Restraint Use Issues Problem Identification University of Alabama Center for Advanced Public Safety Special Study for the 2018 Highway Safety Plan July 2017

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1 Introduction

The goal of this problem identification is to assure that the restraint enforcement program considered by the state throughout FY 2018 is completely evidence-based, the evidence being derived from past data obtained from crash records.

A problem identification study was conducted based on data that were consistent with that used in the FY 2018 HSP, calendar years 2012-2016. CARE is used to display the information. The comparisons made were between those crashes in which the causal drivers were not restrained (generally represented by the red bars in the charts) and those which were reported to be restrained (generally represented by the blue bars in the charts). The use of proper restraints by causal drivers is seen to be an excellent proxy for proper restraint use by all passengers in the vehicle.

2 Geographical Factors

Geographical factors were analyzed in order to determine which areas are overrepresented for crashes involving drivers who did not use restraints. In order to determine these problem areas, geographical factors were analyzed in the following categories: county, city, rural versus urban, highway classification and locale.

2.1 County

CA	RE 10.1.	0.19	- [IN	1PAC	T Results -	2012-201	6 Alabama	Integrated	l Crash Dat	ta - Unrestr	rained Causal Driv 🗕 🗖 🗙
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6 2	2012-2016 Ala	abama	Integrate	ed Cras	h Data	~	Unrestrained	Causal Driver		v §	P 🔞 1/ 1/2012 🗸 12/31/2016 🗸 🚯 🌖
Order:	Max Gain		✓ [Descen	ding v	Suppress Z	ero-Valued Rows			Significance: 0	Ver Representation Y Threshold: 2.0
LC001-	County				Cubant	Cohert	Other	Others	044		
	Veloc				Frequency	Percent	Frequency	Percent	Ratio	Max Gain 🔻	C002: City
▶	Walker				610	2.82	7447	1.11	2.552*	370.989	C003: Year
	Cullman				595	2.75	10485	1.56	1.768*	258.485	C004: Month
	Jackson				399	1.85	4432	0.66	2.805*	256.755	C006: Day of the Week
	Talladega				512	2.37	8306	1.23	1.921*	245.420	C007: Week of the Year
	Dekalb				413	1.91	5691	0.85	2.261*	230.348	C008: Time of Day
	Escambia				334	1.55	3726	0.55	2.793*	214.414	C009: Data Source C010: Rural or Urban
	Blount				338	1.56	3877	0.58	2.716*	213.568	C011: Highway Classifications
	Chilton				348	1.61	4294	0.64	2.525*	210.185	C012: Controlled Access
	Monroe				231	1.07	11005	0.17	6.461 ⁻	195.246	C013: E Highway Side
	Marshall				237	2.49	2000	0.45	1.020	163./36	C016: Primary Contributing Unit Numbe
	Covingion				100	1.10	2330	0.40	2.000	132.044	C017: First Harmful Event
	Clarke				207	0.52	2137	0.25	3.043	138 /13	C018: Location First Harmful Event Rel t
	St Clair				417	1.93	8796	1 31	1.477*	134,693	C019: E Most Harmful Event
	Marion				196	0.91	2297	0.34	2 659*	122 278	C021: Distance to Fixed Object
	Limestone				379	1.75	8020	1.19	1.472*	121,599	C022: E Type of Roadway Junction/Featu
	Tallapoosa				220	1.02	3262	0.48	2.101*	115.306	C023: E Manner of Crash
	Calhoun				655	3.03	16898	2.51	1.208*	112.661	C024. School Bus Related
	Winston				152	0.70	1377	0.20	3.439*	107.805	C026: Intersection Related
	Randolph				153	0.71	1510	0.22	3.157*	104.537	C027: At Intersection
	Franklin				182	0.84	2426	0.36	2.337*	104.138	C028: Mileposted Route
	Geneva				162	0.75	1826	0.27	2.764*	103.395	Sort by Sum of Max Gain
10) 😪 🖉										Display Filter Name
							2012-2016 Alah	ama Integrated C	rach Data		
							2012-2010 AIdD	001: County	10311 (2018		
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						Randolph			Fayette		Russell
	C001: County										

The counties with the greatest overrepresentation factors for crashes in which the driver failed to use restraints include Walker, Cullman, Jackson, Talladega, DeKalb and Escambia. The more populated urbanized counties generally showed the highest occupant restraint use.

CA	.RE 10.1.0.19 - [IMPAC	CT Results -	2012-201	6 Alabama	Integrated	l Crash Da	ta - Unrestra	ained Causal Driv – 🗖 🗙		
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6	2012-2016 Alabama Integrated Cras	sh Data	~	Unrestrained	Causal Driver		v 9	1/ 1/2012 v 12/31/2016 v 🚯 🌖		
Order	Max Gain 🗸 Descen	ding 🗸	Suppress Z	ero-Valued Rows	;		Significance: Over Representation V Threshold: 2.0			
C002:	City	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain 🔻	C001: County C002: City		
•	Rural Walker	426	1.97	2940	0.44	4.513*	331.605	C003: Year		
	Rural Mobile	594	2.75	9613	1.43	1.925*	285.353	C004: Month		
	Rural Cullman	431	2.00	4722	0.70	2.843*	279.389	C005: Day of Month C006: Day of the Week		
	Rural Talladega	351	1.62	3266	0.49	3.347*	246.138	C007: Week of the Year		
	Rural Tuscaloosa	487	2.25	7704	1.14	1.969*	239.645	C008: Time of Day		
	Rural Baldwin	411	1.90	5933	0.88	2.158*	220.507	C009: Data Source		
	Rural Escambia	273	1.26	1643	0.24	5.175*	220.248	C010: Rural or Urban		
	Rural Madison	482	2.23	8186	1.22	1.834*	219.170	C012: Controlled Access		
	Rural Blount	281	1.30	2379	0.35	3.679*	204.617	C013: E Highway Side		
	Rural Chilton	274	1.27	2227	0.33	3.832*	202.497	C015: Primary Contributing Circumstance		
	Rural Calhoun	326	1.51	4438	0.66	2.288*	183.508	C016: Primary Contributing Unit Number		
	Rural Limestone	312	1.44	4050	0.60	2.399*	181.965	C017. First Harmful Event C018: Location First Harmful Event Rel t		
	Rural Dekalb	245	1.13	2009	0.30	3.798*	180.496	C019: E Most Harmful Event		
	Rural Lauderdale	267	1.24	2727	0.41	3.049*	179.443	C020: E Distracted Driving Opinion		
	Rural Marshall	244	1.13	2295	0.34	3.311*	170.314	C021: Distance to Fixed Object		
	Rural Colbert	220	1.02	1657	0.25	4.135*	166.798	C022: E Type of Roadway Junction/Featu		
	Rural Jackson	203	0.94	1345	0.20	4.701*	159.816	C023: E Manner of Crash		
	Rural Monroe	176	0.81	610	0.09	8.986*	156.415	C025: Crash Severity		
	Rural Elmore	245	1.13	3011	0.45	2.534*	148.325	C026: Intersection Related		
	Rural Etowah	224	1.04	2407	0.36	2.898*	146.718	C027: At Intersection		
	Rural Coffee	171	0.79	1284	0.19	4.148*	129.774	C028: Mileposted Route		
	Rural Houston	195	0.90	2038	0.30	2.980*	129.565	Sort by Sum of Max Gain		
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				2012-2016 Aldb	C002: City	rdsh Data				
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2.2 City

Overrepresented cities and county rural areas listed in the order of maximum gain are: rural Walker, rural Mobile, rural Cullman, and rural Talladega. Almost all of the overrepresentation occurs in the rural county areas. The most under represented cities in order of "best" first are as follows: Birmingham, Mobile, Montgomery, Huntsville and Tuscaloosa.

2.3 Rural/Urban



As expected from the city results above, the proportion of crashes involving drivers who use no restraints is greatly overrepresented in rural areas, being well over double what it is in the urban areas. The increased number of crashes in which restraints were used in urban areas might be attributed to greater police presence, newer vehicles, public information and education efforts, and the demographics of urban drivers in general. Speeds are generally much higher in the rural area and thus there is also a very high correlation of fatalities to rural driving.

2.4 Highway Classification

CA	RE 10.1.0.19) - [IMPAC	T Results -	2012-2016	i Alabama I	ntegrated	Crash Data	- Unrestrair	ned Causal D	riv — 🗖	×
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6 °	2012-2016 Alabama	Integrated Cras	n Data	Ý	Unrestrained Ca	ausal Driver		- V 💡	1/ 1/2012	∨ 12/31/2016 ∨	۲
Order	Max Gain	✓ Descender	ling v	Suppress Ze	ro-Valued Rows		Sig	gnificance: Over	Representation	✓ Threshold: 2.	.0 🜲
C011:	Highway Classific	ations	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain 👻	C009: Data Sou C010: Rural or U	rce Jrban	^
	County		8385	38.81	95496	14.19	2.736*	5320.067	C011: Highway (Classifications	
	State		4174	19.32	119108	17.69	1.092*	351.242	C012: Controlled C013: E Highwa	v Side	
	P Other*		0	0.00	21	0.00	0.000	0.000	C015: Primary C	ontributing Circum	stanc
	Private Property		302	1.40	17176	2.55	0.548*	-249.262	C016: Primary C	ontributing Unit Nu	imbe
	Federal		2648	12.26	100168	14.88	0.824*	-566.881	C017: First Harn	nful Event First Hormful Event	Balt
	Interstate		1448	6.70	6/466	10.02	0.669*	-/1/.314	C019: E Most Ha	armful Event	v
	Municipal		4647	21.51	2/3694	40.66	0.529	-4137.178	Sort by Sum of N	Max Gain	
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					C011: Hig	hway Classificati	ons				

Crash incidents in which no restraints were used are greatly overrepresented on county highways with over 2.736 times the expected number of crashes. The proportion of crashes in which restraints were used is greater on federal, interstate, and municipal highway areas.



