University of South Carolina Scholar Commons

Theses and Dissertations

Fall 2023

Investigation of Discrepancies in South Carolina Traffic Collision Forms

Jackson Wegmet

Follow this and additional works at: https://scholarcommons.sc.edu/etd

Part of the Civil Engineering Commons

Recommended Citation

Wegmet, J.(2023). *Investigation of Discrepancies in South Carolina Traffic Collision Forms.* (Master's thesis). Retrieved from https://scholarcommons.sc.edu/etd/7577

This Open Access Thesis is brought to you by Scholar Commons. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of Scholar Commons. For more information, please contact digres@mailbox.sc.edu.

INVESTIGATION OF DISCREPANCIES IN SOUTH CAROLINA TRAFFIC COLLISION FORMS

by

Jackson Wegmet

Bachelor of Science in Engineering University of South Carolina, 2022

Submitted in Partial Fulfillment of the Requirements

For the Degree of Master of Science in

Civil Engineering

College of Engineering and Computing

University of South Carolina

2023

Accepted by:

Nathan Huynh, Director of Thesis

Yuche Chen, Reader

Chowdhury Siddiqui, Reader

Ann Vail, Dean of the Graduate School

ABSTRACT

The aim of this thesis is to improve the accuracy of information recorded in the South Carolina traffic collision forms. To accomplish this, it examines 200 forms containing information about fatal crashes in work zones between 2014 and 2020 to determine how many discrepancies exist between the written narrative and other fields. In addition to obtaining these statistics, this thesis seeks to identify factors that influence discrepancies. To test the hypothesis that crash complexity and weather influence the investigating officer's level of processing (a theory developed by Craik and Lockhart in 1972), and consequentially his/her ability to complete the traffic collision form accurately, a structural equation model (SEM) is developed. The SEM is used to explain the relationships between measured variables and latent variables and the relationships between latent variables (crash characteristics, weather conditions, and level of processing). SEM results show that increases in collision speed, number of units, number of events, and temperature resulted in an increase in the number of words and characters written in the narrative, whereas increases in precipitation and humidity resulted in a decrease in the number of words and characters written in the narrative. Notably, the number of discrepancies was not statistically significant, suggesting crash and weather-related factors do not affect an officer's reporting accuracy. A multiple linear regression model is also developed to identify factors that influence a form field's frequency of discrepancies. The form field's level of difficulty and its number of inputs are found to be statistically significant.

TABLE OF CONTENTS

Abstract ii
List of Tables iv
List of Figuresv
Chapter 1: Introduction1
Chapter 2: Literature Review7
Chapter 3: Data Description
Chapter 4: Methodology16
4.1 Structural Equation Modeling (SEM)16
4.2 Multiple Linear Regression (MLR)19
Chapter 5: Results
5.1 Structural Equation Modeling (SEM)21
5.2 Multiple Linear Regression (MLR)23
Chapter 6: Conclusion
References

LIST OF TABLES

Table 3.1 Number of Forms with Discrepancies between Form Fields and Narrative	9
Table 3.2 Number of Discrepancies by Form Fields	11
Table 3.3 Variables Used for SEM Analysis	13
Table 3.4 Reports by Type of Error	15
Table 5.1 MLR Model Estimation Results	

LIST OF FIGURES

Figure 1.1 South Carolina Traffic Collision Form TR-310, Front Side	2
Figure 1.2 South Carolina Traffic Collision Form TR-310, Back Side	3
Figure 1.3 Discrepancy Example – Written Narrative (Field 86)	4
Figure 1.4 Discrepancy Example – Action Prior to Impact (Field 129)	4
Figure 3.1 Form Field 126 (Vehicle Attachment)	14
Figure 5.1 SEM Results	21

CHAPTER 1: INTRODUCTION

The study of misclassification in police crash reports is well-documented (1-6). Misclassification is commonly defined as any instance of incorrect reporting, including an officer misunderstanding the report format, misunderstanding the crash itself, and making errors during the data entry process (1-3). This thesis addresses one type of misclassification: discrepancies. The term "discrepancies" as used in this thesis means that what is written in the narrative by the investigating officer is inconsistent with the other fields recorded in the same traffic collision form. Figure 1.1 shows the front side of the South Carolina traffic collision form, which includes the narrative in Field 86, and Figure 1.2 shows the back side of the collision form, which contains the coded fields the narrative was compared against. An example of a discrepancy is shown in Figure 1.3 and Figure 1.4. The narrative describes Unit 2 as moving and Unit 3 as stopped in traffic, but the relevant form field has this information backward. From an applied perspective, misclassified data could lead to incorrect conclusions, and from a theoretical perspective, it could lead to severe bias in coefficient estimates and error rates from parametric and non-parametric models (4, 7-9).

SOUTH CAROLINA DPS/OHS & DMV USE ONLY Page #	SOUTH CAROLINA # Of Units Amended - Attach Copy of Notified Arrived
	TR-310 (Rev. 04/2016) 3 4 corrected 5 6
7 Collision Location (2 - US Primary 5 - County 10 3 - SC Primary 6 - PP 7 - Ramp 5 11 /	(RL # / Name) O-Nam O-Connecton Miles. Dir. in / Near City of Town or. 12 2-Alter 13 -Business 5-Spur 9-Other 14 St 16 St 14 St 16
Lane # / Dir. Distance Offset Direction 1- Interstate 4 - Secondary Bas 2 # 17 0f N E 20 20a Miles N E 2 US Primary 5 - County 22 E	ise Intersection (Rt. # / Name) 0-Main Line 6-Connection GPS COORDINATES 00'00'00 23 / 24 2-Alternate 7-Business DEGREES MINUTES SE
C 1/ 10 3-W Feet S W 3-SC Primary 6-Other /- Ramp C R.R. Id. From Ramp Only To 1-Interstate 4-Secondary 2 Se	econd Intersection (Rt. # / Name) 0-Main Line & Connection Latitude 26
28	33 / 34 2-Alternate 7-Business 5-Spur 35 9-Other Longitude 27 °
SA-####### 36 Driver/Pedestrian's Full Name 37 38 39	SA #######
40 42 43 Street 44	Unt# Sex Race Street
41 City, State, & Zip 41 46	# Occ Birth Date City, State, & Zip
State Driver's License # Class Insurance Company: 47 48 49 50	State Driver's License # Class Insurance Company:
Year Body Vehicle Make VIN # 51 52 53 54	Year Body Vehicle Make VIN #
State Year License Plate # 57 Owner's D.L. # 55 56 57 58	State Year License Plate # Owner's D.L. #
Home Telephone Owner's Full Name () 59 60	Home Telephone Owner's Full Name ()
Bus. Telephone 61 Street 62	Bus. Telephone Street ()
Contributed To Collision Yes 63 No 64	Contributed To Collision City, State, & Zip Yes No
Estimated Speed Umit C.D.L. Reg: Yes No 67 T/B S Reg: Yes No 68 AloDrg info (see back): Yes No 68 AloDrg info (see back): Yes No 68 AloDrg info (see back): Yes No 69 AloDrg inf	o G9 Estimated Speed C.D.L. Req: Yes No T/B S Req: Yes No Alc/Drg info (see back): Yes N 5 No Speed Limit Statute # Statute # Towed By Yes
Driver/Pedestrian's Full Name	State Year License Plate # Owner's D.L. #
Unit # Sex Race Street	Home Telephone Owner's Full Name
≢ 000 Birth Date City, State, & Zip	Bus. Telephone Street
State Driver's License # Class Insurance Company:	Contributed To Collision City, State, & Zip
Year Body Vehicle Make VIN #	Yes No Estimated Speed C.D.L. Req: Yes No Speed Limit Crusters T/B S Req: Yes No Alo/Drg info (see back): Yes N
Dir. of Travel: Unit 1: N \$73E W Unit 2: N S E W Unit 3: N S E	E W I I Web 1 Dem I Hals 2 Dem I Hals 2 Dem I Hals 2 Dem I Hals 2 Dem
	S T4 S S S S T5 S T5 T5 <tht5< th=""> <tht5< th=""> <tht5< th=""></tht5<></tht5<></tht5<>
	Property Owner/Witness: 78 Property Owner/Witness:
	Address Address 79
	State Zip: Phone State Zip: Phone 80 81 82 State Zip: Phone
85	Phot Describe What Happened (Refer to Units by Number) Pending Invest
	86
NOTICE - THE TR-310 IS FOR STATISTICAL REPORTING PURPOSES ONLY AND IS A COLLISION, BUT NO WARRANT IS MADE AS TO THE FACTUAL ACCURACY THERE	A REFLECTION OF THE OFFICER'S BEST KNOWLEDGE, OPINION, AND BELIEF COVERING T EOF.
Investigating Officer's Name Rank SCCJA# Jurisdiction Code Re 87 88 89 90	ieview Date Reviewer's Name 92 Rank Internal Agency Code 94

