Restraint Issues Problem Identification Based on Alabama 2011-2015 Data

1. Introduction

The goal of this problem identification is to assure that the restraint enforcement program considered by the state throughout FY 2017 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 2016 HSP, calendar years 2011-2015. This study was updated using five years of data (CY 2011 through 2015). CARE IMPACT displays are 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.

The results are presented in the following categories:

- 1. Introduction
- 2. Geographical
- 3. Time
- 4. Crash Causation
- 5. Severity
- 6. Driver Demographics
- 7. Analysis of Ejection
- 8. Analysis of Back Seat Occupants
- 9. Summary and Conclusions

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

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6 2	2011-2015 Alabama Inter	grated Crash Data	✓ D	river NOT properly	Restrained		Y S	1/ 1/2011 🗸 12/31/2015 🧹 🔋 🕒 🚯
Order	: Max Gain 🗸 Descendin	ig 🗸] Suppress Zero-V	alued Rows			Significance: Ove	er Representation V Threshold: 2.0
C001:	County	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain 👻 🖌	C001: County
•	Walker	644	3.00	6205	1.14	2.642*	400.285	C003: Year
	Jackson	404	1.88	3780	0.69	2.721*	255.532	C004: Month
	Escambia	341	1.59	2389	0.44	3.634*	247.167	C005: Day of Month C006: Day of the Week
	Cullman	599	2.79	9260	1.70	1.647*	235.293	C007: Week of the Year
	Blount	355	1.66	3493	0.64	2.588*	217.805	C008: Time of Day
	Chilton	354	1.65	3701	0.68	2.435*	208.635	C009: Data Source
	Talladega	478	2.23	7039	1.29	1.729*	201.528	C010: Rural or Urban
	Covington	282	1.31	2450	0.45	2.931*	185.771	C012: Controlled Access
	Dekalb	363	1.69	4788	0.88	1.930*	174.941	C013: E Highway Side
	Monroe	182	0.85	701	0.13	6.610*	154.467	C015: Primary Contributing Circumstanc
	Clarke	221	1.03	1810	0.33	3.109*	149.908	C016: Primary Contributing Unit Number
	Conecuh	202	0.94	1417	0.26	3.629*	146.344	C017: First Harmful Event
	Marshall	516	2.41	9424	1.73	1.394*	145.852	C019: E Most Harmful Event
	Marion	192	0.90	2002	0.37	2.442*	113.367	C020: E Distracted Driving Opinion
	Randolph	157	0.73	1258	0.23	3.177*	107.589	C021: Distance to Fixed Object
	Franklin	193	0.90	2203	0.40	2.231*	106.472	C022: E Type of Roadway Junction/Feati
	Geneva	162	0.76	1457	0.27	2.831*	104.773	C024: School Bus Related
	Winston	143	0.67	1124	0.21	3.239*	98.852	C025: Crash Severity
	Washington	125	0.58	738	0.14	4.312*	96.013	C026: Intersection Related
	St Clair	387	1.80	7425	1.36	1.327*	95.367	C027: At Intersection
	Choctaw	118	0.55	615	0.11	4.885*	93.845	C028: Mileposted Route
	Cherokee	173	0.81	2031	0.37	2.169*	93.228	Sort by Sum of Max Gain
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			St Clair		C001: County	Colbert		Russell