The crash incidents involving no restraints are overrepresented in open country areas. However, school and shopping areas are significantly underrepresented, indicating that crashes in these areas generally involve drivers who were much more apt to use their restraints. This gives the general type of locations at which restraint enforcement will be most effective.

3 Time Factors

Time factors were also analyzed in several different categories to determine overrepresentation for day of the week and time of day. Analysis of these time factors allows for the determination of particular days of week and time of day combinations in which more crashes occur with drivers who are not properly restrained, and thus, those times in which enforcement would be more impactful.

3.1 Day of the Week



The weekend is overrepresented for crashes involving causal drivers who failed to use restraints, demonstrating a heavy correlation with alcohol-involved crashes. Saturday and Sunday averaged out to about 1.5 times the expected number of crashes involving causal drivers who failed to use restraints.

3.2 Time of Day

CA	ARE 10.1.0.19 - [IMPAG	CT Results -	2012-201	6 Alabama	Integrated	l Crash Dat	ta - Unresti	rained Ca	usal Driv 🗕 🛛	×
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87	2012-2016 Alabama Integrated Cras	sh Data	~	Unrestrained	Causal Driver		~	7 👔 1/	1/2012 v 12/31/2016	v 🛈 🌖
Order	r: Natural Order 🗸 Descen	iding 🗸	Suppress Z	ero-Valued Rows	;		Significance: O	ver Representa	ation Y Threshold:	2.0 🜲
C008	Time of Day	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C004: 1	Month Day of Month	^
•	12:00 Midnight to 12:59 AM	781	3.62	8084	1.20	3.010*	521.545	C006: [Day of the Week	
	1:00 AM to 1:59 AM	722	3.34	6882	1.02	3.269*	501.123	C007: \	Neek of the Year	
	2:00 AM to 2:59 AM	654	3.03	6482	0.96	3.144*	445.961	C008.	Data Source	
	3:00 AM to 3:59 AM	556	2.57	5556	0.83	3.118*	377.681	C010: F	Rural or Urban	
	4:00 AM to 4:59 AM	549	2.54	5972	0.89	2.864*	357.329	C011: H	-lighway Classifications	3
	5:00 AM to 5:59 AM	631	2.92	9894	1.47	1.987*	313.453	C012: 0	Controlled Access	
	6:00 AM to 6:59 AM	671	3.11	16454	2.44	1.271*	142.911	C013:1	- Highway Side Primary Contributing Ci	rcumstan
	7:00 AM to 7:59 AM	944	4.37	42167	6.26	0.698*	-409.345	C016: F	Primary Contributing Ur	nit Numbe
	8:00 AM to 8:59 AM	619	2.87	29149	4.33	0.662*	-316.534	C017: F	First Harmful Event	
	9:00 AM to 9:59 AM	665	3.08	26332	3.91	0.787*	-180.123	C018: I	Location First Harmful E	Event Rel t
	10:00 AM to 10:59 AM	775	3.59	30206	4.49	0.799*	-194.458	C019: I	Most Harmful Event E Distracted Driving On	inion
	11:00 AM to 11:59 AM	818	3.79	36849	5.47	0.692*	-364.665	C021:1	Distance to Fixed Object	t v
	12:00 Noon to 12:59 PM	922	4.27	45073	6.70	0.637*	-524.613	V Sort b	y Sum of Max Gain	
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				2012-2016 Alah	ama Integrated C	rash Data				
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	- 1	1:00 AM to 4:59	AM 9:0	0 AM to 9:59 A	M 2:00	PM to 2:59 PM	/ 7:00 F	PM to 7:59 Pl	M Unknov	vn
					C008: Time of D	ay				

The relative probability of crashes involving no restraints is generally greater before and after standard work and rush hours. Overrepresentation peaks during the 12 PM to 5 AM period and then tapers off, falling back below crashes involving causal drivers who use restraints in the 7 AM to 8 AM time period. This chart has a very strong resemblance to its DUI counterpart and the fatality study completed for 2016 showed clearly the lack of restraints correlated heavily with DUI (alcohol or other drugs).

CARE 10.1	🛿 CARE 10.1.0.19 - [Crosstab Results - 2012-2016 Alabama Integrated Crash Data - Filter = Unrestrain 🗕 🗖 💌									
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2012-2016	Alabama Integrated C	ìrash Data	~	Unrestrained Causal	Driver	×	P 1/ 1	1/2012 v 12/31/2016 v		
Suppress Zero Va	lues: None	✓ Select	Cells: 🔳 🗸 🚿	ş		Co	lumn: Day of the We	ek ; Row: Time of Day [
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	TOTAL		
12:00 Midnight to 12:59 AM	211 6.72%	67 2.40%	72	84 3.04%	75	78	194 5.05%	781		
1:00 AM to 1:59	209	50	52	65	66	81	199	722		
2:00 AM to 2:59	6.66% 194	49	29	2.35%	2.33%	2.34%	5.18%	3.34% 654		
AM	6.18%	1.75%	1.04%	1.67%	2.01%	2.57%	4.94%	3.03%		
AM AM	4.49%	1.43%	1.19%	1.27%	1.45%	1.88%	5.23%	2.57%		
4:00 AM to 4:59 AM	139 4 43%	44	49	55	53	62 1 79%	147 3.83%	549 2.54%		
5:00 AM to 5:59	129	81	76	65	81	80	119	631		
AM COD AM to CED	4.11%	2.90%	2.74%	2.35%	2.86%	2.31%	3.10%	2.92%		
6:00 AM to 6:59 AM	3.76%	3.69%	3 13%	3.62%	2.86%	2.55%	94 2.45%	311%		
7:00 AM to 7:59	72	155	155	152	144	174	92	944		
AM	2.29%	5.55%	5.58%	5.51%	5.09%	5.03%	2.39%	4.37%		
8:00 AM to 8:59 AM	63	103	94	90	87	91	91	619 2.97%		
9:00 AM to 9:59	76	93	96	95	116	84	105	665		
AM	2.42%	3.33%	3.46%	3.44%	4.10%	2.43%	2.73%	3.08%		
10:00 AM to 10:59	90	116	101	107	108	119	134	775		
AM	2.87%	4.15%	3.64%	3.88%	3.81%	3.44%	3.49%	3.59%		
11:00 AM to 11:59 AM	93	123	3.96%	122	115	12/	128	818		
12:00 Noon to	114	137	123	123	142	144	139	922		
12:59 PM	3.63%	4.90%	4.43%	4.45%	5.02%	4.17%	3.62%	4.27%		
1:00 PM to 1:59	112	140	136	144	136	146	175	989		
PM	3.57%	5.01%	4.90%	5.22%	4.80%	4.22%	4.55%	4.58%		
2:00 PM to 2:59 PM	135	159	152	161	162 5.72%	192	161	5 19%		
3:00 PM to 3:59	159	197	223	175	176	236	165	1331		
PM	5.06%	7.05%	8.03%	6.34%	6.22%	6.83%	4.29%	6.16%		
4:00 PM to 4:59	149	210	179	200	185	211	165	1299		
	4.75%	7.52%	6.44%	7.24%	6.53%	6.10%	4.29%	6.01%		
PM to 5:59	4 68%	7 12%	7.99%	8.04%	7.35%	5.93%	4 84%	6.43%		
6:00 PM to 6:59	167	127	190	152	161	200	188	1185		
PM	5.32%	4.55%	6.84%	5.51%	5.69%	5.79%	4.89%	5.49%		
7:00 PM to 7:59	145	137	127	128	139	188	183	1047		
	4.62%	4.90%	4.57%	4.64%	4.91%	5.44%	4.76%	4.85%		
PM to 8:59	4 84%	5.30%	5.54%	4.56%	4 42%	5.24%	4 89%	4 97%		
9:00 PM to 9:59	116	129	128	127	134	209	211	1054		
PM	3.69%	4.62%	4.61%	4.60%	4.73%	6.05%	5.49%	4.88%		
10:00 PM to 10:59	117	100	92	97	121	200	190	917		
11.00 PM to 11.50	3.73%	3.58%	3.31%	3.51%	4.27%	5.79%	4.94%	4.24%		
PM to 11:59	2 80%	2.93%	346%	3 19%	4 17%	5.67%	5 02%	3.99%		
Univ	4	5	2	2	0	11	5	29		
Unknown	0.13%	0.18%	0.07%	0.07%	0.00%	0.32%	0.13%	0.13%		
TOTAL	3140 14.53%	2794 12.93%	2778 12.86%	2761 12.78%	2831 13.10%	3457 16.00%	3843 17.79%	21604 100.00%		

3.3 Time of Day by Day of the Week for all Unstrained Causal Driver Crashes

The over-represented times for improperly restrained drivers is almost a perfect correlation with DUI (alcohol or other drugs). The correlation with age and DUI is also extremely high. If seatbelts are going to expand in their life-saving capabilities, some way will have to be found to get the impaired drivers to buckle up. In the past there has been a tendency to give up on these drivers, and this is the result.