Figure 1.1 South Carolina Traffic Collision form TR-310, Front Side

Unit#	Date of Birth	Sex	Race	Injury	Seat:	R/S A.B	B.D. Eject	LAI: Tr	an: Name		Street Address		Zip Code
95	96	97	98	993	100	101 10	2a 103	104 10	106	a 106b 106c	107		108
						10	20	1	050				
_													
						•							
-			$\left \right $	- +				+ +	-				
_				_				-					
-		-		- -	•	•		<u> </u>					
lace	A - Asian/Pacific skan Native or Amer	Islander	r ian	W-Wh	ite (Cauca ulti-Racial	siar a) Injury	Status	2- Suspecter	d Minor Injury	Seating Loc. 20- Pedes	than 60-Sleeper of Cab	Restraint/Safety D 00- None Used	21. Child
Blac	ck (African American)	H- His	panic	O- Othe	r U-Unikn	own 1- Possi	ble injury	4- Fatal		01 02 03 40- Bus o	Van (4th row or Higher) 80- La	p 11- Shoulder	Safety Se
Ai	ir Bag Deploymen	t / Swit	ch	E	jection	b) 2 or	3 Wheel	Motorized	Vehicle Only	04 05 06 50- Other 07 08 09 51 Other	Enclosed Area (nontrailing) 99- Ur	nk./NA 12- Lap Belt Only	88- Other
2-0	Deployed Fron 4-Not Deployed Side 7-Not	Applical	ble	2- Part	Ejected	Head I	njury: n After In	1-Yes	2-No 3- Freed	(non-mech.) (a) Trans	onerclosed Area (nontrailing)	Pedestrian, Motor/Pe	edalcycle Only
3-0	Deployed Both 9-Dep	loyment	Unk.	3-Tot. I	Ejected	1- Not T	rapped		4- Not A	pplicable 1- Yes	2- No 3- Unknown	31-Heimet 51-Re	flective Clothing
1-	Switch in On Position	3- No 3	Switch	7- Not	Applicable	2- Extric	ated (Mech	hanical Mea	ns) 9- Unkn	own D) By:	1- EMS 2- Police 8- Other 9- Unkn	own 41- Protective Pads	61-Lighting
ion-C	Collision	04-	Equipmen	nt Failure		Seque	C	ollision: No	ot Fixed 27-P	Collision: Fi	xed Object 47- Embankment	55- Mail Box	68- Other
- Carp	o'Equip Loss or Shift	05-	Fire/Explo	osion	08-Overtu	m/Rollover	20	- Animal (Dee	r Only) 28- R	alway Veh. 40- Bridge Over	ead Structure 49- Equipment	56- Median Barrier	69- Unknown
- Cros	s Median/Center	06-	Immersio	•	09- Ran of 10- Ran of	f Road Left f Road Right	21	- Animal (All C - Motor Veh. d	other) 29-W Maint	Equip. 41- Bridge Para	et End 49- Fence	57- Overhead Sign Support	e Etc.)
-1	Event 2 Event 3 Event 4	Most Par	nd 1*	"Hmfl	11-Separ	ation of Units	23	- Motor Veh. (Stopped) 38- O	ther Movable 43- Bridge Rail	51- Guardrall Face	59- Other (Wall, Building, Tur	nnei, Etc.)
09	110 111 112	113	3	14	12- Spill (1	(wo-Wheeled Veh.)	24	- Matar Veh. (Othe	er Rostway) Object	44- Culvert	52- Highway Traffic Gign Post	60- Tree	
-	3 3 3	3	- '	114	18- Other 19- Unk. N	Noncollision	25	- Motor Veh. () - Fedalcycle	Parked) Object	45- Curb	53- Impact Attenuator/Crash Cushion 54- Lipht/Luminaire Dupport	61- Utility Pole 62- Work Zone Main	nt. Equipment
anne	er of Collision (Str	uck Veh	1.) 30-	Rear-to	-Rear	50-	Sideswipe	Same Dir.	1 st / M	ost 1 st Defor	med 116 2 3	Most Deformed	17 3
15	00- Not Coll. w/ Moto	or Veh.	41 -	Angle		60-	Sideswipe Bankod Int	Opposite Di	Deformed	Area	1 12 13 14 1 152 153	54 55.	73
	Collsion 20- Head On		43-	Angle (1 %	99-	Unknown		2 3		13 6 42 36 62	H 875	ATA N
ehic	le Type	15- Fu	I Size Va	an	27- Ped:	alcycle	61- S	chool Bus	21 11 1	10 10 10 10			"
18	01- Automobile	16- Mir	niVan ortUtilit		38- Anim 39- Anim	al Drawn Veh	62- P	assenger Bu	us 21- Pedestr	an 81-None 92-Rollow	er 93- Total 94-Under Carriage	58 98- Other 99- U	nknown
	13- Truck Tractor	25- Mo	otorcycle		41- Pede	estrian	99- U	nk. (Hit and	119 12	Alcohol / Drug Test G	iven 3- Given - Pending	Special Use (Only
\leq	14- Other Truck	26-05	her Moto	orbike	51- Train	Famelike	R	tun Only)	A2 02	1- Given - Known Result	s 4- None 1 5- Refused 1	21 2 3 4 5	6 7
22	01- Personal	05- Mi	itary		09-	Wrecker or T	ow 13	- Logging	123 12	Test Type 3-	Urine 1- Under- Compartment Intru	usion Underride/C	Override 1
	02- Driver Training	08- Tra	ansport P	Passen	gers	10- Police	18	- Other	A2 02	1- Breath (Alc Only) 4-	Serum 2- Under- No Intrusion	4- Over- MV in transport	6-None 2
ehic	03- Construction/Ma	Utility T	 Transp railer 	ort Prop	8- Towe	11- Governn d Motor Vehi	de C	 Pedestriar Other Tank 		2- Blood 8- Results 3- Mariua	Dther 3- Under- Unknown na D- None/Minor	5- Over- Other Vehicle Extent of Def	9- Unknow *
.26	1- None 5-	Farm Tr	railer		9- Petrol	eum Tanker	D	Flat Bed	00 1- A	nphetamines 4- Opiates	2- Functional Damage	4- Severe/Totaled 8-	Unknown 2
	2- Mobile Home 6-	Trailer w	w/Boat		A- Lowb	oy Trailer	E	Twin Traile	rs 00 2-C	caine 5- PCP	8- Other 3- Disabling Damage	5- Not Applicable	3
ction	Prior to Impact	Camper	(Vel	hicle)	B- Autoc	amer Trailer (No	n-motori	st)	Alc Test 8	2- Two-way, Not	Divided 3- Two	-way, Divided, Barrier	- 11
.29	01- Backing	_	_		_						led, Unprotected Median 4- One	e-Way 8- Other	rafficway
		08-	- Parked		21-7	Approaching	Leaving V	ehicle	A2-	A Gore 3- M	ied, Unprotected Median 4- One edian 5-Roadway 7- Sidewalk	e-Way 8- Other	Harmful
-	02- Changing lanes	-80 -90	- Parked - Slowing Stonned	g or	21-,	Approaching Entering/Cro Plaving/Work	Leaving V ssing Loca	ehicle tion ticle	A2- A3-	A: 2-Island 4-Ro	edian 5-Roadway 7-Didewalk edian 5-Roadway 7-Didewalk ediat 6-Dhoulder 8-Outside Traffics 3-Strainht - Hillcreast 5-	e-Way 8- Other 9- Unit: B: X-walk: 11* way 1- 1-2-47-9- U Ev Currye On grade	Harmful ent Loc.
/	02- Changing lanes 03- Entering traffic la 04- Leaving traffic la	08- 09- ane 10-	 Parked Slowing Stopped Turning 	g or in traffi g left	21- 22- c 23- 24-	Approaching Entering/Cro Playing/Work Pushing Veh	/Leaving V ssing Loca ting on Veł icle	ehicle tion nicle	A2- A3-	A: 2- Island 4- Ro 1- Straight - Leve 2- Straight - On g	led, Unprotected Median 4-One colan 5-Roadway 7-Didewaik adalae 6-Dhouider 8-Outside Trafficu I 3-Straight - Hillcrest 5- rade 4-Curve - Level 6-	e-Way 8- Other 9- Unic By Swalk: 11 1-1-2-76-9-U Ev Curve - On grade Curve - Hillcrest Road Cl	Harmful ent Loc. 13 haracter 13
\checkmark	02- Changing lanes 03- Entering traffic la 04- Leaving traffic la 05- Making U-turn	08- 09- ane 10- 11-	 Parked Slowing Stopped Turning Turning 	g or in traffi g left g right	21- 22- 23- 24- 25-	Approaching Entering/Cro Playing/Work Pushing Veh Standing	/Leaving V ssing Loca ing on Vel icle	ehicle tion nicle	A2- A3-	A: 2- Island 4- Ro 1- Straight - Leve 2- Straight - On g 1- Dry 3- Sno	led, Unprotected Median 4 One colan 5-Roadway 7-Didewalk sostate 6-Disoviter 8-Outside Trafford 1 3-Straight - Hillorest 5- rade 4-Curve - Level 6- w 5-loe 7-Water (Stan-	e-Way 8- Other 9-Unit: By S-typak: 1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	Harmful 11 ent Loc. 13 haracter 13 urface 13
X	02- Changing lanes 03- Entering traffic la 04- Leaving traffic la 05- Making U-turn 06- Movements Ess 07- Overtaking/pass	08- 09- ane 10- 11- entially 1 ing	- Parked - Slowing Stopped - Turning - Turning Straight /	g or in traffi g left g right Ahead Other	21- 22- 23- 24- 25- 26- 99-	Approaching Entering/Cro Playing/Work Pushing Veh Standing Walking, Play Unknown	/Leaving V ssing Loca ing on Vel icle ying, Cyclir [27- Worki	ehicle tion nicle	A2- A3-	A 2- Isand 4- Ro 1- Straight - Leve 2- Straight - On g 1- Dry 3- Sino 2- Wet 4- Slus 01- Stop and Go	led, Unprotected Median 4 One stilan 5 - Rodway 7 - Didewalk sosiale 6 - Douister Tarticio 1 3 - Straight - Hillcrest 5- 5- rade 4 - Curve - Level 6- w 5- Ice 7- Water (Stan h. 6- Contaminate 8- Other Light 2 - Offoer or Flagman 7-	e-Way 8- Other 9-Une: B, & yayak: 1 1-y-2y-2y-1 Curve - On grade Curve - Hillcrest Road Ct ding, etc.) Road St 9- Unk. Condition Traffic C	Harmful ent Loc. 13 haracter 13 urface 13 control
Veat	02- Changing lanes 03- Entering traffic la 04- Leaving traffic la 05- Making U-turn 06- Movements Ess 07- Overtaking/pass her Condition	08- 09- ane 10- 11- entially 1 ing	- Parked - Slowing Stopped - Turning - Turning Straight / 88-	g or in traffi g left g right Ahead Other 3- Clo	21- 22- 23- 24- 25- 26- 99- udy	Approaching Entering/Cro Playing/Work Pushing Veh Standing Walking, Play Unknown 6- Fog, 3	Leaving V ssing Loca ing on Vel icle ying, Cyclir 27- Worki Smog, Smo	ehicle tion nicle ng ng oke 9- Unk	A2- A3-	A 1-Sore 3-M - Island 4-Re 1-Straight - Leve 2-Straight - Cere 1-Dry 3-Snc 2-Wet 4-Stur 01-Stop and 50 02-Flashing Traffic Sign	led, Unprotected Median 4-On stian 5-Rodway 7-Didewalk sosiale 6-Douister Tarticio 3-Straight - Hillcrest 5- rade 4-Curve - Level 6- 6- h 6-Contaminate 8- Other 1- Light 21-Offleer or Flagman al 22-Oncoming Emergency V	+-Way 8- Other 3- Unit B, X-yoakt (arry - 0. grade Curve - Hillcrest ding, etc.) Road St Q- Unit. Conditio Traffic C ehicle Type	Harmful 11 ent Loc. 11 inaracter 13 urface 13 control 13
Veath 37	02- Changing lanes 03- Entering traffic la 04- Leaving traffic la 05- Making U-turn 08- Movements Ess 07- Overtaking/pass ner Condition 1- Clear (no advers 2- Brier	08- 09- ane 10- 11- entially 1 ing	- Parked - Slowing Stopped - Turning - Turning Straight 88- ions)	or in traffi right Ahead Other 3- Clos 4- Slee	21- 22- 23- 24- 25- 26- 99- udy et, Hail	Approaching Entering/Crow Playing/Work Pushing Veh Standing Walking, Play Unknown 6- Fog. 5 7- Blowi 9, Scoop	Leaving V ssing Loca ing on Vel icle ying, Cyclir 27- Worki Smog, Smo ng Sand, C	ehicle tion nicle ng ng oke 9-Unk Nil, Dirt, or S	A2- A3-	A 1-Gore 3-M - Isand 4-Ro 1-Straight - Leve 2-Straight - Leve 1-Dry 3-Sno 2-Wet 4-Stur 0-Stop and So 02-Flashing Traffic Sign 11-RR (X-bucks, Lights 12-BR (X-bucks, Lights	led, Unprotected Median 4-On stan 5-Rodeway 7-Didewalk stan 5-Rodeway 7-Didewalk stansie 6-Douise Transco 5- rade 4-Curve - Level 4-Curve - Level 6- 0 6- Other 6- Dother Light 21-Officer or Flagman al 22- Oncoming Emergency V & Gates) 31- Pavement Markings (onl curve) 5- Stansco 5-	+Way 8- Other 3-Unit B, X-yoak (Curve - On grade Curve - Hillcrest ding, etc.) 9- Unit. Condition 0- Unit. 0- Unit. 0	Harmful 11 ent Loc. 11 maracter 13 urface 13 control 13 ashing Beacon
Veath 37	02- Changing lanes 03- Entering traffic la 04- Leaving traffic la 05- Making U-turn 06- Movements Ess 07- Overtaking/pass ner Condition 1- Clear (no advers 2- Rain Condition	08- 09- ane 10- 11- entially 1 ing e condit 3- Dus	- Parked - Slowing Stopped - Turning Straight / 88- ions)	or in traffi right Ahead Other 3- Clor 4- Slee 5- Sno	21- 22- 23- 25- 26- 99- udy et, Hall w	Approaching Entering/Cro Playing/Work Pushing Veh Standing Walking, Play Unknown 6- Fog. 3 7- Blowin 8- Sever 6- D	Leaving V ssing Loca ting on Veh icle ying, Cyclir 27- Worki Smog, Smo ng Sand, C re Crosswi Dark (Stree	ehicle tion hicle ng ng bke 9-Unk hil, Dirt, or S nds t Lamp Not 1	A2- A3- inown now	A 1-Gore 3-M - Isana 4-Ro 1-Straight - Leve 2-Straight - Leve 1-Dry 3-Sno 2-Wet 4-Slut 0-Stop and So 02-Flashing Traffic Sign 11-RR (X-bucks Lights 12-RR (X-bucks & Lights 13-RR (X-bucks & Lights)	led, Unprotected Median 4-Om tish 5-Rodawar 7-to Useasit bosise 6- Shoulder Hillorest 5- rade 4- Curve - Level 6- w 5-Ice 7- Water (Stan h 6-Contaminate 8-Other Light 21-Officer or Flagman al 22-Oncoming Emergency V & Gates) 31- Pavement Markings (onl s) 41-Stop Sign 42-School zone Sign	+-Way 8- Other 3* Unit B, X-yoalic very 1+-3* 9+ U U Fev 2 Unit - 1+3 9+ U U Fev Curve - On grade Curve - Hillcrest Grave - On grade Qurve - Hillcrest Qurve - Hillcrest Qurve - Hillcrest Qurve - Hillcrest Road St Qurve - Hillcrest Road St	Harmful 13 haracter 13 urface 13 control 13 ashing Beacon 98-None Isns 99-Unk.