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

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6 ?	2011-20)15 Alabama Inte	grated Crash Data	√ D	iver NOT properly	Restrained		v 😌 🔞	1/ 1/2011 v 1	2/31/2015 🗸 👔 🕨	G 🌖
Order: N	1ax Gain	✓ Descendir	g v [Suppress Zero-V	alued Rows			Significance: 0	ver Representation	✓ Threshold:	2.0 🜲
C002: C	ity Lue		Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain 🔻	C001: Cou C002: City	nty	^
► R	lural Walker		464	2.16	2528	0.46	4.672*	364.693	C003: Yea	r	
R	lural Mobile		614	2.86	8290	1.52	1.885*	288.346	C004: Mon	th	
R	tural Cullman		438	2.04	4202	0.77	2.653*	272.934	C005: Day	of the Week	
R	lural Escambia		280	1.31	1423	0.26	5.009*	224.101	C007: Wee	k of the Year	
R	lural Blount		295	1.38	2109	0.39	3.561*	212.153	C008: Tim	e of Day	
R	lural Chilton		282	1.31	1945	0.36	3.691*	205.595	C009: Data	a Source	
R	lural Tuscaloosa		467	2.18	6745	1.24	1.763*	202.037	C010: Rur	al or Urban	
R	lural Madison		483	2.25	7288	1.33	1.687*	196.707	C011: Higt	way Classifications	
R	lural Baldwin		400	1.87	5195	0.95	1.960*	195.926	C012: C01	ahway Side	
R	lural Talladega		305	1.42	2793	0.51	2.780*	195.283	C015: Prin	nary Contributing Circu	umstanc
R	lural Lauderdale		283	1.32	2357	0.43	3.056*	190.410	C016: Prin	nary Contributing Unit	Numbe
R	lural Calhoun		331	1.54	3972	0.73	2.121*	174.969	C017: First	Harmful Event	
B	lural Limestone		311	1.45	3714	0.68	2.132*	165,104	C018: Loc	ation First Harmful Eve	ent Rel t
B	lural Jackson		211	0.98	1186	0.22	4 529*	164 411	C019: E M	ost Harmful Event stracted Driving Opini	on
B	lural Ptowah		244	1 14	2226	0.41	2 790*	156 556	C021: Dist	ance to Fixed Object	
B	lural Colhert		212	0.99	1442	0.26	3 7/3*	155 354	C022: E Ty	pe of Roadway Juncti	on/Feati
	lural Dekalla		212	1.05	1700	0.20	3.745	154 722	C023: E M	anner of Crash	
			225	1.05	1/03	0.35	3.202	154.725	C024: Sch	ool Bus Related	
	iurai Marshali		220	1.00	1344	0.36	2.300	101.634	C025: Cra	sh Severity	
R	iural Elmore		203	1.18	2/49	0.00	2.343	145.012	C026: Intel	tersection	
P	inchard		215	1.00	1836	0.34	2.981-	142.877	C028: Mile	posted Route	
R	lural Covington		177	0.83	899	0.16	5.012*	141.685	C029: Ligh	ting Conditions	~
R	lural Morgan		258	1.20	3130	0.57	2.098*	135.045	V Sort by Su	ım of Max Gain	
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						C002: City					

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 Escambia. Almost all of the over representation 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 number of crashes involving drivers who use no restraints is greatly overrepresented in rural 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.





Crash incidents in which no restraints were used are greatly overrepresented on county highways with nearly 2.7 times the expected number of crashes. The proportion of crashes in which restraints were used is greater in state, interstate, federal, and municipal highway areas.

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Order	r: Max Gain 🗸 Descen	ding 🗸 🗆 S	Suppress Zero-Val	ued Rows		S	ignificance: Over	Representation	✓ Threshold:	2.0 🜲
C031	: Locale	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain 🔻	C028: Mileposte C029: Lighting C	d Route onditions	^
•	Open Country	12439	58.04	154366	28.35	2.047*	6362.860	C030: Weather		
	Residential	4751	22.17	106121	19.49	1.137*	573.875	C031: Locale	recent at Time of	Craet
	Playground	8	0.04	194	0.04	1.048	0.364	C032: E Police Police Police Not	tification Delay	Clasi
	Other	135	0.63	3593	0.66	0.955	-6.427	C034: Police Arri	val Delay	
	Manufacturing or Industrial	246	1.15	9449	1.74	0.661*	-125.931	C035: EMS Arriva	al Delay	
	School	198	0.92	9565	1.76	0.526*	-178.497	C036: Adjusted E	EMS Arrival Delay	
	Shopping or Business	3653	17.05	261147	47.97	0.355*	-6626.244	Sort by Sum of M	lax Gain	naye
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	Open	Country Resider	ntial Play	/ground	Other	Manufacturing or Industrial	 School	Shopping or Business		
				CO	31: Locale					

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.