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🦿 2012-2016 A	Nabama Integrated	Crash Data	~	Unrestrained Causa	Driver and Injury	~	🂡 🔞 1/ 1	/2012 v 12/31/20	i6 🗸 [N 🕕 🍯
Suppress Zero Val	lues: Columns	✓ Select €	Cells: 🔳 🗸 🔣	9			Colun	nn: Day of the Week ;	Row: Time of Day 👔
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	TOTAL	
12:00 Midnight to	137	43	53	55	49	55	119	511	
1:00 AM to 1:59	6.73%	2.53%	3.16%	3.23%	2.84%	2.64%	4.97%	3.83%	
AM	6.83%	1.94%	1.73%	2.40%	2.03%	3.07%	4.93%	3.44%	
2:00 AM to 2:59	127	30	18	34	32	52	120	413	
3:00 AM to 3:59	6.24% 94	1./6%	1.07%	1.99%	1.85%	2.49%	5.01%	3.10%	
AM	4.62%	1.53%	1.07%	1.11%	1.51%	1.92%	6.02%	2.75%	
4:00 AM to 4:59	89	32	30	41	34	46	95	367	
AM E-00 AM to E-E0	4.37%	1.88%	1.79%	2.40%	1.97%	2.21%	3.97%	2.75%	
AM	4.27%	3.06%	2.98%	2.58%	3.30%	2.83%	2.92%	3.14%	
6:00 AM to 6:59	73	68	58	61	54	63	65	442	
AM	3.59%	4.00%	3.46%	3.58%	3.13%	3.02%	2.72%	3.32%	
7:00 AM to 7:59 AM	46	92 5 41°/	86 5 12%	85	91 5 27%	99 4 75%	59	558	
8:00 AM to 8:59	45	63	53	4.53%	53	4.75%	2.46%	380	
AM	2.21%	3.70%	3.16%	3.11%	3.07%	2.83%	2.26%	2.85%	
9:00 AM to 9:59	54	53	61	58	67	55	59	407	
AM	2.65%	3.12%	3.64%	3.40%	3.88%	2.64%	2.46%	3.05%	
AM to 10:59	2.95%	3.88%	3.52%	3.81%	3.88%	64 3.07%	3 38%	462	
11:00 AM to 11:59	66	75	64	76	63	83	81	508	
AM	3.24%	4.41%	3.82%	4.46%	3.65%	3.98%	3.38%	3.81%	
12:00 Noon to	72	84	77	74	80	72	79	538	
1:00 PM to 1:59	3.54%	4.94%	4.59%	4.34%	4.63%	3.45%	3.30%	4.04%	
PM	3.29%	5.23%	4.83%	5.28%	5.04%	4.31%	4.43%	4.58%	
2:00 PM to 2:59	83	96	90	101	87	114	100	671	
PM	4.08%	5.64%	5.37%	5.92%	5.04%	5.47%	4.18%	5.04%	
3:00 PM to 3:59 PM	91	107 6 29%	122	101	99 5.73%	119 5 70%	106	745 5.59%	
4:00 PM to 4:59	99	112	102	123	111	116	98	761	
PM	4.86%	6.58%	6.08%	7.21%	6.43%	5.56%	4.09%	5.71%	
5:00 PM to 5:59	100	113	136	129	124	115	110	827	
6:00 PM to 6:59	4.91%	6.64%	8.11%	/.5/%	7.18%	5.51%	4.59%	6.21%	
PM	4.96%	4.82%	6.74%	5.75%	5.33%	5.42%	4.80%	5.36%	
7:00 PM to 7:59	92	93	72	82	86	108	119	652	
РМ	4.52%	5.47%	4.29%	4.81%	4.98%	5.18%	4.97%	4.89%	
8:00 PM to 8:59 PM	9/	95 5.58%	92 5.49%	/9	/8	5.56%	121	6/8 5.09%	
9:00 PM to 9:59	81	69	93	81	90	119	131	664	
PM	3.98%	4.06%	5.55%	4.75%	5.21%	5.70%	5.47%	4.98%	
10:00 PM to 10:59 PM	72	73	53	56	77	129	122	582	
11:00 PM to 11:59	3.54%	4.23%	3.16% 65	3.28%	4.46%	6.18% 129	5.10%	4.3/%	
PM	3.09%	3.12%	3.88%	3.40%	5.10%	6.18%	4.97%	4.31%	
Unknown	1	2	2	1	0	7	3	16	
	0.05%	0.12%	0.12%	0.06%	0.00%	0.34%	0.13%	0.12%	
TOTAL	2036	1/01	1677	1705	1727	2086	2394	13326	
	10.2076	12.7970	12.00%	12.7 9 70	12.0070	10.0076	17.0076	100.00%	

3.4 Time of Day by Day of the Week: <u>INJURY</u> Unstrained Causal Driver Crashes

Crosstab analysis of time of day by day of the week for crashes involving injury in which restraints were not used helps target specific times in which officers should increase patrols in order to prevent these crashes. The above applies to all injury crashes in which the causal driver was not properly restrained.

4 Crash Causal Factors

Analysis of crash causal factors determines which factors are the most likely contributors to crashes in which drivers did not use restraints. The primary contributing circumstances of the crashes were analyzed, and overrepresentation values indicate certain risk-taking behaviors associated with this type of crash. Vehicle model year and speed at impact were also evaluated to characterize factors that are consistently associated with crashes in which drivers are not properly restrained.

CA	RE 10.1.0.19 - [IMPA	ACT Results	- 2012-2	016 Alaba	ma Integra	ated Crasl	n Data - Ui	nrestrai	ined Causa	_ 🗆	×
E E	le <u>D</u> ashboard <u>F</u> ilters <u>A</u>	alysis <u>I</u> mpao	t <u>L</u> ocations	: <u>T</u> ools <u>W</u>	<u>(</u> indow <u>H</u> elp					-	ъ×
S.	2012-2016 Alabama Integrated Cr	rash Data	Ý	Unrestra	ained Causal Drive	er		• 9	1/ 1/2012	v 12/31/20	IG 🗸 🎒
Order	Max Gain 🗸 Desce	ending v	Suppres	s Zero-Valued	Rows	:	Significance: 0	ver Repres	entation 🗸 Thr	eshold: 2.	0 🕂
C015	Primary Contributing Circums	ance Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain 🔻	^ C01 C01	2: Controlled Acces 3: E Highway Side	S	^
	DUI	4694	21.73	18348	2.73	7.971*	4105.123	C01	5: Primary Contribu	ting Circum	stanc
	Over Speed Limit	1927	8.92	9375	1.39	6.404*	1626.110	C01	6: Primary Contribu	ting Unit Nu	mbe
	E Aggressive Operation	1189	5.50	8329	1.24	4.448*	921.682	C01	8: Location First Ha	armful Event	Relt
	E Ran off Road	1235	5.72	14507	2.16	2.652*	769.399	C01	9: E Most Harmful E	Event	
	E Fatigued/Asleep	1024	4.74	10337	1.54	3.087*	692.235	C02	0: E Distracted Driv	ing Opinion	
	Driving too Fast for Conditions	1177	5.45	24523	3.64	1.495*	389.937	C02	1: Distance to Fixed	l Object	
	E Over Correcting/Over Steer	399	1.85	5729	0.85	2.170*	215.128	C02	.2: E Type of Roadw 23: E Manner of Crac	ay Junction/i	·eatt
	E Swerved to Avoid Animal	422	1.95	7625	1.13	1.724*	177.276	C02	4: School Bus Rela	ted	
	E Distracted by Use of Electr	329	1.52	5317	0.79	1.928*	158.351	C02	5: Crash Severity		
	Traveling Wrong Way/Wron	222	1.03	3237	0.48	2.137*	118.109	C02	6: Intersection Rela	ited	
	E Ran Stop Sign	267	1.24	5539	0.82	1.502*	89.226	C02	7: At Intersection		
	E Other Distraction Inside the	561	2.60	15689	2.33	1.114*	57.463	C02	29. Lighting Conditic	e Ins	
	E Crossed Centerline	274	1.27	7284	1.08	1.172*	40.221	C03	30: Weather		
	E Distracted by Passenger	127	0.59	3032	0.45	1.305*	29.688	C03	1: Locale		
	E Distracted by Fallen Object	95	0.44	2227	0.33	1.329*	23.525	C03	2: E Police Present	at Time of C	rast
	Improper Parking/Stopped in	67	0.31	1655	0.25	1.261	13.883	C03	3: Police Notificatio	n Delay	
	Defective Equipment	377	1.75	11337	1.68	1.036	13.140	C03	4. Police Arrival Dela 35: EMS Arrival Dela;	ay /	
	E Distracted by Use of Other	91	0.42	2440	0.36	1.162	12.688	C03	36: Adjusted EMS Arr	, ival Delay	~
	E Wrong Side of Road	24	0.11	378	0.06	1.978*	11.868	✓ □ So	rt by Sum of Max Gai	n	
00) 🗇 🖉									Display Filte	r Name
				2012-2016 Ala	bama Integrated	Crash Data					
				C015: Primary	Contributing Cir	cumstance					
	30										
	_즐 ²⁰										
										-	
	E 10										
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	0-100000000	DED Door				1	in the second		daan ki ki ki		
		EC	rossed Media	in	E Distracted b	y Insect/Rep	tile E Of	ther - No I	mproper Driving		
				C015: F	Primary Contribut	ting Circumstar	ice				

4.1 Primary Contributing Circumstance

Overrepresentation factors indicate that certain risk-taking behaviors are associated with the crashes in which drivers do not use restraints. In order of maximum potential expected gain (Max Gain), these include: DUI, over the speed limit (ranked even higher when combined with "Driving too Fast for Conditions"), aggressive operation, running off the road and fatigued/asleep. DUI for non-restrained drivers was determined to be about eight times the proportion that it was for restrained drivers, further reinforcing the findings with regard to impaired driving given above. Other overrepresented contributing circumstances include several things that are correlated with impairment: over correcting, swerving, traveling the wrong way, and the collection of all failure to yield categories. Distracted driving is also an issue with the proportion of unrestrained drivers being almost double that of those properly restrained.