Veath 37 38	02- Changing lanes 03- Entering traffic la 04- Leaving traffic la 05- Making U-turn 06- Movements Ess 07- Overtaking/pass ner Condition 1- Clear (no advers 2- Rain Condition 1- Daylight	08- 09- ane 3 ne 10- 11- entially 3 ing e condit 3- Dus 4- Darl	Parked Slowing Stopped Turning Turning Straight / 88- ions) k (Lightir	or in traffi right Ahead Other 3- Clor 4- Slee 5- Sno	21- 22- 23- 24- 25- 26- 26- 99- udy et, Hail w	Approaching Entering/Cro Playing/Work Pushing Veh Standing Walking, Play Unknown 6- Fog. 3 7- Blowi 8- Sever 6- D 7- D	Leaving V ssing Loca ing on Vehicle ying, Cyclin 27- Workii Smog, Smo ng Sand, C re Crosswi tark (Street Jark (No lig	ehicle tion nicle ng oke 9-Unik Nil, Dirt, or S nds t Lamp Not I hts)	A2- A3- Mase of the second sec	A 1-Gore 3-M - Isana 4-Ro 1-Straight - Leve 2-Straight - Leve 2-Straight - Ore 1-Dry 3-Sno 2-Wet 4-Stur 1-Stop and Soo 02-Flashing Traffic Sign 11-RR (X-bucks, Lights 12-RR (X-bucks & Light 13-RR (X-bucks & Light) 13-RR (X-bucks Conly) 1-Yes, Directly 2-	led, Unprotected Median 4-Om solida 5-Rodowar 7-0 Usealt bolida 5-Rodowar 7-0 Usealt 1-3-Straight - Hillorest 5- rade 4- Curve - Level 6- w 5-Ice 7- Water (Stan h 6-Contaminate 8-Other Light 21-Officer or Flagman al 22-Oncoming Emergency V & Gates) 31- Pavement Markings (onl s) 41-Stop Sign 42-School zone Sign Yes, Indirectly 3-No 9-	+Way 8- Other 3-Unit B, X-yoak your	Harmful 1: Harmful 1: haracter 1: urface 1: control 1: ashing Beacon 98-None 199: 99-Unk. volved: 1:3
veath 37 ght 0 38	02- Changing lanes 03- Entering traffic la 04- Leaving traffic la 05- Making U-turn 06- Movements Ess 07- Overtaking joass 07- Overtaking joass 07- Overtaking joass 1- Clear (no advers 2- Rain Condition 1- Daylight 2- Dawn 0- Turo 0- Turo 0	08- 09- ane 10- 11- entially 1 ing e condit 3- Dus 4- Darl 5- Darl 5- Darl	Parked Slowing Stopped Turning Turning Straight / [88- ions) k k (Lightir k (Street Kore Poir	g or in traffi g left g right Ahead Other 3- Clou 4- Slee 5- Sno Ing Unsp Lamp I	21- 22- 23- 24- 25- 26- 99- 3dy et. Hail w vecified) .it)	Approaching Entering/Cro Playing/Work Standing Walking, Play Unknown 6- Fog. 3 7- Blowii 8- Sever 6- D 7- D	Leaving Vi ssing Loca ing on Vehicle ying, Cyclir 27- Workii Simog, Smo ng Sand, O re Crosswi Vark (Street Jark (No lig	ehicle tion nide ng oke 9-Unk NIL Dirt, or S nds t Lamp Not I hts)	A2- A3- known now Lit)	A 1-Gore 3-M - Island 4-Ro - Island 4-Ro 2-Straight - Leve 2-Straight - Leve 2-Straight - Ong 1-Dry 3-Sno 2-Wet 4-Slut 01-Stop and Go 02-Flashing Traffic Sign 11- RR (X-bucks Lights 12- RR (X-bucks & Lights 12- RR (X-bucks & Lights 13- RR (X-bucks & Lights) 13- RR (X-bucks & Lights) 14- RR (X-bucks & Lights) 15- RR (X-bucks & L	led, Unprotected Median 4-Om sould - Fradawar - to Userait sould - Fradawar - to Userait - Stragfit - Hillorest 5- rade 4- Curve - Level 6- w 5- Loe 7- Water (Stan h 6- Contaminate 8- Other Light 21- Officer or Flagman al 22- Oncoming Emergency V & Gates) 31- Pavement Markings (onl s) 41- Stop Sign 42- School zone Sign fres, Indirectly 3- No 9- 3-Transition Area 5-Termination		Harmful 1: Harmful 1: haracter 1: urface 1: control 1: ashing Beacon 98- None 199: 99- Unk. volved: 1: prk Zone: 1:2
Veath 37 38 uncti	22. Changing lanes 23. Entering traffic la 04. Leaving traffic la 04. Leaving traffic la 06. Making U-burn 06. Movements Ess 07. Overtaking/pass 07. Overtaking/pass 10. Clear (no advers 2. Rain Condition 1. Clear (no advers 2. Rain Condition 1. Daylight 2. Dawn 00. Type 01. Orossover 04. Of -Crossover	08- 09- ane 3- ing e condit 3- Dus 4- Darl 5- Darl 5- Darl - Five/W	Parked Slowing Stopped Turning Turning Straight / [88- ions) k k (Lightir k (Street fore Poir vay Inter	or in traffi y left Ahead Other 3- Clor 4- Slee 5- Sno 1g Unsp Lamp I ts section	21- 22- 23- 24- 25- 26- 99- 99- 10	Approaching Entering/Cro Playing/Work Pushing Veh Standing Walking, Play Walking, Play	Leaving V ssing Loca ing on Vel icle ving, Cyclir (27- Worki Smog, Smo ng Sand, Cy Cark (Street Dark (No lig Dark (No lig Use Paths iccion	ehicle tion nide ng oke 9-Unk NI, Dirt, or S nds t Lamp Not 1 hts) or Trails 12 13	A2- A3- inown now Lit)	A 1-Gore 3-M - Isana 4-Re 1-Straight - Leve 2-Straight - Leve 2-Straight - Leve 1-Dry 3-Sno 2-Wet 4-Slut 0-Stop and Soc 02-Flashing Traffic Sign 11-RR (X-bucks, Lights 12-RR (X-bucks & Lights 12-RR (X-bucks & Light) 13-RR (X-bucks & Light) 13-RR (X-bucks & Dnly) 1-Yes, Directly 2- 1-Before 1" Sign 2-Advanced Warning Ar	led, Unprotected Median 4-Om solide 5-Rodowar 7-0 Usealt solide 6- Shoulder 8-Outside Traffici- solide 6- Shoulder 8-Outside Traffici- 1 3-Stragfit - Hillcrest 5- rade 4- Curve - Level 8- w 5-Ice 7- Water (Stan h, 6- Contaminate 8-Other Light 21-Officer or Flagman al 22- Oncoming Emergency V & Gates) 31- Pavement Markings (onl s) 41- Stop Sign 42- School zone Sign Yes, Indirectly 3- No 9- 3-Transition Area 5-Termination rea 4- Activity Area Area & 3- Intermittent/Moving Work		Harmful 1: Harmful 1: haracter 1: haracte
Veath 37 ght 0 38 unctil	22. Changing lanes 232. Entering traffic la 234. Entering traffic la 244. Eaving traffic la 04- Leaving traffic la 265. Making U-burn 06- Movements Ess. 27- Overtaking/pass 07- Overtaking/pass 2. Rain Condition 1- Clear (no advers 1- Clear (no advers 2. Rain Condition 1- Daylight 2- Dawn 07 07 - Oversover 40 02 - Driveway 05	08- 09- ane 3- ing 10- 11- entially 3- ing e condit 3- Dus 4- Dari 5- Dari 5- Dari 5- Dari - Five/W - Four-v - Railwa	Parked Slowing Stopped Turning Turning Straight [88- ions) k (Lightir k (Street fore Poir vay Inter vy Grade	or in traffi right Ahead Other 3- Clor 4- Slee 5- Sno 12 Unsp Lamp I ts section Crossi	21- 22- 24- 25- 99- 1dy et, Hail w vecified) .it)	Approaching Entering/Cro Playing/Work Standing Walking, Play Unknown 8 - Fog. : 7 - Blowi 8 - Sevet 7 - C 07 - Shared I 08 - T-Interse 09 - Traffic C	Leaving Vi ssing Loca ing on Vel- icle ving, Cyclir (27- Worki Smog, Smo ng Sand, C ng S	ehicle tion ng ng oke 9-Unk NJ, Dirt, or S nds t Lamp Not I hts) or Trails 12 13 99	A2- A3- inown now Lit) - Y - Intersection - Nonjunction - Unk.	A 1-Gore 3-M - Island 4-Ro - Straight - Leve 2-Straight - Leve 2-Straight - Leve 2-Straight - Ong 1- Dry 3-Sno 2-Wet 4-Slut 0-Stop and Soo 02-Flashing Traffic Sign 11- RR (X-bucks, Lights 12- RR (X-bucks & Light 12- RR (X-bucks & Light 13- RR (X-bucks & Light 13- RR (X-bucks & Dirly) 1- Yes, Directly 2- 1- Before 1* Sign 2- Advanced Warning Al 1- Shoulder/Median Wor 2- Lane Shift/Crossover	led, Unprotected Median 4- On lish - F-Rodawar 7- Diseast sosiat 6- Shoulder 6- Outside Traffic- lish - S-Rodawar 6- Outside Traffic- 8- Outside Traffic- lish - S-Rodawar 8- Outside Traffic- 8- Outside Traffic- lish - S-Contaminate 8- Other 8- Other Light 21- Officer or Flagman al 22- Oncoming Emergency V al 22- Oncoming Emergency V 8- Gates) 31- Pavement Markings (onl s) s) 41- Stop Sign 42- School zone Sign 9- 3-Transition Area -4- Activity Area Area Area Area -6- S-InterminationMoving Work 4- Lane Closure 8- Other 9- Un		Hamful 1: Hamful 1: ent Loc 1: haracter 13 urface 13 ashing Beacon @ Roorrol 13 ashing G9-Unk: volved: 13 krk Zona: 14 e Location 14 cone Type 14 s Present: 17
(eath 37 38 uncti 44	22: Changing lanes 23: Entering traffic la 04: Leaving traffic la 04: Leaving traffic la 06: Making U-burn 06: Making U-burn 07: Overtaking/assi 07: Overtaking/assi 10: Clear (no advers 2: Rain Condition 1: Clear (no advers 2: Rain Condition 1: Daylight 2: Dawn 07: Oversover 02: Driveway 05: OcntroBurg 07: Oversover 07: Oversover 07: Oversover	08- 09- ane 3 ne 10- 11- entially 3 ing e condit 3- Dus 4- Dari 5- Dari 5- Dari 5- Dari 5- Dari Five/W - Four-w - Raitwa	Parked Slowing Stopped Turning Turning Straight / [88- ions) k (Lightin k (Street More Poir vay Inten sy Grade I'S	g or in traffi g left Ahead Other 3- Clor 4- Slev 5- Sno 10 Unsp Lamp I 10 section Crossi	21- 22- 24- 25- 99- 24- 25- 99- 24- 25- 99- 24- 25- 99- 24- 25- 14- 25- 14- 25- 14- 25- 14- 25- 14- 25- 14- 25- 14- 25- 14- 25- 14- 25- 14- 14- 14- 14- 14- 14- 14- 14	Approaching Entering/Cro Playing/Work Standing Walking, Play Unknown 8 - Fog. : 7 - Blow 8 - Sever 7 - D 07 - Shared I 08 - T-Interse 09 - Traffic C 12 - Aggress 13 - Over-on	Leaving V ssing Loca ing on Vehicle ying, Cyclir [27- Workii Smog, Smo ng Sand, Cre Crosswi Jark (Stree Dark (No lig Dark (Stree Dark (No lig Dise Paths iccle we Operative vectina/Course	ehicle tion g ng ng ng ng ng ng ng ng ng	A2- A3- inown now Lit) - Y - Intersection - Nonjunction - Unk. Roadway 30- Debns	A 1-Gore 3-M - Island 4-Ro - Straight - Leve 2-Straight - Leve 2-Straight - Leve 2-Straight - Ong 1- Dry 3-Sno 2-Wet 4-Slut 0-Stop and Soo 02-Flashing Traffic Sign 11- RR (X-bucks Alight 12- RR (X-bucks Alight) 12- RR (X-bucks Alight) 13- RR (X-bucks Alight)	led, Unprotected Median 4-Om status 4-Rodars 7-0 denait 1		Hamful 1 Hamful 1 int Loc. 13 naracter 13 ashing Beacon @8- None @95 @9- Unk. oolved: 13 brk Zone: 14 Location 14 s Present: 11 wcton 68- ftm
Veath 37 ght (38 uncti 44	22. Changing lanes 232. Entering traffic la 232. Entering traffic la 242. Exercing traffic la 04. Leaving traffic la 265. Making U-burn 05. Making U-burn 06. Movements Ess 07. Overtaking/pass 27. Overtaking/pass 17. Overtaking/pass 27. Overtaking/pass 10. Tollear (no advers 2. Rain Condition 1 Dayright 2. Dawn 01. Orossover 40 02. Driveway 05 91. Oisregarded 01. Oisregarded	08- 09- ane 3 ine 10- 11- entially 3 ing e condit 3- Dus 4- Darl 5- Da	Parked Slowing Stopped Turning Turning Straight / 88- ions) k k (Lightin k (Street fore Poir vay Inter sy Grade IS Signals, I	g or in traffi g left g right Ahead Other 3- Cloud 4- Sleft 5- Sno 9 Unsp Lamp I tts section c Crossi Etc.	21- 22- 24- 25- 99- 1dy et, Hail w vecified) .it)	Approaching Entering/Cro Pushing Veh Standing Walking, Play Unknown 6- Fog. : 7- Blowi 8- Seven 6- C 7- C 07- Shared 08- T-Interss 09- Traffic C 12- Aggress 13- Over-cou	Leaving V ssing Loca ing on Vehicle ying, Cyclir [27- Workii Smog, Smo ng Sand, Cre Crosswii Jark (Stree Dark (No lig Jse Paths cotion ircle we Operative recting/Ov g to Avoidii	ehicle sincle ng ng ng ske 8- Unk Ni, Dirt, or S nds r Lamp Not I hts) or Trails 12 13 99 ion of Vehicl er-steering ng Object	A2- A3- inown now Lit > V - Intersection > Nonjunction > Unk. Roadway 30- Debrs	A 1-Gore 3-M - Island 4-Re 2-Island 4-Re 2-Straight - Leve 2-Straight - Leve 2-Straight - Ong 1- Dry 3-Sno 2-Wet 4-Slut 0-Stop and Go 02-Flashing Traffic Sign 11- RR (X-bucks Lights 12- RR (X-bucks & Lights 12- RR (X-bucks & Lights 12- RR (X-bucks & Lights 13- RR (X-bucks & Lights 13- RR (X-bucks & Lights) 13- RR (X-bucks & Lig	led, Unprotected Median 4- On red, Ling protected Median 7- 00 evait risis 8- 60 arg 7- 00 evait ISB 8- 7- 00 evait 8- 00 uside ISB 3- Straght - Hillorest 5- ISB 8- 00 uside 6- w 5- 0c 7- Water (Stan h) h 6- Contaminate 8- Other Jail 22- 0nooming Emergency V 8 (Sates) 31- Pavement Markings (onl s) 41- Stop Sign 42- School zone Sign 7- No 7es, Indirectly 3- No 9- 3-Transition Area 5- Termination 8- S- IntermitentMoving Work 4- Lane Closure 4- Lane Closure 8- Other 9- Un Non- Motorist 50- Inattentive 51- Lying Slor Illegally in Roadway		Hamful 1: ent Loc. 1: anaracter 1: arface 1: ashing Beacon @: None @: None #: None @: None ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! !