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 or times of day in which more crashes occur with drivers who did not use restraints, and thus, those times in which enforcement would be more fruitful.

3.1 Day of the Week

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C00	6: Day of the Week		Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C001: County C002: City	^
•	Sunday		3082	14.37	49667	9.10	1.580*	1131.219	C003: Year	
	Monday		2748	12.81	82518	15.11	0.848*	-493.076	C004: Month	
	Tuesday		2726	12.71	83338	15.26	0.833*	-547.283	C005: Day of Month C006: Day of the Week	
	Wednesday		2824	13.17	81587	14.94	0.881*	-380.509	C007: Week of the Year	
	Thursday		2818	13.14	84468	15.47	0.849*	-499.666	C008: Time of Day	
	Friday		3392	15.82	99015	18.13	0.872*	-497.032	C009: Data Source	
	Saturday		3857	17.98	65449	11.99	1.500*	1286.347	Sort by Sum of Max Gain	•
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					C006: I	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. Both Saturday and Sunday had about 1.5 times the expected number of crashes involving causal drivers who failed to use restraints.

3.2 Time of Day

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Order: Natural Order V Descendi	ng V	Suppress Zero-V	alued Rows			Significance: 0	ver Representatio	on 🗸 Threshold:	2.0 🜲
C008: Time of Day	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C001: Co C002: Cit	ounty V	^
► 12:00 Midnight to 12:59 AM	808	3.77	5640	1.03	3.647*	586.477	C003: Ye	ar	
1:00 AM to 1:59 AM	703	3.28	4774	0.87	3.749*	515.491	C004: Mo	inth w of Month	
2:00 AM to 2:59 AM	679	3.17	4475	0.82	3.863*	503.235	C006: Da	y of the Week	
3:00 AM to 3:59 AM	590	2.75	3882	0.71	3.870*	437.526	C007: We	eek of the Year	
4:00 AM to 4:59 AM	521	2.43	4429	0.81	2.995*	347.041	C008: Tir	ne of Day	
5:00 AM to 5:59 AM	621	2.90	7742	1.42	2.042*	316.916	C009: Da	ita Source	
6:00 AM to 6:59 AM	651	3.04	13352	2.45	1.241*	126.571	C010. Ru	nar or Orban nhway Classifications	
7:00 AM to 7:59 AM	929	4.33	36293	6.65	0.652*	-496.487	C012: Co	ntrolled Access	
8:00 AM to 8:59 AM	628	2.93	24259	4.44	0.659*	-324.826	C013: E H	Highway Side	
9:00 AM to 9:59 AM	663	3.09	21956	4.02	0.769*	-199.370	C015: Pri	mary Contributing Circur	nstanc
10:00 AM to 10:59 AM	758	3.53	25015	4.58	0.771*	-224.519	C016: Pri	mary Contributing Unit N st Harmful Event	umbe v
11:00 AM to 11:59 AM	814	3.80	31069	5.69	0.667*	-406.303	Sort by Sor	Sum of Max Gain	
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The relative probability of crashes involving no restraints is generally greater before and after standard work and rush hours. Over representation 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.

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 do not use restraints.