It is obvious that the presence of seat belts will not have a large impact on the causation of these crashes, although the increased ability to maintain control in adverse situations should not be minimized as a benefit of restraints. However, the correlation here would be the result of risk acceptance in general, and the inability or unwillingness of those who are impaired to consider the life-saving benefits of restraint use. Additionally, analysis of other contributing circumstances presented similar risk-taking behaviors associated with crashes in which causal drivers did not use restraints.

CA	ARE 10.1.0.19 - [IMP/	ACT Results	- 2012-2	016 Alaba	ma Integra	ated Crasł	n Data - Un	nrestrained C	ausa — 🗖 🗙
💀 E	ile <u>D</u> ashboard <u>F</u> ilters <u>A</u>	<u>A</u> nalysis <u>I</u> mpac	t <u>L</u> ocations	s <u>T</u> ools <u>V</u>	<u>/</u> indow <u>H</u> elp				_ @ ×
6 2	2012-2016 Alabama Integrated C	irash Data	~	Unrestra	ained Causal Driv	er		v 💡 🦉	1/ 1/2012 🗸 12/31/2016 🗸 🎒
Order	∵ Max Gain 🗸 Desc	xending ∨	Suppres	ss Zero-Valued	Rows	:	Significance: Ov	ver Representation	✓ Threshold: 2.0 →
C208	CU Model Year	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain data	▲ C208: CU Mo	odel Year
•	Older than 1960	8	0.04	25	0.00	9.225	7.133		
	1960-1969	27	0.13	228	0.04	3.414*	19.091		
	1970-1979	140	0.66	1203	0.20	3.355*	98.269		
	1980	13	0.06	160	0.03	2.342	7.450		
	1981	24	0.11	240	0.04	2.883*	15.675		
	1982	28	0.13	260	0.04	3.105*	18.981		
	1983	47	0.22	381	0.06	3.556*	33.784		
	1984	80	0.38	650	0.11	3.548*	57.452		
	1986	139	0.66	1162	0.19	3.448*	98.691		
	1987	129	0.61	1236	0.20	3.009*	86.124		
	1988	147	0.69	1691	0.28	2.506*	88.341		
	1989	179	0.84	2247	0.37	2.296*	101.054		
	1990	190	0.90	2538	0.42	2.158*	101.960		
	1991	273	1.29	3288	0.54	2.394*	158.943		
	1992	356	1.68	4494	0.74	2.284*	200.108		
	1993	411	1.94	6006	0.98	1.973*	202.658		
	1994	565	2.67	8433	1.38	1.931*	272.468		
	1995	627	2.96	11238	1.84	1.608*	237.166	Sort by Sum	of Max Gain
	a 😪 🖉								Display Filter Name
				2012-2016 Ala	bama Integrated	Crash Data			
				C20	8: CU Model Yea	ar			
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	>					1111		11	
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	2								
		_		114					
	0		5550						
		1	987		1997		20	007	2017
	C208: CU Model Year								

4.2 Vehicle Age – Model Year

Crashes attributed to drivers who used no restraints are greatly overrepresented in vehicles with model years 1960-2003. This might be attributed to the lack of current safety restraints in the older model vehicles. Vehicles with model years 2004 and later indicate that the proportion involving restraints surpasses those involving drivers who did not use restraints very significantly. One factor that would increase the rural problem could well be the economic disadvantages of those in the rural areas, and thus their use of older vehicles.

