric (obesity)	1	00.01
Ground-Other Not Listed	15	00.14
Not Applicable	229	02.19
Not Recorded	1339	12.79
Total	**10,469**	**100.00**

INCIDENT PATIENT DISPOSITION	COUNT	%
Patient treated transported by EMS	9,530	91.03
Patient treated transferred care to another EMS professional	508	04.85
Other**	431	04.12
Total	**10,469**	**100.00**

**Other includes patient dead at scene, patient refused evaluation / care, no treatment / transport required, released against medical advice, etc.

INCIDENT SEASON	COUNT	%
Spring (March, April, May)	2,869	27.41
Summer (June, July, August)	2,924	27.93
Fall (September, October, November)	2,599	24.83
Winter (December, February, January)	2,076	19.83
Missing	*	*
Total	**10,469**	**100.00**

RESPONSE TIME (Minutes)	COUNT	MEAN	MEDIAN
Traffic-related (linked crash-EMS-trauma)	10,464	10.62	8.0
Ems all 911 responses (EMS dataset)	4,341,536	18.27	8.0

Crash Variables

MANNER OF COLLISION**	COUNT	%
One motor vehicle - going straight	4,089	39.06
Angle - both going straight	1,562	14.92
Opposite direction - one straight-one left turn	986	09.42
Same direction - both going straight-rear end	878	08.39
Opposite direction - both going straight	792	07.57
Same direction - one straight-one stopped	516	04.93
Other	1,646	15.72
Total	**10,469**	**100.00**

INJURY SEVERITY ID**	COUNT	%
Incapacitated injury	4,706	44.95
Non-incapacitating injury	2,796	26.71
Possible injury	2,083	19.90
Killed	495	04.73
Not injured	337	03.22
Unknown	52	00.50
Total	**10,469**	**100.00**

**ftp.dot.state.tx.us/pub/txdot-info/trf/crash_statistics/automated/standard-extract.xlsx

Conclusion

This report should inform TxDOT about the 2021 linked data statistical results and offer an opportunity to identify new topics for further studies. DSHS anticipates the information in this report will be useful to identify motor vehicle crash causes and set priorities to reduce morbidity, injury severity, and cost arising from motor vehicle traffic crashes. This data will be useful in supporting community-based highway safety programs.

Finally, this report will help researchers to further explore motor vehicle traffic crash causes and consequences.