27 37 38 uncti 44 45 46	22. Changing lanes 232. Entering traffic la 233. Entering traffic la 24. Leaving traffic la 04. Leaving traffic la 26. Making U-burn 05. Making U-burn 00. Movements Ess 07. Overtaking/assi 27. Overtaking/assi 17. Overtaking/assi 2. Rain Condition 1 10. Torgang 03 01. Oransover 04 02. Driveway 05 01. Oransover 04 02. Driveway 05 01. Disregarded 22. Distracted/in	08 09 ore 10 11 11 entially : entially : e condit 3- Dus 4- Dari 5- Da	Parked Slowing Stopped Turning Turning Straight / Iss ions) k k (Lightin k (Street fore Poir vay Inter fs Signals, I n	g or in traffi y left y left 3 - Clob 4 - Slet 5 - Sno 4 - Slet 5 - Sno 9 Unsp Lamp I hts section - Crossi Etc.	22- 22- 24- 26- 20- 20- 20- 20- 20- 20- 20- 20- 20- 20	Approaching Entering/Cro Pushing Veh Standing Walking, Play Unknown 6- Fog. 1 7- Blowi 8- Seven 6- C 7- C 07- Shared 08- T-Interss 09- Traffic C 12- Aggress 13- Over-cou 14- Swervin 15- Wrong S	Leaving V ssing Loca ing on Vet icle 27- Worki Smog. Smog. Smog. Smog. Smog. Smog. Smog. Street ark (No lig Use Paths iccion ircle we Operative recting/Ov g to Avoidir icle or Wro	ehicle 6on ng ng oke 3-Unk NI, Dirt, or S nds t Lamp Not I hts) or Trails 12 13 99 ion of Vehicl ier-steering g Object ing Way	A2- A3- mown now Lit) - Y - Intersection - Nonjunction - Unik. Roadway 30- Debris 31- Non-highwa 32- Obstruction	A 1-Gore 3-M - Isand 4-Re 2-Isand 4-Re 2-Straight - Leve 2-Straight - Leve 2-Straight - Ong 1-Dry 3-Sno 2-Wet 4-Slut 0-Stop and Go 02-Flashing Traffic Sign 11- RR (X-bucks Lights 12- RR (X-bucks & Lights 12- RR (X-bucks & Lights 13- RR (X-bucks & Lights 13- RR (X-bucks & Lights) 13- RR (X-bucks & Light	led, Unprotected Median 4. On red, Unprotected Median 7. 00 evait red, Singer, F. 100 evait 8. Outside traffic IS-Straght - Hildrest 5. rade 4. Curve - Level 6. w 5- loc 7. Water (Stan h 6- Contaminate 8. Other Light 21- Officer or Flagman al 22- Oncoming Emergency V States) 31- Pavement Markings (onl s) 41- Stop Sign 42- School zone Sign 7. 9. (res, Indirectly 3. No 9- 3-Transition Area 5-Termination 8. 3- IntermittentMoving Work 4- Lane Closure 8- Other 9- Un Non- Motorist 50- Institentive 50- Institentive 51- Lying & Kor Illegally in Roadway 51- Lying & Kor Illegally in Roadway 52- Failure to Yield R. of W. 53- Failure to Yield R. of W.	+Way 8- Other 5-Unc 8, Xepail: 	Ammuni and a second a se
Veath 37 38 uncti 44 145 46 47	22. Changing lanes 23. Entering traffic la 23. Entering traffic la 24. Exercing traffic la 04. Leaving traffic la 56. Making U-burn 05. Making U-burn 06. Movements Ess 07. Overtaking/assent 58. 17. Overtaking/assent 28. 16. Condition 1 16. Togstop 03. 01. Obsressorer 04. 02. Driveway 05. 01. Obsresgarded 02. Drivergarded 02. Driverser 04. 02. Driversared 04. 03. Driving Tog 01. 04. Descreaded A 04.	08 09 09 09 09 01 11 10 11 10 11 10 11 10 11 10 11 10 10	Parked Slowing Stopped Turning Turning Israight 88- ions) k k (Lightin k (Street fore Por vay Inter ty Grade fS Signals, I n Conditio Conditio	g or in traffi y left y left 3- Cloo 4- Sleve 5- Sno 4- Sleve 5- Sno rg Unsp Lamp I ts section Crossi Etc.	22- 22- 24- 25- 20- 20- 20- 20- 20- 20- 20- 20- 20- 20	Approaching Approaching Pushing Weh Standing Walking, Play Walking, Play Walking, Play B- Standing 8- Sevet 7- D 09- Traffic C 12- Aggress 13- Over-coi 14- Swerving 15- Wrong S 16- Under th 17- Vision C	Leaving V ssing Loca ing on Vet icle 27- Worki 27- Worki 27- Worki Smog. Smo Smog. Smo Smog. Smo Sark (Street ark (No lig Use Paths icle we Operative recting/Ov g to Avoidir icle or Wro e Influence becared V	ehicle 6on 1ide 10 10 10 10 10 10 10 10 10 10	A2- A3- mown now Lit) - Y - Intersection - Monjunction - Unik. Roadway 30- Debris 31- Non-highwa 32- Obstruction 33- Road Surfa 34- Ruit Helies	A 1-Gore 3-M - Isana 4-Re 2-Isana 4-Re 2-Straight - Leve 2-Straight - Leve 2-Straight - Ong 1- Dry 3-Sno 2-Wet 4-Slub 0-Stop and Go 02-Flashing Traffic Sign 11- RR (X-bucks Lights 12- RR (X-bucks & Lights 12- RR (X-bucks & Lights 13- RR (X-bucks & Lights 13- RR (X-bucks & Lights) 13- RR (X-bucks & Ligh	led, Unprotected Median 4. On red, Darprotected Median 4. On sites 5. Roders 7. Diseasit isites 5. Foouliser 6. Outside traffici isites 5. Straght - Hillcrest 5. rade 4. Curve - Level 6. isites 21. Officer or Flagman al al 22. Oncoming Emergency V 8. Gates) site 3.1. Pavement Markings (onl s) 41. Stop Sign 4. Lane Closure 8. Other 5. Termination as 4. Activity Area Area is 1. IntermittentMoving Work 4. Lane Closure 4. Lane Closure 8. Other 9- Un Non- Motorist 50. Instituentive 50. Instituentive 51. Lying & Kor Illingally in Roadway 52. Failure to Yield R. of W. 33. Not Visible (Dark Clothing)		Hamful ent Loc. 13 Hamful ent Loc. 13 inface 13 inface 13 inface 13 inface 13 inface 13 inface 13 inface 13 inface 13 inface 14 inface 14 Location 14
Veath 37 38 uncti 44 145 46 47	22. Changing lanes 23. Entering traffic la 23. Entering traffic la 24. Eaving traffic la 24. Leaving traffic la 26. Making U-burn 06. Making U-burn 06. Making U-burn 07. Overtaking/pass 20. To condition 1 - Clear (no advers 2. Rain Condition 1 1 - Davight 2. Dawn 01. Orsosover 04 102. Driverway 05 01. Orsosover 04 02. Driverway 05 04. Exceeded M 02. Drivergarded 03. Driving Tool 04 04. Exceeded M 05. Failed to Yeil	08. 09. 09. 09. 00. 00. 00. 00. 00	Parked Slowing Stopped Turning Straight. [88- ions) k k (Lightin k (Street fore Poin k k (Lightin k (Street fore Poin vay Inter sy Grade Signals, I n Conditio d Speed of Way	g or in traffi y left or right Ahead Other 3 - Clov A - Ster 5 - Sno 9 Unsy Lamp I Crossi Etc.	21 22 24 25 26 99 udy et. Hail w vecified) .it)	Aproaching Aproaching Playing/Work Pushing Veh Standing Walking, Play Walking, Play B- Sever 8- D 7- D 07- Shared 08- T-Interse 08- Traffic C 12- Aggress 13- Over-coi 14- Swerving 15- Wrong 3 16- Under th 17- Vision O 18- Imprope	Leaving V ssing Loca ing on Vet icle ving, Cyclir [27- Worki Smog, Smog Igark, (Stree ark (Stree ar	ehicle son jide og ng oke 9-Unk Nil, Dirt, or S nds t Lamp Not I hts) or Trails 12 13 99 on of Vehicl ter-steering ng Object ng Way k Vithin Unit) peChange	A2- A3- mown now LR - V- Intersector - Nonjunction - Unk. Roadway 30- Debris 31- Non-highwa 32- Obstruction 33- Road Surfa 34- Rut, Holes, 34- Rut, Holes, 34- Rut, Holes,	A 1-Gare 3- M A	led, Unprotected Median 4. On red, Sanger - Source - Straight - Hildrest - Straight - Hildrest - Outside traffic - Straight - Hildrest - Forward - Straight - Hildrest - Forward - Contaminate - Other - Display 21- Officer of Flagman - A - Concoming Emergency V - Straight - Hildrest - Sono - Straight - Middlest - Sono - Straight - Middlest - Sono - Straight - Middlest - Sono - Sono - Sono - Straight - Middlest - Sono - Straight - Middlest - Sono - Straight - Strastraght - Str		trafficway 14 Hamful 11 ent Loc 11 intracter 13 inface 13 iontrol 13 ashing Beacon 98-None 98-
Veath 37 38 144 145 46 47	22: Changing lanes 32: Entering traffic la 42: Leaving traffic la 44: Leaving traffic la 45: Making U-kum 40: Movements Ess 47: Condition 11: Clear (no advers 2: Rain Condition 11: Daviggit 2: Dawn 40: Condition 11: Daviggit 2: Dawn 40: Construction 40: C	08- 09- 09- 09- 01- 01- 11- 11- 11- 11- 11- 11- 11- 11	Parked Slowing Stopped Turning Straight. [88- ions) k k (Lightin k (Street fore Poin k k (Lightin k (Street fore Poin y Grade Signals, I a Conditio d Speed of Way 	g or in traffic pleft Ahead Other 3- Cloo 4- Sleve 5- Sno 9 Unsp Lamp I hts section c Crossi Etc.	22 22 22- 25- 26- 99- udy et, Hail w vecified) .it)	Aproaching Aproaching Elvering/Cor Playing/Work Standing Walking, Play Walking, Play B- Sever 8- E 7- El 07- Shared 08- T-Interss 08- T-Interss 08- T-Interss 08- Traffic 09- Traffic 09- Traffic 09- Traffic 09- Traffic 09- Traffic 13- Over-coi 14- Swerving 15- Wrong 5 16- Under th 17- Vision O 18- Improper 19- O Cell	Leaving V ssing Loca ing on Vet icle ving, Cyclin [27- Worki Smog, Smc g Sand, C re Crosswi Jark (Stree Vark (No lig Jse Paths icle ve Operat meeting/Out jso Avoid ide or Wro e Influenco bscured (V toare Use Phone	ehicle son ide ng ng oke 9-Unk Nil, Dirt, or S nds FLamp Not I hts) or Trails 12 13 99 on of Vehicler-steering ng Object ng Usy k Vithin Unit) pe/Change	A2- A3- mown now LR - Nonjunction - Nonjunction - Nonjunction - Unk. Roadway 30- Debris 31- Non-highwa 32- Obstruction 33- Road Surfa 34- Rut, Holes, 34- Rut, Holes, 35- Shoulders (36- Traffic Cont	A 1-Gref 3-M -Isand 4-Re 2-Straight - Leve 2-Straight - On g 1-Dry 3-Snc 2-Wet 4-Slut 01-Stop and Go 02-Flashing Traffic Sign 11- RR (X-bucks Lights 12-RR (X-bucks Lights 12-RR (X-bucks Lights 12-RR (X-bucks Colly) 1-Yes, Directly 2- 1-Before 1*Sign 2-Advanced Warning A 1-Shoulder/Median Wor 2-Lane Shift/Crossover 48-Other the York 49-Unknown in Roadway ce Condition (Le., Wet) Bumps None, Low, Soft, High) rol Device (I.e., Missing)	led, Unprotected Median 4. On red, Salar 7. Solewaix solide 6- Shoulder 8- Outside Traffic 3-Straight - Hildrest 5- rade 4- Curve - Level 6- w 5- Contaminate 8- Other Light 21- Officer of Flagman al al 22- Officer of Flagman al al 22- Oncoming Emergency V 8- & Gotson 31- Pavement Markings (orl) 9- stransition Area 5-Termination 8- & Strass) 31- Pavement Markings (orl) 9- 3-Transition Area 5-Termination 8- & Activity Area Area Area & A- Activity Area Area Area & Lane Closure 8- Other 9- Un Non- Motorist S0- Instentive 50- Instentive 51- Lying & Illegally in Roadway S2- Failure to Yield R. of W. 54- Disregard Signals, Stio. 56- Improper Crossing 56- Darting 57- Wrong Side of Road 57- Wrong Side of Road		rafficway 11 Hamful ent Loc 11 ent Loc 13 inface 13 infa