4.3 Speed	l at	Impact
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Image: Bile Qashboard Eile Qashboard	B CARE 10.1.0.19 - [IMPA
V Unrestrained Causal Driver V <thv< th=""> V V V<</thv<>	💀 Eile Dashboard Eilters A
Order: Max Gain Descending Superss Zero-Valued Rows Significance: Over Representation Threshold: 2.0 1 1224: CULEStimated Speed at Impact Prequency Subset Prequency Other Precent Other Ratio Max Gain C224, CU Estimated Speed at Impact 2.0 1 21to 25 MPH 513 3.66 2012 9.70 0.376 -945.624 26 to 30 MPH 558 3.98 21868 10.54 0.376 -918.219 3 31 to 35 MPH 933 6.66 24642 11.87 0.561 -730.481 30.785 492.097 410.4 7.45 22755 10.96 0.680* 492.097 491.0 46 to 50 MPH 1338 9.55 16621 8.01 1.192* 215.984 66 to 50 MPH 1337 1.911* 685.187 656 to 60 MPH 1337 1.943 12503 6.02 1.165* 1.137 1.28.833 120.677 6 to 50 MPH 1301 2.58 2.545 1.23 2.101*	2012-2016 Alabama Integrated Cr
C224: CU Estimated Speed at Impact Proce Subset Prequency Subset Precent Other Frequency Other Percent Odds Rato Max Gain 21 to 25 MPH 513 3.66 20126 9.70 0.378* -845.624 26 to 30 MPH 558 3.98 21868 10.54 0.378* -918.219 31 to 35 MPH 933 6.66 24642 11.87 0.561* -730.481 36 to 40 MPH 1044 7.45 22755 10.96 0.680* -492.097 41 to 45 MPH 2252 16.07 32904 15.85 1.014 30.785 46 to 50 MPH 1338 9.55 16621 8.01 1.192* 215.984 5 10 55 MPH 2372 16.93 25855 12.46 1.359* 625.567 6 to 60 MPH 1321 9.43 12503 6.02 1.565* 476.974 6 to 50 MPH 361 2.58 2545 1.23 2.101* 189.197 7 to 75 MPH 361 2.58 2545 <td>Order: Max Gain 🗸 Desc</td>	Order: Max Gain 🗸 Desc
21 to 25 MPH5133.66201269.700.378"-845.62426 to 30 MPH5583.982186810.540.378"-918.21931 to 35 MPH9336.662464211.870.561"-730.48136 to 40 MPH10447.452275510.960.680"-492.09741 to 45 MPH225216.073290415.851.01430.78546 to 50 MPH13389.55166218.011.192"215.984▶51 to 55 MPH237216.932585612.461.355"626.56756 to 60 MPH113710.26111375.371.911"685.18761 to 65 MPH13219.43125036.021.565"476.97466 to 70 MPH10707.64139426.721.137"128.83371 to 75 MPH3612.582.5451.232.101"189.19776 to 80 MPH1300.933150.156.114"108.73681 to 85 MPH1300.933150.156.114"108.73691 to 95 MPH380.27670.038.402"33.47795 to 100 MPH1030.742500.126.103"8.12491 to 95 MPH1030.742500.126.104"33.47796 to 100 MPH1030.742500.126.103"8.12491 to 95 MPH6.1041030.742500.126.104" <td>C224: CU Estimated Speed at Impac</td>	C224: CU Estimated Speed at Impac
26to 30 MPH5583.982186810.540.378*-918.21931 to 35 MPH9336.662464211.870.561*-730.48136 to 40 MPH10447.452275510.960.680*-492.09741 to 45 MPH225216.073290415.851.01430.78546 to 50 MPH13389.55116218.011.192*215.98451 to 55 MPH237216.932585612.461.359*626.56756 to 60 MPH143710.26111375.371.911*685.18761 to 65 MPH13219.43125036.021.565*476.97466 to 70 MPH10707.64139426.721.137*128.83371 to 75 MPH3612.5825451.232.101*189.19776 to 80 MPH1300.933150.156.114*108.73681 to 85 MPH1521.084640.224.853*120.67786 to 90 MPH1300.933150.156.114*108.73691 to 95 MPH380.27670.038.402*33.47796 to 100 MPH1030.742500.026.103*86.124	21 to 25 MPH
31 to 35 MPH 933 6.66 24642 11.87 0.561* -730.481 36 to 40 MPH 1044 7.45 22755 10.96 0.680* -492.097 41 to 45 MPH 2252 16.07 32904 15.85 1.014 30.785 46 to 50 MPH 1338 9.55 16621 8.01 1.192* 215.984 51 to 55 MPH 2372 16.93 25856 12.46 1.359* 626.567 56 to 60 MPH 1137 10.26 11117 5.37 1.911* 685.187 61 to 65 MPH 1321 9.43 12503 6.02 1.565* 476.974 66 to 70 MPH 1070 7.64 13942 6.72 1.137* 128.833 71 to 75 MPH 361 2.58 2545 1.23 2.101* 189.197 76 to 80 MPH 152 1.08 464 0.22 4.853* 120.677 86 to 90 MPH 130 0.93 315 0.15 6.114* 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402* <td>26 to 30 MPH</td>	26 to 30 MPH
36 to 40 MPH 1044 7.45 22755 10.96 0.680° -492.097 41 to 45 MPH 2252 16.07 32904 15.85 1.014 30.785 46 to 50 MPH 1338 9.55 16621 8.01 1.192' 215.984 51 to 55 MPH 2372 16.93 22856 12.46 1.359' 626.567 56 to 60 MPH 1437 10.26 11137 5.37 1.911' 685.187 61 to 65 MPH 1321 9.43 12503 6.02 1.565' 476.974 66 to 70 MPH 1070 7.64 13942 6.72 1.137' 128.833 71 to 75 MPH 361 2.58 2.545 1.23 2.101' 189.197 76 to 80 MPH 152 1.08 464 0.22 4.853' 120.677 86 to 90 MPH 130 0.93 315 0.15 6.114'' 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402'' 33.477 96 to 100 MPH 103 0.47 2.00 6.103'' 86.124<	31 to 35 MPH
41 to 45 MPH 2252 16.07 32904 15.85 1.014 30.785 46 to 50 MPH 1338 9.55 16621 8.01 1.192* 215.984 51 to 55 MPH 2372 16.93 22856 12.46 1.359* 626.567 56 to 60 MPH 11437 10.26 11137 5.37 1.911* 685.187 61 to 65 MPH 1321 9.43 12503 6.02 1.565* 476.974 66 to 70 MPH 1070 7.64 13942 6.72 1.137* 128.833 71 to 75 MPH 361 2.58 2.545 1.23 2.101* 189.197 76 to 80 MPH 152 1.08 464 0.22 4.853* 120.677 86 to 90 MPH 130 0.93 315 0.15 6.114* 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402* 33.477 96 to 100 MPH 103 0.47 2.00 6.103* 86.124	36 to 40 MPH
46to 50 MPH 1338 9.55 16621 8.01 1.192* 215.984 51to 55 MPH 2372 16.93 25856 12.46 1.359* 626.567 56 to 60 MPH 11437 10.26 11137 5.37 1.911* 685.187 61 to 65 MPH 1321 9.43 12503 6.02 1.565* 476.974 66 to 70 MPH 1070 7.64 13942 6.72 1.137* 128.833 71 to 75 MPH 361 2.58 2.545 1.23 2.101* 189.197 76 to 80 MPH 341 2.43 1443 0.70 3.501* 243.589 81 to 85 MPH 152 1.08 464 0.22 4.853* 120.677 86 to 90 MPH 130 0.93 315 0.15 6.114* 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402* 33.477 96 to 100 MPH 103 0.45 1.20 0.12 6.103* 86.124 91 to 95 MPH 103 0.45 1.20 0.05 7.610.20	41 to 45 MPH
51 to 55 MPH 2372 16.93 25856 12.46 1.359* 626.567 56 to 60 MPH 1437 10.26 11137 5.37 1.911* 685.187 61 to 65 MPH 1321 9.43 12503 6.02 1.565* 476.974 66 to 70 MPH 1070 7.64 13942 6.72 1.137* 128.833 71 to 75 MPH 361 2.58 2.545 1.23 2.101* 189.197 76 to 80 MPH 341 2.43 1443 0.70 3.501* 243.589 81 to 85 MPH 152 1.08 464 0.22 4.853* 120.677 86 to 90 MPH 130 0.93 315 0.15 6.114* 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402* 33.477 96 to 100 MPH 103 0.45 1.20 6.103* 86.124	46 to 50 MPH
56 to 60 MPH 1437 10.26 11137 5.37 1.911* 685.187 61 to 65 MPH 1321 9.43 12503 6.02 1.565* 476.974 66 to 70 MPH 1070 7.64 13942 6.72 1.137* 128.833 71 to 75 MPH 361 2.58 22545 1.23 2.101* 189.197 76 to 80 MPH 341 2.43 1443 0.70 3.501* 243.589 81 to 85 MPH 152 1.08 464 0.22 4.853* 120.677 86 to 90 MPH 130 0.93 315 0.15 6.114* 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402* 33.477 96 to 100 MPH 103 0.45 1.20 6.103* 86.124	▶ 51 to 55 MPH
61 to 65 MPH 1321 9.43 12503 6.02 1.565* 476.974 66 to 70 MPH 1070 7.64 13942 6.72 1.137* 128.833 71 to 75 MPH 361 2.58 2545 1.23 2.101* 189.197 76 to 80 MPH 341 2.43 1443 0.70 3.501* 243.589 81 to 85 MPH 152 1.08 464 0.22 4.853* 120.677 86 to 90 MPH 130 0.93 315 0.15 6.114* 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402* 33.477 96 to 100 MPH 103 0.75 1.09 0.12 6.103* 86.124	56 to 60 MPH
66 to 70 MPH 1070 7.64 13942 6.72 1.137* 128.833 71 to 75 MPH 361 2.58 2545 1.23 2.101* 189.197 76 to 80 MPH 341 2.43 1443 0.70 3.501* 243.589 81 to 85 MPH 152 1.08 464 0.22 4.853* 120.677 86 to 90 MPH 130 0.93 315 0.15 6.114* 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402* 33.477 96 to 100 MPH 103 0.74 250 0.12 6.103* 86.124	61 to 65 MPH
71 to 75 MPH 361 2.58 2545 1.23 2.101* 189.197 76 to 80 MPH 341 2.43 1443 0.70 3.501* 243.589 81 to 85 MPH 152 1.08 464 0.22 4.853* 120.677 86 to 90 MPH 130 0.93 315 0.15 6.114* 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402* 33.477 96 to 100 MPH 103 0.74 250 0.12 6.103* 86.124	66 to 70 MPH
76 to 80 MPH 341 2.43 1443 0.70 3.501* 243.589 81 to 85 MPH 152 1.08 464 0.22 4.853* 120.677 86 to 90 MPH 130 0.93 315 0.15 6.114* 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402* 33.477 96 to 100 MPH 103 0.74 250 0.12 6.103* 86.124	71 to 75 MPH
81 to 85 MPH 152 1.08 464 0.22 4.853* 120.677 86 to 90 MPH 130 0.93 315 0.15 6.114* 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402* 33.477 96 to 100 MPH 103 0.74 250 0.12 6.103* 86.124	76 to 80 MPH
86 to 90 MPH 130 0.93 315 0.15 6.114* 108.736 91 to 95 MPH 38 0.27 67 0.03 8.402* 33.477 96 to 100 MPH 103 0.74 250 0.12 6.103* 86.124 0 109 MPH 0.25 120 0.00 5.077 10.20	81 to 85 MPH
91 to 95 MPH 38 0.27 67 0.03 8.402* 33.477 96 to 100 MPH 103 0.74 250 0.12 6.103* 86.124 0 103 MPH 0.25 120 0.00 5.077* 10.20	86 to 90 MPH
96 to 100 MPH 103 0.74 250 0.12 6.103* 86.124	91 to 95 MPH
	96 to 100 MPH
Over 100 MPH 49 0.35 129 0.06 5.627 40.292 Sort by Sum of Max Gain	Over 100 MPH
📋 🕼 🕸 🖉	📋 🕼 🞯 🖉
2012-2016 Alabama Integrated Crash Data	
C224: CU Estimated Speed at Impact	
20	20
15	15
0 41 to 45 MPH 66 to 70 MPH 91 to 95 MPH	0
C224: C11 Estimated Speed at Impact	

Speed at impact for crashes in which drivers failed to use restraints is most highly overrepresented in the range of 71 MPH and over. This is a major change from the previous year's observation where the mid-speed ranges, 51-65 MPH, were also highly over-represented. This is consistent with the findings of the recent fatality study that indicated speeds increasing overall by several crash and citation metrics. Crashes in which restraints are not used consistently occur at higher speeds than crashes in which restraints were used by the causal driver. This confirms the rural-urban finding, in that speeds are generally higher in the rural areas, and since speed is an excellent proxy for risk-taking, shows the correlation between improper restraints and other risk-taking items. It also exacerbates the problem, resulting in

greater severity caused by the high-speed, unrestrained situations. Severity factors are considered immediately below.

5 Severity Factors

Generally restraints do not prevent crashes, although on rare occasions they might help to keep the driver behind the wheel and in a position to avoid a crash. But in general occupant restraints serve to reduce the severity of crashes when they occur. Severity factors were analyzed in several different categories to determine to what extent the use of restraints affects the safety of the drivers. These factors analyzed include crash severity, crash severity in urban versus rural areas, number injured, number killed, driver ejection status, and driver injury type. **5.1 Crash Severity**



Fatal, incapacitating, and non-incapacitating injuries are all extremely overrepresented in crashes that occurred without the use of restraints, as given by the Odds Ratios that show the proportions of fatal, Incapacitation Injury and Non-incapacitating injury were about 21, 6 and 3 times expected, respectively. While overrepresentations were certainly expected, these results further

quantify the effects of the benefits of restraint use. Property damage only was far more common in crashes in which drivers employed the use of restraints.

CARE 10.1	🛿 CARE 10.1.0.19 - [Crosstab Results - 2012-2016 Alabama Integrated Crash Data - Filter = Restraint N 🗕 🗖 💌												
🔋 Eile Dashboard Eilters Analysis Crosstab Locations Tools Window Help 🗕 🗗 🗙													
2012-2016	2012-2016 Alabama Integrated Crash Data V Restraint Non-Use CUDriver V 🌱 😨 1/ 1/2012 V 12/31/2016 V												
Suppress Zero Values: None 🗸 Select Cells: 🗐 🗸 😴 Column: Crash Severity ; Row: Highway Classifications 👰													
	Fatal Injury	Incapacitating Injury	Non- Incapacitating Inju	Possible Injury	Property Damage Only	Unknown	TOTAL						
Internation	152	314	360	118	490	14	1448						
Interstate	9.29%	6.39%	7.17%	6.72%	6.24%	3.31%	6.70%						
Endorol	245	612	628	234	882	47	2648						
rederal	-ederal 14.97% 12.45%		12.51%	13.33%	11.23%	11.11%	12.26%						
Ctata	402	1028	924	357	1384	79	4174						
Sidle	24.56%	20.91%	18.41%	20.34%	17.62%	18.68%	19.32%						
County	649	2271	2140	476	2752	97	8385						
County	39.65%	46.20%	42.65%	27.12%	35.04%	22.93%	38.81%						
Municipal	183	668	916	542	2158	180	4647						
Municipal	11.18%	13.59%	18.25%	30.88%	27.47%	42.55%	21.51%						
Private Property	6	23	50	28	189	6	302						
Trivate Troperty	0.37%	0.47%	1.00%	1.60%	2.41%	1.42%	1.40%						
P Other*	0	0	0	0	0	0	0						
r Oulei	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
τοτοι	1637	4916	5018	1755	7855	423	21604						
TOTAL	7.58%	22.76%	23.23%	8.12%	36.36%	1.96%	100.00%						

5.2 Crash Severity by Highway Classification for Driver Not Restrained

Analysis of crash severity by highway classification for crashes in which the causal driver did not use restraints shows that fatal injuries are overrepresented on Interstate, Federal and State roadways. Possible injuries and Property Damage Only were overrepresented on municipal highways.