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Order	Max Gain 🗸 Descendin	g - C] Suppress Zero-V	alued Rows			Significance: Ov	ver Representation	✓ Threshold: 2.0) 📫
C015:	Primary Contributing Circumstance	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain 🔻	C012: Controlled C013: E Highway	Access Side	^
•	DUI	4928	22.98	13678	2.50	9.173*	4390.766	C015: Primary Co	ontributing Circums	stanc
	Over Speed Limit	1939	9.04	7637	1.40	6.464*	1639.040	C016: Primary Co	ontributing Unit Nur	nbe
	E Aggressive Operation	1051	4.90	3796	0.70	7.049*	901.904	C017: First Harm	iui Event irst Harmful Event F	Relt
	E Ran off Road	1173	5.47	11184	2.05	2.670*	733.724	C019: E Most Har	mful Event	NOT
	E Fatigued/Asleep	939	4.38	9192	1.68	2.601*	577.964	C020: E Distracte	d Driving Opinion	
	Unknown	561	2.62	5648	1.03	2.529*	339.162	C021: Distance to	Fixed Object	
	Driving too Fast for Conditions	1169	5.45	22480	4.12	1.324*	286.049	C022: E Type of F	Roadway Junction/F	Feati
	E Over Correcting/Over Steering	385	1.80	4753	0.87	2.062*	198.315	C023: E Manner C	s Related	
	E Distracted by Use of Electronic	322	1.50	4689	0.86	1.748*	137.829	C025: Crash Sev	erity	
	Traveling Wrong Way/Wrong Side	220	1.03	2233	0.41	2.508*	132.294	C026: Intersection	n Related	
	E Swerved to Avoid Animal	405	1.89	7025	1.29	1.468*	129.078	C027: At Intersect	tion	
	E Ran Stop Sign	248	1.16	4100	0.75	1.540*	86.963	C028: Mileposted	Route	
	E Crossed Centerline	244	1.14	4403	0.81	1.411*	71.062	C029: Lighting Co	onditions	
	Improper Parking/Stopped in Road	69	0.32	803	0.15	2.188*	37.460	C031: Locale		
	E Improper Crossing	32	0.15	73	0.01	11.161*	29.133	C032: E Police Pr	esent at Time of C	rast
	E Crossed Median	23	0.11	263	0.05	2.227*	12.670	C033: Police Noti	fication Delay	
	E Not Visible	14	0.07	56	0.01	6.365	11.800	C034: Police Arriv	al Delay	
	Pedestrian Under the Influence	12	0.06	16	0.00	19 095	11.372	C035: EMS Arrival	I Delay	
	E Wrong Side of Road	20	0.09	231	0.04	2.204*	10.927	C036. Adjusted E	NIS Arrival Delay	~
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				C015: Prin	nary Contributing (Circumstance				

4.1 Primary Contributing Circumstance

Over representation factors indicate that certain risk-taking behaviors are often 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, aggressive operation, running off the road and fatigued/asleep. 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. In the order of maximum gain, these include: DUI, over the speed limit, running off the road, aggressive operation, and over correction. Other overrepresented contributing circumstances include traveling the wrong way, vehicle left in road, running stop signs, driver condition, improper parking, and wrong side of the road.