Figure 1.2 South Carolina Traffic Collision form TR-310, Back Side



Figure 1.3 Discrepancy Example – Written Narrative (Field 86)

Actio	n Prior to Impact	(Vehicle)	
1 06	01-Backing	08-Pa	rked	
2 09	02-Changing lanes	09-Slo	owing or	
3 06	03-Entering traffic lane	Sto	pped in traffic	
\setminus /	04-Leaving traffic lane	10-Tu	rning left	
$ \vee $	05-Making U-turn	11-Turning right		
Á	06-Movements Essentially Straight Ahead			
$/ \setminus$	07-Overtaking/passing		88-Other	

Figure 1.4 Discrepancy Example – Action Prior to Impact (Field 129)

Existing literature on the topic of misclassification primarily focuses on comparing information from traffic collision forms to external sources to identify misclassification. Some authors compared police crash reports to crash data sets collected by other agencies to assess their accuracy and comprehensiveness (2, 10, 11). Others compared traffic collision forms against unique sources, such as medical data and independent assessors, to determine their validity (1, 3). In cases where external sources were not used, the researchers relied on suggestive rather than explicit evidence to determine if misclassification occurred (12-14). To date, no studies have directly compared the narrative

to other fields in traffic collision forms to understand the nature of discrepancies and their potential sources.