5.3 Number Injured

CA	🕴 CARE 10.1.0.19 - [IMPACT Results - 2012-2016 Alabama Integrated Crash Data - Unrestrained Causal 🗕 🗖 💌													
🖡 Ei	le <u>D</u> ashboard <u>F</u> ilters <u>A</u> n	alysis <u>I</u> mpact	<u>L</u> ocations	<u>T</u> ools <u>W</u> ind	ow <u>H</u> elp			_ & ×						
6	2012-2016 Alabama Integrated Cras	sh Data	~	Unrestrained	l Causal Driver		× 5	P 🕎 1/ 1/2012 v 12/31/2016 v 🕽 🌖						
Order	Max Gain 🗸 Descer	iding v	Suppress 2	Zero-Valued Row	s	Sig	nificance: Over	Representation v Threshold: 2.0						
C059:	Number Injured (Includes Fatali	ties) Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C057: Number of Pedacyclists C058: Number Injured (Non-Fatal)						
•	No Injuries	8238	38.13	534817	79.45	0.480*	-8926.892	C059: Number Injured (Includes Fatalitie						
	1 Injury	9579	44.34	102100	15.17	2.923*	6302.112	C060: Number Killed						
	2 Injuries	2460	11.39	25327	3.76	3.026*	1647.133	C061: Number of Railroad Trains						
	3 Injuries	836	3.87	7028	1.04	3.706*	610.437	C080: CMV Involved						
	4 Injuries	274	1.27	2415	0.36	3.535*	196.491	C081: E Has Truck Bus Supplement						
	5 Injuries	126	0.58	887	0.13	4.426*	97.532	C101: Causal Unit (CU) Type						
	6 Injuries	55	0.25	321	0.05	5.339*	44.698	C102: CU Non-Motorist Indicator						
	7 Injuries	22	0.10	130	0.02	5.273*	17.828	C104: CUL eff Scene						
	8 Injuries	4	0.02	41	0.01	3.040	2.684	C105: CU Driver Age Range 1						
	9 Injuries	5	0.02	23	0.00	6.773	4.262	C106: CU Driver Age Range 2						
	11 Injuries	2	0.01	3	0.00	20.772	1.904	C107: CU Driver Raw Age						
	12 Injuries	1	0.00	8	0.00	3.895	0.743	C108: CU Driver Race						
	15 Injuries	1	0.00	2	0.00	15.579	0.936	C110: CU Driver Residence Distance						
	19 Injuries	1	0.00	3	0.00	10.386	0.904	Sort by Sum of Max Gain						
00	1 🞯 🖉							Display Filter Name						
				2012-2016 Alaba	ma Integrated Cra	ish Data								
				C059: Number In	jured (Includes Fa	atalities)								
	100													
	è – 🦉													
	50 - SO - S	_												
	0					1 1								
			4 Inji	uries		9 In	njuries							
				C059: Numb	per Injured (Includ	es Fatalities)								

The proportion of injuries (including fatalities) in crashes in which no restraints were used is overrepresented by more than a factor of two when there were 1 to 7 injuries per crash. In the 6 and 5 injury crashes, it is over-represented by a factor of over 5. These results show quite plainly that crashes in which the causal driver was not restrained are much more severe in their effects to all passengers and not just the causal driver. The overrepresentation of multiple injuries in the causal vehicle might also indicate a tendency of unrestrained drivers to travel with multiple individuals in the vehicle. This also demonstrates that the use of a seat belt by the driver is an excellent proxy for seat belt use in general in the corresponding vehicle.

5.4 Number Killed

CA	RE 10.1.0.19	- [IMPA	CT Results -	2012-201	6 Alabama	Integrated	d Crash Da	ata - Unrest	rained Causal	_ 🗆 📕	×
🖡 Ei	e <u>D</u> ashboard	<u>F</u> ilters <u>A</u> n	alysis <u>I</u> mpact	<u>L</u> ocations	<u>T</u> ools <u>W</u> inde	ow <u>H</u> elp				- 6	₽×
۴	2012-2016 Alabama	Integrated Cra	sh Data	~	Unrestrained	Causal Driver		× 🖓	7 1/ 1/2012	✓ 12/31/2016 ∨	۲
Order:	Max Gain	✓ Descer	nding v	Suppress 2	Zero-Valued Rows	5	Si	gnificance: Over	Representation v	Threshold: 2.0	÷
C060:	Number Killed		Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C057: Number of P C058: Number Injur	edacyclists red (Non-Fatal)	^
	No Fatalities		19962	92.40	670653	99.63	0.927*	-1562.533	C059: Number Injur	red (Includes Fatali	itie
	1 Fatality		1510	6.99	2295	0.34	20.500*	1436.342	C060: Number Kille		
	2 Fatalities		104	0.48	154	0.02	21.042*	99.057	C061: Number of R	airead trains	-
	3 Fatalities		20	0.09	21	0.00	29.674*	19.326	C080: CMV Involved	i crossing Number	·
	4 Fatalities		6	0.03	4	0.00	46.736	5.872	C081: E Has Truck	Bus Supplement	
	5 Fatalities		2	0.01	2	0.00	31.158	1.936	Sort by Sum of Max	Gain	× 1
00	1 🗞 🖉									Display Filter Name	•
					2012-2016 Alaba	ma Integrated Cra	ash Data				
					C060:	Number Killed					
	100			-							
	-										
	50 E										
	10 50 -										
	ш. —										
	0	No	Eatalities	1 Eatality	2 Eatalitie	as 3.Fat	alities 4	4 Eatalities	5 Eatalities		
		NO	i utumica	r r atanty	COR	0: Number Killed	unuea -	r i utuniico	o r utunites		

The proportion of fatalities in general as well as the proportion of multiple fatality crashes is dramatically overrepresented when restraints are not used in the causal vehicle. Multiple fatality crashes were found to be a large factor in the increase of fatalities in 2016. This was especially true in the 4 and 5 fatality crashes; 4 fatalities went from 3 to 6 in 2012-2016 from 2011-2015, and 5 fatalities doubled from 1 to 2. Of course, the largest increase was in the single fatality crashes, which went from 1423 in 2011-2015 to 1510 in the 2012-2016

5.5 Driver Ejection Status

CA	RE 10.1.0.1	9 - [IN	1PAC	T Results ·	- 2012-201	6 Alabama	a Integrate	d Crash Da	ta - Unrestra	ained Caus	sal — 🗖 📕	x	
🖳 Ei	le <u>D</u> ashboard	<u>F</u> ilters	<u>A</u> na	alysis <u>I</u> mpact	<u>L</u> ocations	<u>T</u> ools <u>W</u> ind	ow <u>H</u> elp				_ 1	∂ ×	
S.	😵 2012-2016 Alabama Integrated Crash Data v Unrestrained Causal Driver v 🌱 🏆 1/ 1/2012 v 12/31/2016 v 1 🌖												
Order:	Max Gain	Y	Descen	ding v	Suppress	Zero-Valued Row	/5	Sig	nificance: Over R	epresentation	✓ Threshold: 2.0	÷	
C327:	CU Driver Ejec	tion Status		Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain 🔻	C327: CU Driv	ver Ejection Status		
	Totally Ejected			1784	8.45	1530	0.24	35.685*	1734.007				
	Trapped within V	ehicle		1271	6.02	4170	0.65	9.328*	1134.745				
	Partially Ejected			361	1.71	569	0.09	19.417*	342.408				
	Not Ejected or Tr	apped		17686	83.81	608741	94.26	0.889*	-2204.577	Sort by Sum	of Max Gain		
00	Display Filter Name												
	2012-2016 Alabama Integrated Crash Data												
						C327: CU E	river Ejection Sta	atus					
	100												
	_												
	- en co												
	n 50 -		_						_				
	۳ –												
									_				
	0 —												
				Totally Ejec	ted Trap	ped within Vehi	icle Partia	Ily Ejected	Not Ejected or	Frapped			
						C327: CU I	Driver Ejection St	atus					

Driver Totally Ejected is overrepresented by a factor of over 36 in crashes in which the driver did not use restraints, indicating another cause for many fatalities. This means that the probability of being ejected is 36 times higher when restraints are not used. Partial ejection, total ejection, or entrapments in the vehicle are also greatly over-represented, which is expected in crashes in which safety equipment is not properly utilized.