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Order	Natural Order	✓ Descending		Suppress Zero-V	alued Rows			Significance:	Over Repr	esentation	✓ Threshold: 2.	.0 븆
C208	CU Model Year		Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	^ C	130: E CU 201: CU Ve	Non-Motorist Maneuve hicle Most Harmful Ev	rs ^ ent
•	Older than 1960		8	0.04	15	0.00	13.554	7.410	C	202: CU Co	ontributing Circumstan	ice
	1960-1969		34	0.16	106	0.02	8.151*	29.829	C	203: CU Fii	rst Harmful Event Loca	tion
	1970-1979		176	0.82	925	0.17	4.835*	139.602		204: E CU 205: E CU	Sequence of Events #1	1
	1980		15	0.07	140	0.03	2.723	9.491		205: E CU	Sequence of Events #2	3
	1981		30	0.14	205	0.04	3.719*	21.933	C	207: E CU	Sequence of Events #4	4
	1982		29	0.14	242	0.04	3.045*	19.477	С	208: CU Mo	odel Year	
	1983		47	0.22	359	0.07	3.327*	32.874	C	209: CU Ma	ake	
	1984		97	0.45	652	0.12	3.781*	71.344		210: CU Bo	ody (Passenger Cars C Owners State	Only)
	1985		103	0.48	809	0.15	3.236*	71.166		211. E CU 212: CU Li	cense Tag State	
	1986		151	0.70	1136	0.21	3.378*	106.299	c	213: CU Ve	hicle Usage	
	1987		152	0.71	1216	0.22	3.177*	104.151	C	214: E CU	Emergency Status	
	1988		168	0.78	1716	0.32	2.488*	100.477	C	215: E CU	Placard Required	
	1989		192	0.90	2257	0.41	2.162*	103.189		216: E CU	Placard Status	
	1990		219	1.02	2706	0.50	2.057*	112.521		217. CO H	Hazardous Cargo	
	1991		316	1.47	3410	0.63	2.355*	181.819	c	219: CU At	achment	
	1992		400	1.87	4594	0.84	2.213*	219.230	C	220: CU O	versized Load Requirin	ig Pe
	1993		488	2.28	6170	1.13	2.010*	245.215	C	221: CU Ha	ad Oversized Load Per	mit
	1994		652	3.04	8653	1.59	1.915*	311 511		222: CU C(ontributing Vehicle Def	ect
	1995		709	3.31	11451	2 10	1.574*	258 412		223.003		. *
									<u> </u>	Sort by Sum	of Max Gain	
) 😪 🖉									Displa	y Filter Name	
					2011-2015 Alabar	ma Integrated Cras	h Data					
					C208: (CU Model Year						
	8 —											1
	6 Countries 4 2 0		1986	ألس	1996	ľ			11	2016	- b -a ,	
			1900		1990	208: CLI Model Ve	2006			2016		
						200: CO Model Ye	sdi					

4.2 Vehicle Age – Model Year

Crashes attributed to drivers who used no restraints are greatly overrepresented in vehicles with model years 1960-2002. This might be attributed to the lack of standard safety restraints in the older model vehicles. Vehicles with model years 2003 and later indicate that the numbers involving restraints very significantly surpasses those involving drivers who did not use restraints. 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 at Impact



Speed at impact for crashes in which drivers failed to use restraints is overrepresented in the range of 45-100 MPH. This indicates that crashes in which restraints were 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. It also exacerbates the problem, resulting in greater severity caused by the high-speed, unrestrained situations. Severity factors are considered in the next section.

5 Severity Factors

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 overrepresented in crashes that occurred without the use of restraints. This expected result quantifies 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	.0.7 - [Cross	tab Results -	2011-2015 A	labama Inte	grated Crash	Data - Filter	= Driver NO	T properly Re 🗕 🗖 🗙			
🖡 <u>F</u> ile <u>D</u> ashb	ooard <u>F</u> ilters <u>A</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			_ @ ×			
😵 2011-2015 Alabama Integrated Crash Data 🗸 Driver NOT properly Restrained 🗸 🖓 😨 1/ 1/2011 v 12/31/2015 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				
laterate to	143	310	323	103	464	15	1358				
Interstate	9.24%	6.21%	6.47%	6.40%	5.89%	3.50%	6.33%				
Enderal	250	641	637	214	905	45	2692				
rederal	16.16%	12.84%	12.77%	13.29%	11.48%	10.49%	12.55%				
Cinta	350	996	877	322	1379	88	4012				
Sidle	22.62%	19.95%	17.58%	20.00%	17.50%	20.51%	18.71%				
County	643	2332	2210	441	2824	98	8548				
County	41.56%	46.71%	44.30%	27.39%	35.84%	22.84%	39.86%				
Municipal	156	687	894	510	2137	176	4560				
Municipal	10.08%	13.76%	17.92%	31.68%	27.12%	41.03%	21.26%				
Private Property	5	26	48	20	171	7	277				
r invate r toperty	0.32%	0.52%	0.96%	1.24%	2.17%	1.63%	1.29%				
P Other*	0	0	0	0	0	0	0				
i Oulei	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%				
τοτοι	1547	4992	4989	1610	7880	429	21447				
TOTAL	7.21%	23.28%	23.26%	7.51%	36.74%	2.00%	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.