What distinguishes this thesis from previous misclassification studies is the determination of discrepancies within individual traffic collision forms by comparing the narrative text (Field 86) to information recorded in the form fields (see Table 3.2). In this thesis, the text in the narrative field is considered to have higher fidelity and is treated as the ground truth. Discrepancies between the narrative and form fields suggest that there are internal and external factors that affected the officer's cognitive ability to recall information and record it in a consistent manner. To this end, this thesis seeks to determine the level of discrepancies in South Carolina traffic collision forms and to identify factors that may have contributed to the discrepancies. The authors postulate that weather conditions and crash characteristics affect the process of recording crash information for the investigating officer. For example, the greater the number of vehicles involved in a crash, the more complex the situation, thereby requiring a higher level of processing by the officer to accurately fill out the form. The levels of processing theory states that the way information is encoded affects how well it is remembered. The deeper the level of processing, the easier the information is to recall (15). The psychology-based approach to understanding discrepancies in traffic collision forms is unique to this paper.

This thesis's objective is to improve the South Carolina Highway Patrol's (SCHP) accuracy of crash data reporting by identifying inaccuracies and their contributing factors. By identifying contributing factors, this thesis provides guidance on which areas of the reporting process the SCHP can focus on to improve its accuracy. To this end, it examines 200 randomly selected traffic collision forms out of 300 which involved a fatal crash in a

work zone in South Carolina between 2014 and 2020. Error rates are determined for various fields on the form. Additionally, both structural equation modeling (SEM) and multiple linear regression (MLR) are used to identify factors that may have contributed to the discrepancies. Specifically, SEM is used to investigate the relationships between latent variables and level of processing, and MLR is used to investigate factors that affect the frequency of discrepancies in form fields.

CHAPTER 2: LITERATURE REVIEW

To my knowledge, this thesis is the first to consider the levels of processing concept in the context of crash data analysis. However, the levels of processing theory has been applied in other fields. A brief review is provided below. Regarding methods, SEM and MLR are used in this thesis. A review of related SEM studies is provided. As for MLR, its use in the area of crash data analysis is extensive. Previous work includes the prediction of injury severity score (16, 17), crash frequency (18, 19), and accident mortality rates (20, 21). Readers are referred to the work of Jiang et al. (22) and Edries and Alomari (23) for additional information regarding the application of MLR in crash data analysis.

Craik and Lockhart (1972) developed the levels of processing theory, in which information is understood through either shallow processing or deep processing, with deep processing leading to better memory retention (15). In linguistics, levels of processing theory is applied to language acquisition and recognition in native and non-native English speakers (24-27). In neuroscience, brain activity is measured for its reaction to different levels of processing tasks (28-30). In advertising, levels of processing theory is applied to memory retention from advertisement campaigns (31-33). In this thesis, levels of processing theory is applied to understand the complexity of a crash and how it affects discrepancies.

SEM has been applied in several traffic safety studies. Lee et al. (2018) used SEM to investigate how road, traffic and human, and rain and water-depth factors affected levels of accident severity of crashes in Seoul, South Korea (34). Boonyoo et al. (2021) applied

SEM to investigate how driver, road, environmental, and rear-end crash-specific factors affected the severity of rear-end collisions in Thailand (35). Kashani et al. (2021) used SEM to understand the influence of pedestrian, vehicle, environment, and road factors on measures of accident size for pedestrian-related crashes in Iran (36). Wang and Qin (2014) developed three SEM models to evaluate the factors affecting single-vehicle crash severity (37). Dong et al. (2022) used SEM to investigate how COVID-19 affected driver aggressiveness and inattentiveness, which in turn affected crash severity (38). The terms "accident size" and "crash severity" used in these studies refer to an overall measure of damage and injury caused by the crash which include injury severity. Yao and Wu (2012) used survey responses from E-bike riders in China to create an SEM model linking riders' safety perception and risk perception to aberrant riding behavior (39).

This thesis is the first to apply SEM to understand how the exogenous latent variables, crash characteristics and weather conditions, affect the endogenous latent variable, level of processing. The aim is to understand the relationship between the exogenous and endogenous variables and determine whether the level of processing has an impact on the observed discrepancies.

CHAPTER 3: DATA DESCRIPTION

Traffic collision forms (TR-310 forms) of fatal crashes occurring within work zones from 2014 to 2020 were provided by the South Carolina Department of Transportation (SCDOT) in PDF format as shown in Figures 1.1 and 1.2. Fields containing personal information were removed from the reports by the SCDOT. The information in the collision forms has been digitized by the SCDOT, and the digitized data were provided in a spreadsheet format. From the provided 300 traffic collision forms, 200 were randomly selected for review of discrepancies between the written narrative and the form fields on the traffic collision form. When information in a form field does not match the written narrative, the entire traffic collision form is classified as having a discrepancy. A summary of the frequency of discrepancies at the form level is shown in Table 3.1. It can be seen that 63.5%, 31%, and 5.5% of the forms contained 0, 1, and 2 discrepancies, respectively.

Number of	Traffic Collision
Discrepancies	Form Count
0	127
1	62
2	11

Table 3.1 Number of Forms with Discrepancies between Form Fields and Narrative

In addition to classifying discrepancies at the form level, the discrepancies were also counted at the field level. When multiple items in a field contain incorrect information, they were treated as a single discrepancy. For example, Fields 109 to 112 in Figure 1b capture the sequence of events following the action prior to impact. If the officer left out an event described in the written narrative, a correction would affect the entire sequence of fields. If only a single event was omitted, it is counted as one discrepancy. The discrepancies by form field are shown in Table 3.2. 17 distinct fields were investigated based on what information was included in the narrative. Given the reporting officers' conciseness in their descriptions, some narratives may not have contained information that could be compared to some of the 17 fields. As such, the selected fields represent the most common information available in the narrative, but not all fields could be compared to the narrative in every case. The fields with the most discrepancies were the sequence of events, action prior to impact, manner of collision, and contributing factors; their discrepancy rates are 31.0%, 21.4%, and 13.1%, respectively. Many of the fields had 0, 1, or 2 discrepancies.

Discrepancy Type	Form Field Number(s)	Error Count
Sequence of Events	109-112	26
Most Harmful Event	113	1
First Harmful Event	114	1
Manner of Collision	115	11
Deformed Areas	116-117	7
Vehicle Type	118	0
Vehicle Attachments	126	1
Extent of Deformity	128	2
Action Prior to Impact	129	18
Trafficway Type	131	0
First Harmful Event Location	133	1
Road Character	134	0
Traffic Control Type	136	1
Work Zone Type	142	0
Worker Presence	143	0
Junction Type	144	2
Contributing Factors	145-149	11

Table 3.2 Number of Discrepancies by Form Fields

The data set used for SEM considered each traffic collision form as an observation. Fields hypothesized to affect crash complexity include the number of units involved, the number of events describing the collision, collision speed, the number of alcohol or drug tests administered, and license class of the at-fault driver. The level of processing is operationalized by the number of discrepancies, the number of words in the narrative, and the number of characters in the narrative. This information was extracted from the traffic collision forms and the digitized data set. Additionally, weather station data for each crash was acquired from Local Climatological Data on a website managed by the National Oceanic and Atmospheric Administration (NOAA). A spreadsheet containing each station's observations with date and time was obtained through the NOAA's Geoportal. The weather station closest to the crash location was selected for each crash, and weather readings for the observation time closest to the police arrival time were used. The complete list of variables and their data types used for SEM analysis are shown in Table 3.3. It should be noted that because the SCDOT dataset was limited to only fatal work zone crashes, crash severity and work zone presence could not be used as variables, although they may indeed affect reporting accuracy.

Data Source	Variable Name	Variable Type
Form TR-310	-310 Number of Discrepancies	
	Number of Characters in Narrative	Discrete
	Number of Words in Narrative	Discrete
	Number of Units (Vehicles or Pedestrians)	Discrete
	Involved in Crash	
	Number of Events (for all Units) in Crash	Discrete
	Collision Speed (mph)	Continuous
	Number of Alcohol/Drug Test Administered	Discrete
	License Class	Nominal
Weather Station	Dry Bulb Temperature (F)	Continuous
Data from LCD	Precipitation (in)	Continuous
	Relative Humidity (%)	Continuous
	Wind Speed (mph)	Continuous

Table 3.3 Variables Used for SEM Analysis

The data set used for MLR considered each form field discrepancy to be an observation. With the help of experts from SCDOT, each observation was assigned a level of difficulty, with 0 denoting a relatively simple field, requiring only visual comprehension, and 1 a more complex field, requiring deeper comprehension. For instance, form fields 116-117 (Deformed Areas) were assigned a 0 due to their visual nature, whereas form fields 109-112 (Sequence of Events) were assigned a 1 due to the complexity of sequentially ordering the crash-related events. Each observation was also assigned a count of inputs and options. The input count was defined as the number of individual boxes within the field the officer could fill out. The option count was defined as the number of possible options the officer could select from. For example, in Figure 3.1, form field 126 (Vehicle Attachment) has an input count of 3 (for each of the boxes on the left) and an option count of 15 (for

each of the options the officer can select from). Because the narrative only includes information regarding the crash and not personal driver information, only 17 form fields can be compared to the narrative. The data set used to estimate the MLR model is shown in Table 3.4.

Vehic	le Attachment	4- Utility Trailer	8- Towed Motor Vehicle	C- Other Tanker
126	1- None	5- Farm Trailer	9- Petroleum Tanker	D- Flat Bed
2	2- Mobile Home	6- Trailer w/ Boat	A- Lowboy Trailer	E- Twin Trailers
3	3- Semi-Trailer	7- Camper Trailer	B- Autocarrier Trailer	F- Other

Figure 3.1 Form Field 126 (Vehicle Attachment)

Form Location	Level of Difficulty	Error Count	Input Count	Option Count
109-112	1	26	12	51
113	1	1	3	12
114	1	1	1	12
115	1	11	3	11
116-117	0	7	6	61
118	0	0	3	18
126	0	1	3	15
128	0	2	3	6
129	1	18	3	20
131	0	0	1	5
133	1	1	2	11
134	0	0	1	6
136	0	1	1	16

Table 3.4 Reports by Type of Error

CHAPTER 4: METHODOLOGY

4.1 Structural Equation Modeling (SEM)

SEM allows the relationship between different latent variables to be modeled. In this thesis, latent variables represent the different factors that could affect an officer's comprehension of the crash. These are weather conditions, crash characteristics, and level of processing. Latent variables are inherently unmeasurable and must be measured using observed variables. In this thesis, the observed variables are those shown in Table 3. These variables are not uniform in value. For example, the variable "Character Count" has values ranging from 56 to 761, while "Precipitation" has values ranging from 0 to 0.06 inches. Before proceeding with the SEM analysis, the variables' values were homogenized to the Likert scale with values ranging between 1 to 5, where 1 denotes the worst condition and 5 denotes the best condition.