CARE 10.1	.0.19 - [Cros	stab Results	- 2012-2016	Alabama Int	egrated Crasł	n Data - Filte	r = Unrestra	ined 🗕 🗖 🗙					
🖳 <u>F</u> ile <u>D</u> ashb	oard <u>F</u> ilters <u>/</u>	<u>A</u> nalysis <u>C</u> rossta	b <u>L</u> ocations <u>T</u>	ools <u>W</u> indow	<u>H</u> elp			_ 8 ×					
2012-2016	😵 2012-2016 Alabama Integrated Crash Data 🗸 Unrestrained Causal Driver V 🌳 😨 1/ 1/2012 🗸 12/31/2016 🗸 🕽 🥥												
Suppress Zero Va	lues: None	✓ Select	Cells: 🔳 🛛 🔀	9		Column: Cr	ash Severity ; Row	CU Driver Ejection Status 👰					
	Fatal Injury	Incapacitating Injury	Non- Incapacitating Inju	Possible Injury	Property Damage Only	Unknown	TOTAL						
Not Ejected or	603	3271	4270	1581	7605	356	17686						
Trapped	36.84%	66.54%	85.09%	90.09%	96.82%	84.16%	81.86%						
Partially Eigsted	137	129	60	15	19	1	361						
Fartially Ejected	8.37%	2.62%	1.20%	0.85%	0.24%	0.24%	1.67%						
Totally Figsted	504	816	358	47	44	15	1784						
Totally Ljected	30.79%	16.60%	7.13%	2.68%	0.56%	3.55%	8.26%						
Trapped within	apped within 355 596		207	58	32	23	1271						
Vehicle	21.69%	12.12%	4.13%	3.30%	0.41%	5.44%	5.88%						
Hakaawa	6	26	27	7	39	16	121						
UNKIOWI	0.37%	0.53%	0.54%	0.40%	0.40% 0.50%		0.56%						
Not Applicable	13	48	69	35	104	11	280						
Not Applicable	0.79%	0.98%	1.38%	1.99%	1.32%	1.32% 2.60% 1.							
CU is Not a	19	30	27	12	12	1	101						
Vehicle	1.16%	0.61%	0.54%	0.68% 0.15%		0.24%	0.47%						
CILie Unknown	0	0	0	0	0	0	0						
CO IS OIKHOWI	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
E CU Driver Not	0	0	0	0	0	0	0						
Recorded	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
τοτοι	1637	4916	5018	1755	7855	423	21604						
TOTAL	7.58%	22.76%	23.23%	8.12%	36.36%	1.96%	100.00%						

5.6 Ejection Status by Severity

All crashes in the above cross-tabulation involved drivers who were not properly restrained. In evaluating crash severity by ejection status, data show that fatal and incapacitating injuries were significantly overrepresented in crashes in which the driver was partially ejected, totally ejected, or trapped within the vehicle. Because the ejection status is strongly associated with the use of restraints, this data indicates that failure to use restraints results in greater severity of injuries in crashes. The table given above quantifies this increase in severity. The probability of any given crash being fatal over the five years (2012-2016) of the study was 0.59% (including all crashes whether the driver/passengers were restrained or not). The following table give the multipliers to this probability (0.59%) of a crash being a fatal crash for the various ejection conditions.

Ejection Status	Probability of Fatality	Multiplier from All Crashes
Not Ejected	3.40%	5.78
Partially Ejected	37.95%	64.32
Totally Ejected	28.25%	47.88
Trapped in Vehicle	27.93%	47.34

Fatality Multipliers for Unrestrained Drivers

The non-ejection has a multiplier of 5.78 because it is being compared to all crashes, of which a large number (over 90% of passengers) are restrained. Partial ejection is the worst case scenario

with a multiplier of over 64. For totally ejected or trapped causal vehicle drivers this is reduced to the 47-48 range, but is still dramatically worse than not being ejected even if unrestrained.

C C	ARE 1	0.1.0.19	9 - [IM	PACT Re	sults - 2	2012-2	016 A	labama In	tegrated (Crash Dat	a - Unrest	rained Causal 🗕 🗖 🗙		
B	<u>F</u> ile <u>D</u>	ashboard	<u>F</u> ilters	<u>A</u> nalysis	<u>I</u> mpact	<u>L</u> ocation	is <u>T</u> ool	s <u>W</u> indow	<u>H</u> elp			_ & ×		
¢?	2012-2	016 Alabama	a Integrate	d Crash Data		~	L	Inrestrained Cau	sal Driver		~ <	💡 瑁 1/ 1/2012 🗸 12/31/2016 🗸 🌒		
Orde	Drder: Natural Order v Descending v Suppress Zero-Valued Rows Significance: Over Representation v Threshold: 2.0													
C32	8: CU Di	river/Non-N	Aotorist Inj	ury Type	Sul Freque	bset S ency Pe	ubset rcent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C323: CU Driver/Non-Motorist Safety Eq. A C324: CU Driver Airbag Status		
•	Fatal I	njury			1	354	6.27	1509	0.23	27.670*	1305.066	C325: CU Driver/Non-Motorist Age		
	Incapa	acitating			4	1531	20.97	16187	2.43	8.632*	4006.082	C326: CU Driver/Non-Motorist Gender		
	Non-Ir	ncapacitating)		4	1669	21.61	29214	4.39	4.928*	3721.638	C327: CO Driver/Non-Motorist Injury Type		
	Not Vi	sible but Con	nplains of l	Pain	1	411	6.53	23273	3.49	1.870*	656.295	C329: CU Driver/Non-Motorist First Aid B		
	E Unk	nown Injury				201	0.93	2754	0.41	2.251*	111.692	C330: CU Driver/Non-Motorist Transport		
	CU Dr	iver/Non-Mo	torist was	Not a Victim	9	438	43.69	571307	85.76	0.509*	-9088.549	Sort by Sum of Max Gain		
Ũ	□ Display Filter Name													
	2012-2016 Alabama Integrated Crash Data C328: CU Driver/Non-Motorist Injury Type													
	aquency	100												
	Ę	0 1		Fatal Injury		Incapacitatin	g N C32	on-Incapacitating 28: CU Driver/Nd	Not Visible Complains of	but E Ur Pain ry Type	aknown Injury	CU Driver/Non-Motorist was Not a Victm		

5.7 Driver Injury Type

Various types of driver injuries, including fatalities, are consistently overrepresented in crashes where no restraints were used by the driver. Fatalities in these crashes are overrepresented by a factor of over 27.670. In crashes in which safety restraints were used, drivers and non-motorists were far less likely to be injured.

5.8 Fatality Probability by Restraint Use

The following is for all crashes over the 2012-2016 time frame.

Ø	CAR	E 10.1.0.19 - [Crosstab Res	ults - 2012-2	2016 Alabam	a Integrated	Crash Data]	_ 🗆 🗙				
🚦 <u>F</u> ile <u>D</u> asł	board <u>F</u> ilters	<u>A</u> nalysis <u>C</u> rosstal	b <u>L</u> ocations <u>T</u>	ools <u>W</u> indow	<u>H</u> elp			_ & ×				
2012-2016	😵 2012-2016 Alabama Integrated Crash Data 🗸 All records (do not apply a filter) 🗸 🖓 1/ 1/2012 🗸 12/31/2016 🗸 D											
Suppress Zero V	Suppress Zero Values: None 🗸 Select Cells: 🔳 🖉 🍞 Column: Crash Severity ; Row: CU Driver/Non-Motorist Safety Equipment 👰											
	Fatal Injury	Incapacitating Injury	Non- Incapacitating Inju	Possible Injury	Property Damage Only	Unknown	TOTAL	^				
None Used -	1637	4916	5018	1755	7855	423	21604					
Motor Vehicle Oc	40.24%	15.64%	9.56%	2.86%	1.51%	2.30%	3.14%					
Shoulder and Lap	1509	21390	39763	52052	437364	11711	563789					
Belt Used	37.09%	68.06%	75.72%	84.88%	84.10%	63.77%	81.97%	×				

The probability that any given crash will be classified as a fatal crash is calculated by the number in any specific category divided by the total number in that general category. From the above, the probability of a fatality of those who are properly restrained is given by:

1509 Fatal Crashes / 563,789 Total Crashes = 0.002677 = 0.002677% (1 in every 374.62 crashes).

The same calculation for the None Used row is:

1637 Fatal Crashes / 21,604 Total Crashes = 0.075773 = 7.5773 (1 in every 13.20 crashes).

These figures show that the probability of being killed in a crash goes up by a factor of 374.62/13.20 = 28.3 times the probability of being killed given proper restraints.

6 Driver Demographics

The study of driver demographics provides information about which gender or age groups are more likely to be involved in these crashes in which no restraints are used. Determination of overrepresentation can help to target the gender or age group that is more likely to be involved in this type of crash.