In a comparison of crash severity in rural versus urban areas for causal drivers who did not use restraints, possible injuries were overrepresented in urban areas. However, in rural areas, fatal injuries crashes with causal drivers who did not use restraints were significantly overrepresented, comprising 70% of fatal injuries.

5.3 Number Injured

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		×
2011-2015 Alabama Integrated Crash Data V Driver NOT property Restrained V S 1/ 1/2011 V 12/31/2015 V		۲
Order: Natural Order V Descending V Suppress Zero-Valued Rows Significance: Over Representation V Thr	eshold: 2.0	÷
C059: Number Injured (Includes Fatalities) Subset Subset Subset Other Percent Percent Odds Ratio Max Gain C053: Number of Percent Odds Ratio C053: Number of Motor C054: Number of Motor	ns Recorded sts Recorded	^
No injunes 8263 38.53 434728 79.61 0.484* -8811.898 C055: Number of Non-III	otorists Record	i I
1 Injury 9479 44.20 80716 14.78 2.990* 6308.702 CO55: Number of Pedes	trians voliete	
2 Injuries 2435 11.35 21348 3.91 2.904* 1596.510 CO58: Number 0 Field CO58: Common Field CO58: Number 0 Field CO58	Von-Fatal)	
3 Injuries 794 3.70 5911 1.08 3.420* 561.832 C059; Number Injured	ncludes Fataliti	
4 Injuries 270 1.26 2072 0.38 3.318" 188.618 C060: Number Killed		
5 Injuries 114 0.53 798 0.15 3.637* 82.657 CO61: Number of Railro	ad Trains	
6 Injuries 53 0.25 260 0.05 5.190* 42.788 CU02: Has Railroad CC	ssing Number	
7 Injuries 22 0.10 119 0.02 4.707 17.326 CO81: E Has Truck Bus	Supplement	
8 Injuries 6 0.03 29 0.01 5.268 4.861 C101: Causal Unit (CU)	Туре	~
9 Injuries 6 0.03 22 0.00 6.944 5.136 v South So		
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2011-2015 Alabama Integrated Crash Data		
C059: Number Injured (Includes Fatalities)		
§ -		
4 Injuries 9 Injuries 29 Injuri	es	
C059: Number Injured (Includes 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. 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 than when the causal driver is restrained. The overrepresentation of multiple injuries in the causal vehicle might also indicate a tendency 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



The proportion of fatalities in general as well as the proportion of multiple fatality crashes is dramatically overrepresented when restraints are not used.

5.5 Driver Ejection Status



Totally Ejected is overrepresented by a factor of over 300 in crashes in which the driver did not use restraints, indicating the cause for many fatalities. Partial ejection, total ejection, or entrapments in the vehicle are expected in crashes in which safety equipment is not properly utilized.

