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# **LINKING 2021 CRASH DATA WITH TRAUMA RECORDS**



**TEXAS**  
Health and Human  
Services

Texas Department of State  
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## **Contents**

<b>Introduction.....</b>	<b>4</b>
Background and Significance.....	4
Project Objective .....	4
<b>Methodology .....</b>	<b>5</b>
<b>Data Linkage Process .....</b>	<b>6</b>
Overview.....	6
Matching Variables Used for Probabilistic Data Linkage .....	6
<b>2021 Data linkage Summary .....</b>	<b>7</b>
<b>Missing Records in Datasets Before and After Linkage .....</b>	<b>8</b>
<b>Descriptive Statistics of Linked Dataset (Crash to Trauma).....</b>	<b>9</b>
Demographic Variables .....	9
Trauma Variables .....	9
Crash Variables .....	11
<b>Conclusion .....</b>	<b>12</b>

# 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.<sup>1</sup>

This report linked two 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) with the trauma registry's reported hospital records to create a linked dataset. For this report, EMSTR used 2021 data for both datasets.

## Project Objective

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

- Crash Data – TxDOT's CRIS
- Trauma Hospital Data – DSHS trauma records

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<sup>1</sup> Texas Department of Transportation, 2022 [ftp.txdot.gov/pub/txdot-info/trf/crash\\_statistics/2021/01.pdf](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

### **Exclusion Criteria**

Records with transfers were excluded from trauma 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.

### Matching Variables Used for Probabilistic Data Linkage

DSHS linked CRIS data to trauma data based on the following matching variables

	<b>Matching Variables*</b>
Crash to Trauma	First Name, Last Name, Middle Name, Birth Date, Incident County, Incident Date, Age

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

## 2021 Data linkage Summary

<b>Dataset</b>	<b>N total (in full dataset before linkage)</b>	<b>N total (transportation related injuries subset)</b>	<b>N linked pairs (based on the data linking algorithm)</b>	<b>N linked de-duplicated pairs</b>
Crash	1,591,148	1,480,738	-	-
Trauma	153,135	26,081	16,071	-
Crash to Trauma	-	-	16,071	16,071

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

<b>Dataset</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
Crash to Trauma	11,886	16,262	17,829	15,283	16,587	17,379	16,071

\*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 -Trauma)			
	Trauma Linking Subset		Crash Linking Subset	
Matching Variable	Count	%	Count	%
Last Name	0	0	5,045	0.34
First Name	0	0	4,247	0.29
Birth Date	11	0.04	444,481*	30.02*
Incident Date	21	0.08	0	0.00

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

	After Linking (Crash -Trauma)			
	Trauma		Crash	
Matching Variable	Count	%	Count	%
Last Name	0	0	0	0
First Name	0	0	1	0.01
Birth Date	8	0.08	1,844	17.61
Incident Date	0	0	0	0



## Descriptive Statistics of Linked Dataset (Crash to Trauma)

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.

### Demographic Variables

<b>SEX</b>	<b>COUNT</b>	<b>% of all Linked Records</b>
Male	10,117	62.82
Female	5,986	37.17
Not Recorded	*	*
<b>Total</b>	<b>16,105</b>	<b>100.00</b>

<b>RACE and ETHNICITY</b>	<b>COUNT</b>	<b>% of all Linked Records</b>
White (non-Hispanic)	5,963	37.03
Hispanic	4,768	29.61
Black (non-Hispanic)	2,754	17.10
Other (non-Hispanic)	2,407	14.95
Not Recorded	213	1.32
<b>Total</b>	<b>16,105</b>	<b>100.00</b>

<b>AGE GROUP (YEARS)</b>	<b>COUNT</b>	<b>% of all Linked Records</b>
0-17	1,251	7.77
18-24	2,722	16.90
25-44	5,905	36.67
45-64	3,902	24.23
65+	2,295	14.25
Missing	30	0.19
<b>Total</b>	<b>16,105</b>	<b>100.00</b>

### Trauma Variables

<b>PRIMARY METHOD PAYMENT</b>	<b>COUNT</b>	<b>%</b>
Medicaid	1,483	9.21
Medicare	1,830	11.36
Other Government	412	2.56
Private/Commercial Insurance	5,929	36.81

<b>PRIMARY METHOD PAYMENT</b>	<b>COUNT</b>	<b>%</b>
Self- Pay	4,371	27.14
Not Known/Not Recorded	665	4.13
Other	1,409	8.75
Missing	6	0.04
<b>Total</b>	<b>16,105</b>	<b>100.00</b>

<b>HOSPITAL DISPOSITION</b>	<b>COUNT</b>	<b>%</b>
Deceased/Expired	393	2.44
Discharged to home or self-care	8,898	55.25
Transferred to other short-term facility	132	0.82
Transferred to inpatient rehabilitation	1,187	7.37
Transferred to skilled nursing facility	445	2.76
Transferred to long term care hospital	122	0.76
Left against medical advice or discontinued care	193	1.20
Other	840	5.22
Not Applicable*	3,886	24.13
Not Recorded	9	0.06
<b>Total</b>	<b>16,105</b>	<b>100.00</b>

\*Not Applicable 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.

<b>LOCALLY CALCULATED INJURY SEVERITY SCORE* (ISS)</b>	<b>COUNT</b>	<b>%</b>
Very Low (0-8)	6,706	41.64
Low (9-15)	5,410	33.59
High (16-24)	2,449	15.21
Very High (25-75)	1,540	9.56
<b>Total</b>	<b>16,105</b>	<b>100.00</b>

\*Decided by the [Association for the Advancement of Automotive Medicine](#) (AAAM).

When establishing the ISS criteria, 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

<b>INCIDENT SEASON</b>	<b>COUNT</b>	<b>%</b>
Spring (March, April, May)	4,371	27.14
Summer (June, July, August)	4,352	27.02
Fall (September, October, November)	4,101	25.46
Winter (December, February, January)	3,281	20.37
<b>Total</b>	<b>16,105</b>	<b>100.00</b>

### Crash Variables

<b>MANNER OF COLLISION*</b>	<b>COUNT</b>	<b>%</b>
One motor vehicle - going straight	6,299	39.11
Angle - both going straight	2,348	14.58
Opposite direction - one straight-one left turn	1,475	9.16
Same direction - both going straight-rear end	1,328	8.25
Opposite direction - both going straight	1,244	7.72
Same direction - one straight-one stopped	806	5.00
Other	2,605	16.18
<b>Total</b>	<b>16,105</b>	<b>100.00</b>

<b>INJURY SEVERITY ID*</b>	<b>COUNT</b>	<b>%</b>
Incapacitated injury	6,919	42.96
Non-incapacitating injury	4,244	26.35
Possible injury	3,062	19.01
Killed	847	5.26
Not injured	938	5.82
Unknown	95	0.59
<b>Total</b>	<b>16,105</b>	<b>100.00</b>

\*[ftp.dot.state.tx.us/pub/txdot-info/trf/crash\\_statistics/automated/standard-extract.xlsx](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.

By linking CRIS data only to trauma data, DSHS was able to analyze a larger dataset. This allows for descriptive statistics that more closely match the statistics for all crash and injury data.

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

Emergency Medical Services and Trauma Registries

***[dshs.texas.gov/injury-  
prevention/ems-trauma-registries](https://dshs.texas.gov/injury-prevention/ems-trauma-registries)***