6.1 Driver Age

CA	ARE 10.1.0.19 - [II	MPACT Results	- 2012-20)16 Alaban	na Integrate	ed Crash [Data - Unre	strained Cau	sal 🗕 🗖 🗙
₿ E	ile <u>D</u> ashboard <u>F</u> ilter	s <u>A</u> nalysis <u>I</u> mpac	<u>L</u> ocations	<u>T</u> ools <u>W</u> ir	ndow <u>H</u> elp				_ 8 ×
۴	2012-2016 Alabama Integra	ated Crash Data	~	Unrestrain	ed Causal Driver		~	9 1/1	/2012 🗸 12/31/2016 🗸 🖉
Order	; Max Gain 🗸 🗸	Descending v	Suppres	s Zero-Valued Ro	ows	[Significance: 0	ver Representation	✓ Threshold: 2.0 ÷
C107	: CU Driver Raw Age	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C107: CU Dr	iver Raw Age
•	15	62	0.30	1123	0.18	1.647*	24.351		
	16	477	2.28	18111	2.91	0.786*	-130.186		
	17	705	3.38	20201	3.24	1.041	27.745		
	18	836	4.00	23041	3.70	1.082	63.532		
	19	895	4.29	235/8	3./9	1.132	104.529		
	21	254	4.09	22011	3.03	1 209*	147 578		
	22	813	3.89	19919	3.20	1.217*	145,199		
	23	789	3.78	18661	3.00	1.261*	163.375		
	24	697	3.34	16955	2.72	1.226*	128.570		
	25	697	3.34	15932	2.56	1.305*	162.867		
	26	643	3.08	14667	2.36	1.308*	151.277		
	27	606	2.90	13560	2.18	1.333*	151.390		
	28	585	2.80	12951	2.08	1.347*	150.807		
	29	499	2.39	12459	2.00	1.195*	81.302		
	30	540	2.59	12038	1.93	1.338*	136.416		
	31	481	2.30	11/96	1.89	1.216*	85.530		
	32	436	2.13	11304	1.02	1.202	90.288		
	34	418	2.00	10518	1.69	1.185*	65.376		
	35	412	1.97	10115	1.62	1.215*	72.886		
	36	370	1.77	9675	1.55	1.141*	45.638		
	37	353	1.69	9258	1.49	1.137*	42.618		
	38	331	1.59	8899	1.43	1.109	32.654		
	39	325	1.56	8661	1.39	1.119	34.633	V Sort by Sum	of Max Gain
0) 🛯 🖉								Display Filter Name
				2012-2016 Ala	bama Integrated C	rash Data			
				C107:	CU Driver Raw A	ge			
	6—								
	ک ⁴	11							
	adue adue								
	^ب 2	i i i i i i i i i i i i i i i i i i i							
			litte	10110 and	Minana.				
							Illina	Hiller	
	0		34		54		7/		94
			57		04 C107: CLI Driver F	Raw Age	/4		54
JI					star. Co brivel r	an Age			

Analysis of individual driver ages indicates that crashes involving no restraints are overrepresented in the years above the teen-drivers (age range 19-37). While it appears that 16-18 teen-aged drivers are more likely to use safety equipment (perhaps due to the emphasis on it

placed during training), there is still a very large proportion that are unrestrained, and this problem is multiplied by their overrepresentation in crashes in general (note that, for crashes in general, they are at least twice the average of the other ages). The tendency toward risk-taking is generally thought to end at age 25. This distribution correlates very strongly with crashes in which the causal driver was impaired by drugs (including alcohol).

6.2 Driver Gender



Males account for 70.69% of crashes in which restraints are not used, and they are overrepresented by a factor of 1.344. Since males also do the majority of the driving, they become a clear target for restraint countermeasures.

CARE 10.1	.0.19 - [Cros	stab Results	- 2012-2016	Alabama Int	egrated Cras	h Data 🗕 🗖 🗙								
🚦 <u>F</u> ile <u>D</u> ashb	ooard <u>F</u> ilters <u>/</u>	<u>A</u> nalysis <u>C</u> rosstal	b <u>L</u> ocations <u>T</u>	ools <u>W</u> indow	<u>H</u> elp	_ & ×								
2012-2016	😵 2012-2016 Alabama Integrated Crash Data V Unrestrained Causal Driver V 💎 📆 1/													
Suppress Zero Values: Rows and Columns 🗸 Select Cells: 🛋 🗸 🥳 Column: CU Driver/Non-Motorist Gender ; Row: Crash Severity 🖓														
	Male	Female	Unknown	Not Applicable	TOTAL									
Established	1263	373	0	1	1637									
Fatal injury	8.41%	5.99%	0.00%	10.00%	7.58%									
Incapacitating	3425	1486	4	1	4916									
Injury	22.81%	23.87%	1.12%	10.00%	22.76%									
Non-	3512	1495	11	0	5018									
Incapacitating Inju	23.39%	24.02%	3.09%	0.00%	23.23%									
Possible Injuny	1104	644	7	0	1755									
r ossible injury	7.35%	10.35%	1.97%	0.00%	8.12%									
Property Damage	5442	2098	307	8	7855									
Only	36.25%	33.70%	86.24%	80.00%	36.36%									
Unknown	267	129	27	0	423									
Chichowh	1.78% 2.07%		7.58%	0.00%	1.96%									
τοται	TOTAL 15013 6225		356	10	21604									
	69.49%	28.81%	1.65%	0.05%	100.00%									

6.3 Driver Gender by Severity for Unrestrained Causal Drivers

When driver gender by severity was studied, data indicate that "Possible Injuries" are overrepresented for female drivers in crashes where the female causal driver was not restrained. Generally, the distribution of severity is skewed toward more severe injuries for unrestrained male drivers. The probability that any of these (unrestrained driver) crashes resulted in a fatality was 8.41% for male drivers and 5.99% for female drivers.



7 Analysis of Back Seat Occupants

Back seat occupants who are not properly restrained have close to 17 times the probability of being killed as do those who are properly restrained. The other highest two severity classifications are also greatly increased, although not by as great of multipliers: 4.370 for Incapacitating Injury and 2.515 for Non-Incapacitating Injury.

Looking at the numbers, over the five year period, there were 423 back seat occupants killed, which is about 83 per year. Question: how many of these would have been saved had they been properly restrained? Applying the 0.34% (probability of being killed if restrained) to the total unrestrained (sum of the Subset Frequency column, which is 7,430) as opposed to the actual 5.69% yields 25.12 total fatalities. This means that the total fatality savings over the five years would have been 423-25=398 fatalities, the saving of about 80 lives per year.

8 Summary and Conclusions

The following summarizes the findings of the analysis:

- Geographical Factors
 - Counties with the greatest overrepresentation factors for unrestrained driver crashes include Walker, Cullman, Jackson, Talladega, DeKalb and Escambia.
 - The number of crashes involving drivers who use no restraints is greatly overrepresented in rural areas in comparison to the urban areas. The odds ratio for rural areas is well over twice what would be expected if rural and urban restraint use were the same.
 - The most overrepresented (worst) areas are the rural county areas in Walker, Mobile, Cullman, Talladega Counties.
 - The most underrepresented (best) cities are Birmingham, Mobile, Montgomery, Huntsville and Tuscaloosa.
 - Crash incidents with no driver restraints being used are greatly overrepresented on county highways, with 2.7 times the expected number of crashes. County and State were the only roadway classification that were overrepresented.
 - In the analysis of locale, crashes involving no restraints are most commonly overrepresented in open country areas.
- Time Factors
 - The weekend days are the most overrepresented days of the week for crashes in which drivers did not use restraints. This correlates highly with impaired driving crashes.
 - In the evaluation of time of day, overrepresentation peaks during the 12 Midnight to 5 AM period and then tapers off, falling back below crashes involving causal drivers who use restraints in the 7 AM to 7 PM time periods. Additional crosstabulations were performed for crashes involving injury.
- Analysis of Time of Day by Day of Week.
 - Crosstab analyses of time of day by day of the week of crashes in which restraints were not used enables officers to determine target times and days to enforce restraint laws so that severe crashes may be prevented. Three analyses were performed and compared for three target groups: rural crashes, crashes caused by drivers 16-20, and crashes caused by drivers 21-25. While the rural and 21-25 crosstabs were expected to correlate very heavily with impaired driving, it was found that the 16-20 year old causal drivers were not very much different. It

seems clear that while they might not be involved with alcohol or drugs, they are out and engaged in risk-taking practices at the same time as the impaired driving by their older driver counterparts, further compounding the problem at these times. The drivers 16-20 would also reasonably be expected to be overrepresented in the week-day after school hours in the proximity of their schools and after-school activities.

- The cross-tabulation of time of day by day of the week that was restricted to injury crashes only showed a very high resemblance to the same analysis for impaired driving (alcohol and other drugs involvement).
- Crash Causal Factors
 - The overrepresentation factors indicate that certain risk-taking behaviors are often associated with crashes in which restraints are not used, including DUI, over the speed limit, aggressive operation, running off the road, and fatigue/sleep.
 - Crashes attributed to drivers who used no restraints are greatly overrepresented in vehicles with model years 1960-2003, which could be attributed to the lack of standard safety restraints in some of these older model vehicles, or perhaps the removal of these safety devices over time.
 - The speed at impact for crashes for this type of crash is overrepresented in all of the categories above 40 MPH, indicating that these crashes consistently occur at higher speeds than crashes in which restraints were used by the causal driver.
- Severity Factors
 - Fatal, incapacitating, and non-incapacitating injuries are all overrepresented in crashes where drivers were not restrained; this analysis quantified the benefits of the restraint use.
 - Fatal injuries in crashes where no restraints are used are highly overrepresented on interstate, federal and state roadways. "Possible Injuries" were highly overrepresented on municipal highways.
 - Analysis of injuries shows that the proportion of injuries (including fatalities) in unrestrained driver crashes is overrepresented from 1 to 7 injuries per crash.
 Crashes without restraints are clearly causing much more severe injuries and a greater number of injuries and fatalities per crash.
 - The proportion of fatalities in general as well as the proportion of multiple fatality crashes is dramatically overrepresented in crashes where the causal driver is unrestrained.
 - As expected, ejection of the unrestrained driver is overrepresented, indicating one major cause for many fatalities in which safety equipment is not properly utilized.

- All types of injuries, including fatalities, are consistently overrepresented in crashes where no restraints were used.
- Driver Demographics
 - Analysis of individual driver ages indicates that crashes involving no restraints are overrepresented in drivers in and immediately above the teen driver classification (age range 19-38).
 - Male drivers account for a majority of crashes in which restraints are not used, and they are overrepresented by a factor of 1.344.
- Ejection and Back Seat Analysis
 - The non-restrained person is about 50 times more likely to be ejected than those who are properly restrained.
 - If all back-seat occupants were properly restrained it would result in a saving of 80 lives per year.