CARE 10.1	1.0.7 - [Cross	tab Results -	2011-2015 A	labama Inte	grated Crash	Data - Filter	- = Driver NC)T properly Re 🗕 🗖 🚩	
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7 0	2011-2015 Alabam	a Integrated Crash D	ata V		Restrained		9 1/ 1/ 1	1/2011 \(\) 12/31/2015 \(\) \(\) \(\) \(\) \(\)	
	2011/2010/14004		310 ·	biller no r property	Hostidiriod		A		
Suppress Zero Values: None 🗸 Select Cells: 🗐 🗸 Column: Crash Severity ; Row: CU Driver Ejection S									
	Fatal Injury	Incapacitating Injury	Non- Incapacitating Inju	Possible Injury	Property Damage Only	Unknown	TOTAL		
Not Ejected or	540	3339	4233	1463	7635	365	17575		
Trapped	34.91%	66.89%	84.85%	90.87%	96.89%	85.08%	81.95%		
Partially Fiected	136	128	65	14	16	2	361		
r dradny Ejected	8.79%	2.56%	1.30%	0.87%	0.20%	0.47%	1.68%		
Totally Fiected	490	836	361	37	44	12	1780		
Totally Ejected	31.67%	16.75%	7.24%	2.30%	0.56%	2.80%	8.30%		
Trapped within	347	579	209	47	27	20	1229	_	
Vehicle	22.43%	11.60%	4.19%	2.92%	0.34%	4.66%	5.73%		
Unknown	3	30	27	6	41	18	125	_	
	0.19%	0.60%	0.54%	0.37%	0.52%	4.20%	0.58%		
Not Applicable	12	52	65	30	107	9	275		
	0.78%	1.04%	1.30%	1.86%	1.36%	2.10%	1.28%		
CU is Not a	19	28	29	13	10	3	102	_	
Vehicle	1.23%	0.56%	0.58%	0.81%	0.13%	0.70%	0.48%		
CU is Unknown	0	0	0	0	0	0	0	_	
	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%		
TOTAL	1547	4992	4989	1610	7880	429	21447	_	
	7.21%	23.28%	23.26%	7.51%	36.74%	2.00%	100.00%		

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.

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 43. In crashes in which safety restraints were used, drivers and non-motorists were far less likely to be injured.

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	🛿 CARE 10.1.0.7 - [IMPACT Results - 2011-2015 Alabama Integrated Crash Data - Driver NOT properly Restrained 🗕 🗖 💌										
E E	ile <u>D</u> ashboard	<u>Filters</u> <u>A</u> naly	sis <u>I</u> mpact I	Locations <u>T</u> ool	s <u>W</u> indow <u>H</u>	<u>H</u> elp					_ 8 ×
V	2011-2	015 Alabama Inte	grated Crash Data	¥ [river NOT properly	Restrained		▼	/ 1/2011 👻 12/31.	/2015 🗸 🔋 🕨	(i)
Order	Order: Max Gain v Descending v Suppress Zero-Valued Rows Significance: Over Representation v Threshold: 2.0										
C107	: CU Driver Raw Age	B	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C107: CU Drive	er Raw Age	
•	13		20	0.10	43	0.01	12.144*	18.353			
	14		47	0.23	120	0.02	10.226*	42.404			
	15		60	0.29	987	0.18	1.587*	22.198			
	16		496	2.38	17246	3.17	0.751*	-164.524			
L	17		744	3.57	18880	3.47	1.029	20.894			
<u> </u>	18		835	4.01	21316	3.92	1.023	18.595			
	19		912	4.38	21683	3.99	1.098*	81.539			
<u> </u>	20		851	4.09	20173	3.71	1.101*	78.372			
	21		869	4.1/	19124	3.52	1.186*	136.549			
	22		864	4.15	1/80/	3.28	1.26/*	181.990			
	23		/00	3.68	16/33	3.08	1.130	07.000			
	24		6/4	3.24	13040	2.77	1.170	112 415			
	25		645	3.12	14010	2.30	1.210	1/9//39			
	27		565	2 71	11910	2.30	1.301	108 846			
	28		556	2.67	11639	2.10	1.200	110 225			
	29		491	2.36	11169	2.05	1.148*	63.226			
	30		509	2.44	10853	2.00	1.225*	93.329 🗸	Sort by Sum of	Max Gain	
	1 5 64 🖉				1	1			Diselau P	Tilter News	
									Uisplay H	niter Name	
					2011-2015 Alaba	ma Integrated Cras	sh Data				
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	0 - 1		3	2		52		72		92	
					C	107: CU Driver Rav	v Age				

Analysis of individual driver ages indicates that crashes involving no restraints are overrepresented in the years above the teen-drivers (age range 19-35). While it appears that 16-18 teenaged 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, in general, they are at least twice the average of the other ages).

6.2 Driver Gender



Males account for about 55% of crashes in which restraints are not used, and they are overrepresented by a factor of 1.292. Since males also do the majority of the driving, they become a clear target for restraint countermeasures.