First, hypothesized relationships between the observed variables shown in Table 3 and the latent variables were developed. The weather conditions factor is operationalized by wind speed, temperature, humidity, and precipitation. The crash characteristics factor is operationalized by the number of units, number of events, collision speed, license class, and the number of alcohol and/or drug tests administered. The level of processing factor is operationalized by the number of words in the narrative, the number of characters in the narrative, and the number of discrepancies in the form. Once the latent factors and their associated observed variables were defined, confirmatory factor analysis (CFA) was performed to test whether the data fit the hypothesized relationships. Once results were obtained from CFA, the SEM could be developed.

SEM consists of a structural model (the paths between latent variables) and measurement models (the relationship between each latent variable and its respective observed variables). Latent variables are called endogenous when they are dependent on another latent variable and exogenous when they are independent of other latent variables. For this thesis, the endogenous latent variable is level of processing, whereas the weather conditions and crash characteristics are exogenous. These factors were confirmed using Exploratory Factor Analysis (EFA) with Promax rotation. Each latent variable has a measurement model composed of the factor and its indicators. The exogenous variable measurement models can be expressed by the following equation.

$$x = \Lambda_x \xi + \delta$$

where x is a $(q \times 1)$ column vector of observed exogenous variables. δ is a $(q \times 1)$ column vector of measurement error terms for the observed variables in x. ξ is an $(n \times 1)$ column vector of latent exogenous variables. Λ_x is a $(q \times n)$ matrix of structural coefficients corresponding to the effects of the latent exogenous variables on their observed variables. The endogenous variable measurement model can be expressed by the following equation.

$$y = \Lambda_{v}\eta + \varepsilon$$

where y is a $(p \times 1)$ column vector of observed endogenous variables. ε is a $(p \times 1)$ column vector of measurement error terms for the observed variables in y. η is an $(m \times 1)$ column vector of the latent endogenous variable. Λ_y is a $(p \times m)$ matrix of

structural coefficients corresponding to the effects of the latent endogenous variable on its observed variables.

The structural model consists of the exogenous variables weather conditions and crash characteristics, and the endogenous variable level of processing. Intuitively, this model resembles the levels of processing theory. Crash factors will affect crash complexity, and weather factors will likely have an impact on the officers' decision on how long to spend at the crash site. Both of these factors affect the level of processing the officer undergoes when filling out the traffic collision form. The structural model can be expressed by the following equation.

$$\eta = \beta \eta + \Gamma \xi + \zeta$$

where β is an $(m \times m)$ matrix of coefficients for the effects between latent endogenous variables. Since this thesis uses only one latent endogenous variable, the $\beta\eta$ term is zero. Γ is an $(m \times n)$ matrix of coefficients for the effects of latent exogenous variables on the latent endogenous variables. ζ is an $(m \times 1)$ column vector of error terms.

Three measures of model fit were used to assess the model: root mean squared error of approximation (RMSEA), Tucker-Lewis Index (TLI), and comparative fit index (CFI). The RMSEA measures goodness of fit based on the Chi-Square (χ^2) statistic and degrees of freedom (35, 37, 38). RMSEA is computed using the following equation.

$$RMSEA = \sqrt{\frac{\chi_M^2 - df_M}{df_M(N-1)}}$$

where χ_M^2 is the chi-squared test statistic for the model, df_M is the is the degrees of freedom, and N is the sample size. There are differing opinions on the maximum acceptable RMSEA value, but even the more stringent cutoffs agree a value less than 0.05 indicates

good model fit (35, 37, 40-44). TLI and CFI are relative fit indices that compare to a baseline model to assess fit, but they differ in how they are affected by model complexity (45, 46). The equation for TLI is shown below.

$$TLI = \frac{\chi_B^2/df_B - \chi_M^2/df_M}{\chi_B^2/df_B - 1}$$

The equation for CFI is shown below.

$$CFI = 1 - \frac{max (\chi_M^2 - df_M, 0)}{max (\chi_B^2 - df_B, 0)}$$

where χ_B^2 and df_B are the χ^2 and degrees of freedom for the baseline model, respectively. Both CFI and TLI fall between 0 and 1, and values greater than 0.90 indicate the model to have good relative fit (47-49).

4.2 Multiple Linear Regression (MLR)

For MLR, the following assumptions are made: the residuals are normally distributed, there is a linear relationship between the dependent and independent variables, the variance of errors is consistent across independent variables (homoskedasticity), and the independent variables are independent (50-52). The data set used for the MLR model was assessed and found to satisfy the assumption criteria. A MLR model was created to assess the effect of level of processing, number of inputs, and number of options on the number of discrepancies by field type. The MLR model can be expressed as follows.

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_i x_i + \varepsilon$$

where y is the expected value for the dependent variable (discrepancies), and x_i is the list of independent variables (level of difficulty, number of inputs, and number of options). β_0 is the value of y when the independent variables are all zero, and β_1 through β_i are the regression coefficients for the independent variables x_i . ε is the error between the predicted and observed value for the dependent variable, or residual.

To assess goodness of fit, R-squared and adjusted R-squared were used. These values indicate the amount of variance explained by the model and range from 0 to 1, with a value of 1 indicating all variance can be explained by the model. Adjusted R-squared compensates for the addition of variables into a model (53-55).

CHAPTER 5: RESULTS

5.1 Structural Equation Modeling (SEM)

First, CFA was conducted to assess the fit of the proposed model. The results indicated good model fit, so the SEM model was developed. Both CFA and SEM analysis were performed using SPSS Amos. Figure 5.1 shows the SEM model results for the 200 traffic collision forms with coefficients standardized. The fit indices indicate that the SEM model is statistically significant, meaning its null hypothesis (crash characteristics and weather conditions affect level of processing) cannot be rejected: $\chi^2/df = 1.119$ (<3), CFI = 0.986 (>0.9), TLI = 0.981 (>0.9), and RMSEA = 0.024 (<0.05). Overall, 76% of the variance in level of processing is explained by crash characteristics and weather conditions.



Figure 5.1 SEM Results

Due to the relatively small sample size, the 90% confidence level was used. At this threshold, several variables are significant. The structural model indicates the expected relationships between the latent variables. The coefficient estimate for the latent crash characteristics (0.42) indicates that it has a strong positive effect on the level of processing, whereas the coefficient estimate for the latent weather conditions (-0.26) indicates that it has a negative impact on the level of processing, meaning as the measure of poor weather conditions increases, the level of processing decreases. Since both of these variables are statistically significant, it can be concluded that crash characteristics and weather conditions positively and negatively affect the level of processing, respectively, with crash characteristics having a more significant role.

The measurement models indicate which observed variables are significant to the model. Out of the statistically significant variables affecting crash characteristics, the number of events, the number of units, and collision speed all have a positive effect on crash characteristics (0.97, 0.58, and 0.18, respectively). The number of events has the strongest effect. A higher value for any of these variables will result in an increase in the level of processing. Multiplying the coefficient estimate for any of these variables by the coefficient estimate for crash characteristics will give the effect of the variable on level of processing. Humidity and precipitation have positive effects on weather conditions (0.26 and 0.66, respectively), and thus will lower level of processing with an increase in value due to the negative relationship between weather conditions and level of processing. Temperature has the opposite effect because it has a negative relationship with weather conditions (-0.22), which in turn has a negative relationship with level of processing; an increase in temperature will increase the level of processing. Multiplying their coefficients

shows a positive impact of temperature on level of processing. The number of words and characters in the narrative both have positive relationships with the latent variable level of processing (0.91 and 0.97, respectively), although the number of characters has a slightly stronger impact. As the level of processing increases, both the number of words and number of characters in the narrative will increase. To find the direct impact of any variable on the number of characters or words, simply multiply the coefficients forming the path between the variables. For example, the effect of precipitation on number of words would be the product of the coefficients 0.26, -0.26, and 0.91.

The variables not found to be statistically significant were number of alcohol and/or drug tests administered, license class, wind speed, and, most notably, the number of discrepancies (p = 0.87, 0.35, 0.23, and 0.78, respectively). For these variables, the model failed to reject the null hypothesis that each was not related to their respective latent variables. As such, it can be concluded that no variables in the model affect the occurrence of discrepancies. This result suggests that poorer weather conditions and crashes with a higher measure of complexity result in a longer written narrative (and vice versa), but these factors do not contribute to form discrepancies. Form discrepancies may be explained through the results of the MLR model examined below.

5.2 Multiple Linear Regression (MLR)

The MLR model estimation results are shown in Table 5.1. The model's R-squared and adjusted R-squared are 0.752 and 0.695, respectively, indicating very good model fit. At the 90% confidence level, the level of difficulty (p = 0.054) and input count (p = 0.007) are statistically significant. Their positive coefficients indicate that as the level of difficulty and/or input count increases, so will the number of discrepancies. That is, when the level

of difficulty is complex instead of simple, the number of discrepancies can be expected to increase by 4.678. When the input count is increased by 1, the number of discrepancies can be expected to increase by 1.928. These findings correspond to intuition. That is, a field that is more difficult or requires more information to be entered is more likely to have discrepancies.

Variable	β	Std. Error	<i>t</i> -value	<i>p</i> -value
(Intercent)	2 670	1 502	1 677	0.117
(Intercept)	-2.070	1.392	-1.0//	0.117
Level of Processing	4.678	2.213	2.114	0.054
Input Count	1.928	0.603	3.194	0.007
Option Count	-0.005	0.084	-0.064	0.950

Table 5.1 MLR Model Estimation Results

CHAPTER 6: CONCLUSION

This thesis analyzed 200 traffic collision forms from fatal work zone crashes occurring in South Carolina between 2014 to 2020 to determine the number of discrepancies and potential contributing factors. A SEM model was developed to test whether factors related to weather conditions and crash complexity affected an officer's level of processing (indicated by the narrative length and presence of discrepancies) when filling out the traffic collision form. The SEM results showed that an increase in the number of units, number of events, collision speed, and temperature resulted in an increased number of characters and words written in the narrative, and that the narrative length is shortened with an increase in precipitation and humidity. Notably, the number of discrepancies occurring within the form was not found to be statistically significant. In addition, an MLR model was developed to test whether factors related to the structure of form fields affect the frequency of discrepancies. This thesis's findings indicated that the frequency of discrepancies in a form field will increase with additional inputs or if it has a higher level of difficulty. Additional study may be required to draw definitive conclusions regarding discrepancies in traffic collision forms.

Based on this thesis's findings, it can be concluded that officers in South Carolina are doing their job well in filling out the traffic collision forms. That is, they do not let the circumstances surrounding the crash, such as its complexity and weather conditions, affect their ability to process information and record it. Should the traffic collision form need to be modified in the future, the new fields should be kept as simple as possible with minimum

input boxes. This thesis has several limitations that need to be considered when interpreting its findings. First, the provided traffic collision forms are limited to fatal crashes occurring within work zones. Analyzing traffic collision forms of other injury severity levels may yield different results. Along this line, crashes occurring within work zones are a relatively small subset of all traffic crashes. Future work that analyzes traffic collision forms not occurring within work zones may yield different results. Second, the narrative text does not allow for all fields to be validated. Thus, the number of discrepancies is likely to be more than what was identified in this thesis. Third, police officers used an app to fill out the traffic collision form rather than a pen and paper. As such, discrepancies could be due to errors in inputting the information rather than the inability to accurately recall the crash information. Fourth, because personal information was removed from the forms by SCDOT, this thesis did not investigate how demographic factors (i.e., age, gender, or race of involved drivers) affect the officer's level of processing. Fifth, in some cases, officers may not include enough information in their narratives to compare to all 17 form fields. Subsequently, some inaccuracies may have been unidentified because the officer omitted information that could result in a discrepancy. Lastly, because officer training varies across states, the findings in this thesis cannot be generalized to the entire nation. Future work could compare discrepancy rates across different states to assess officer training quality.

REFERENCES

1. Fotios S, Robbins C. Incorrect categorisation of ambient light level at the time of a road traffic collision. Lighting Research & Technology 2022: 14771535211069028.

2. Shinar D, Treat JR, McDonald ST. The validity of police reported accident data. Accident Analysis & Prevention 1983; 15: 175-191.

3. Amoros E, Martin J-L, Chiron M, Laumon B. Road crash casualties: characteristics of police injury severity misclassification. Journal of Trauma and Acute Care Surgery 2007; 62: 482-490.

4. Hausman JA, Abrevaya J, Scott-Morton FM. Misclassification of the dependent variable in a discrete-response setting. Journal of econometrics 1998; 87: 239-269.

5. Ahmed A, Sadullah AFM, Yahya AS. Errors in accident data, its types, causes and methods of rectification-analysis of the literature. Accident Analysis & Prevention 2019; 130: 3-21.

6. Ullman GL, Scriba TA. Revisiting the Influence of Crash Report Forms on Work Zone Crash Data. Transportation Research Record 2004; 1897: 180-182.

7. Bi Y, Jeske DR. The efficiency of logistic regression compared to normal discriminant analysis under class-conditional classification noise. Journal of Multivariate Analysis 2010; 101: 1622-1637.

8. Meyer BD, Mittag N. Misclassification in binary choice models. Journal of Econometrics 2017; 200: 295-311.

9. Höfler M. The effect of misclassification on the estimation of association: a review. International journal of methods in psychiatric research 2005; 14: 92-101.

10. Farmer CM. Reliability of police-reported information for determining crash and injury severity. 2003.

11. Blackman R, Debnath AK, Haworth N. Understanding vehicle crashes in work zones: Analysis of workplace health and safety data as an alternative to police-reported crash data in Queensland, Australia. Traffic injury prevention 2020; 21: 222-227.

12. Filtness AJ, Armstrong KA, Watson A, Smith SS. Sleep-related crash characteristics: Implications for applying a fatigue definition to crash reports. Accident Analysis & Prevention 2017; 99: 440-444.

13. Yahaya M, Fan W, Fu C, Li X, Su Y, Jiang X. A machine-learning method for improving crash injury severity analysis: A case study of work zone crashes in Cairo, Egypt. International journal of injury control and safety promotion 2020; 27: 266-275.

14. Sayed MA, Qin X, Kate RJ, Anisuzzaman D, Yu Z. Identification and analysis of misclassified work-zone crashes using text mining techniques. Accident Analysis & Prevention 2021; 159: 106211.

15. Craik FI, Lockhart RS. Levels of processing: A framework for memory research. Journal of verbal learning and verbal behavior 1972; 11: 671-684.

16. Majdzadeh R, Eshraghian MR, Khalagi K, Motevalian A, Naraghi K. Crash-related factors associated with the severity of road traffic injuries in Iran. International journal of injury control and safety promotion 2011; 18: 175-180.

17. Ryb GE, Dischinger PC. Injury severity and outcome of overweight and obese patients after vehicular trauma: a crash injury research and engineering network (CIREN) study. Journal of Trauma and Acute Care Surgery 2008; 64: 406-411.

18. Chliaoutakis JE, Demakakos P, Tzamalouka G, Bakou V, Koumaki M, Darviri C. Aggressive behavior while driving as predictor of self-reported car crashes. Journal of safety Research 2002; 33: 431-443.

19. Sivak M, Schoettle B, Reed MP, Flannagan MJ. Body-pillar vision obstructions and lane-change crashes. Journal of safety research 2007; 38: 557-561.

20. O'Neill B, Kyrychenko SY. Use and Misuse of Motor-Vehicle Crash Death Rates in Assessing Highway-Safety Performance. Traffic Injury Prevention 2006; 7: 307-318.

21. La Torre G, Van Beeck E, Quaranta G, Mannocci A, Ricciardi W. Determinants of within-country variation in traffic accident mortality in Italy: a geographical analysis. International Journal of Health Geographics 2007; 6: 49.

22. Jiang Z-H, Yang X-G, Sun T, Wang T, Yang Z. Investigating the relationship between traffic violations and crashes at signalized intersections: an empirical study in China. Journal of advanced transportation 2021; 2021: 1-8.

23. Edries B, Alomari AH. Forecasting the Fatality Rate of Traffic Accidents in Jordan: Applications of Time-Series, Curve Estimation, and Multiple Linear Regression Models. Journal of Engineering Science & Technology Review 2022; 15.

24. Ayçiçegi-Dinn A, Caldwell-Harris CL. Emotion-memory effects in bilingual speakers: A levels-of-processing approach. Bilingualism: Language and Cognition 2009; 12: 291-303.

25. Hui B, Godfroid A. Testing the role of processing speed and automaticity in second language listening. Applied Psycholinguistics 2021; 42: 1089-1115.

26. Bird S. Expert knowledge, distinctiveness, and levels of processing in language learning. Applied Psycholinguistics 2012; 33: 665-689.

27. Morris CD, Bransford JD, Franks JJ. Levels of processing versus transfer appropriate processing. Journal of verbal learning and verbal behavior 1977; 16: 519-533.

28. Kapur S, Craik FI, Tulving E, Wilson AA, Houle S, Brown GM. Neuroanatomical correlates of encoding in episodic memory: levels of processing effect. Proceedings of the National Academy of Sciences 1994; 91: 2008-2011.

29. Van Veen V, Cohen JD, Botvinick MM, Stenger VA, Carter CS. Anterior cingulate cortex, conflict monitoring, and levels of processing. Neuroimage 2001; 14: 1302-1308.

30. Rose NS, Craik FI, Buchsbaum BR. Levels of processing in working memory: Differential involvement of frontotemporal networks. Journal of cognitive neuroscience 2015; 27: 522-532.

31. Nordhielm CL. The influence of level of processing on advertising repetition effects. Journal of consumer research 2002; 29: 371-382.

32. Wilson RT, Lohmeier JH, Lustick DS, Chen RF. Using transit advertising to improve public engagement with social issues. International Journal of Advertising 2021; 40: 783-809.

33. Saegert J. A demonstration of levels-of-processing theory in memory for advertisements. ACR North American Advances 1979.

34. Lee J, Chae J, Yoon T, Yang H. Traffic accident severity analysis with rain-related factors using structural equation modeling–A case study of Seoul City. Accident Analysis & Prevention 2018; 112: 1-10.

35. Boonyoo T, Champahom T, Ratanavaraha V. ANALYSIS OF FACTORS AFFECTING REAR-END CRASH SEVERITY USING STRUCTURAL EQUATION MODELING. Suranaree Journal of Science & Technology 2022; 29.

36. Kashani AT, Jafari M, Bondarabadi MA. A new approach in analyzing the accident severity of pedestrian crashes using structural equation modeling. Journal of injury and violence research 2021; 13: 23.

37. Wang K, Qin X. Use of structural equation modeling to measure severity of single-vehicle crashes. Transportation Research Record 2014; 2432: 17-25.

38. Dong X, Xie K, Yang H. How did COVID-19 impact driving behaviors and crash Severity? A multigroup structural equation modeling. Accident Analysis & Prevention 2022; 172: 106687.

39. Yao L, Wu C. Traffic safety for electric bike riders in China: attitudes, risk perception, and aberrant riding behaviors. Transportation research record 2012; 2314: 49-56.

40. Shi J, Bai Y, Tao L, Atchley P. A model of Beijing drivers' scrambling behaviors. Accident Analysis & Prevention 2011; 43: 1540-1546.

41. Champahom T, Jomnonkwao S, Karoonsoontawong A, Hantanong N, Beeharry R, Ratanavaraha V. Modeling user perception of bus service quality: case study of Mauritius. Songklanakarin J Sci Technol 2020; 42: 660-670.

42. Steiger JH. Understanding the limitations of global fit assessment in structural equation modeling. Personality and Individual Differences 2007; 42: 893-898.

43. Browne MW, Cudeck R. Alternative Ways of Assessing Model Fit. Sociological Methods & Research 1992; 21: 230-258.

44. Hair J, Black W, Babin B, Anderson R, Tatham R. Multivariate Data Analysis 6th Edition Pearson Education Inc. USA: 898pp 2006.

45. Bentler PM, Bonett DG. Significance tests and goodness of fit in the analysis of covariance structures. Psychological Bulletin 1980; 88: 588-606.

46. Bentler PM. Comparative fit indexes in structural models. Psychological Bulletin 1990; 107: 238-246.

47. Yu C-Y. Evaluating cutoff criteria of model fit indices for latent variable models with binary and continuous outcomes: University of California, Los Angeles; 2002.

48. Hamdar SH, Schorr J. Interrupted versus uninterrupted flow: a safety propensity index for driver behavior. Accident analysis & prevention 2013; 55: 22-33.

49. Hassan HM, Abdel-Aty MA. Exploring the safety implications of young drivers' behavior, attitudes and perceptions. Accident Analysis & Prevention 2013; 50: 361-370.

50. Uyanık GK, Güler N. A Study on Multiple Linear Regression Analysis. Procedia - Social and Behavioral Sciences 2013; 106: 234-240.

51. Williams MN, Grajales CAG, Kurkiewicz D. Assumptions of multiple regression: Correcting two misconceptions. Practical Assessment, Research, and Evaluation 2013; 18: 11.

52. Osborne JW, Waters E. Four assumptions of multiple regression that researchers should always test. Practical assessment, research, and evaluation 2019; 8: 2.

53. Eberly LE. Multiple linear regression. Topics in Biostatistics 2007: 165-187.

54. Jobson J. Multiple linear regression. Applied multivariate data analysis: Regression and experimental design 1991: 219-398.

55. Fávero LP, Belfiore P, de Freitas Souza R. Chapter 14 - Simple and multiple regression models. In: Fávero LP, Belfiore P, de Freitas Souza R, editors. Data Science, Analytics and Machine Learning with R: Academic Press; 2023: p. 237-258.