0.5 Driver Genuer by Severity	6.3	Driver	Gender	by	Severity
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CARE 10.1	.0.7 - [Cross	tab Results -	2011-2015 /	Alabama Inte	grated Crash	Data - Filter	= Driver NO	T properly Re	_ 🗆 🗙	
🚦 <u>F</u> ile <u>D</u> ashb	oard <u>F</u> ilters	<u>A</u> nalysis <u>C</u> rosstał	<u>L</u> ocations <u>]</u>	ools <u>W</u> indow	<u>H</u> elp				_ & ×	
😵 2011-2015 Alabama Integrated Crash Data 🗸 Driver NOT properly Restrained 🗸 <table-cell> 😨 1/ 1/2011 v 12/31/2015 v 👔 🕨 🗊 🌒</table-cell>										
Suppress Zero Values: None 🗸 Select Cells: 🔹 🌳										
	Male	Female	Unknown	Not Applicable	CU is Not a Vehicle	CU is Unknown	TOTAL			
Established	1184	343	0	1	19	0	1547	1		
Fatal injury	7.96%	5.61%	0.00%	10.00%	18.63%	0.00%	7.21%			
Incapacitating	3455	1504	5	0	28	0	4992	1		
Injury	23.22%	24.61%	1.46%	0.00%	27.45%	0.00%	23.28%]		
Non-	3484	1464	11	1	29	0	4989			
Incapacitating Inju	23.41%	23.95%	3.21%	10.00%	28.43%	0.00%	23.26%			
Possible Injuny	1001	590	6	0	13	0	1610			
r ossible injury	6.73%	9.65%	1.75%	0.00%	12.75%	0.00%	7.51%			
Property Damage	5486	2081	296	7	10	0	7880			
Only	36.87%	34.05%	86.30%	70.00%	9.80%	0.00%	36.74%			
Unknown	270	130	25	1	3	0	429			
UNKNOWN	1.81%	2.13%	7.29%	10.00%	2.94%	0.00%	2.00%			
τοτοι	14880	6112	343	10	102	0	21447]		
TOTAL	69.38%	28.50%	1.60%	0.05%	0.48%	0.00%	100.00%			
								-		

When driver gender by severity was studied, data indicate that "Possible Injuries" are overrepresented for female drivers in this type of crash. Generally, the distribution of severity is skewed toward more severe injuries for unrestrained male drivers.

CARE 10.1	.0.7 - [Cros	stab Results -	2011-2015	Alabama Inte	grated Crash	Data - Filter	= Driver NC)T properly Re	– 🗆 🗙	
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6 ⁰	2011-2015 Alaba	ma Integrated Crash Da	ta 🗸	Driver NOT properly	Restrained and Rural	Ŷ	9 1/	1/2011 v 12/31/201	5 v 🔋 🕨 🚯	
Suppress Zero Values: None 🗸 Select Cells: 🔹 🌱 Column: Day of the Week ; Row: Time of Day 👰										
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	TOTAL		
12:00 Midnight to	144	47	44	51	56	53	127	522		
12:59 AM	7.45%	3.07%	3.04%	3.39%	3.70%	2.84%	5.41%	4.30%		
1:00 AM to 1:59 AM	140 7.24%	35	32	2 73%	3/	48	122 5.20%	455		
2:00 AM to 2:59	133	34	21	2.75%	38	50	120	425		
AM	6.88%	2.22%	1.45%	1.93%	2.51%	2.68%	5.12%	3.50%		
3:00 AM to 3:59	111	20	21	19	20	42	129	362		
AM	5.74%	1.30%	1.45%	1.26%	1.32%	2.25%	5.50%	2.98%		
4:00 AM to 4:59	85	24	28	32	30	40	95	334		
5:00 AM to 5:59	4.40%	1.57 %	1.93%	2.13%	1.98%	2.14%	4.05%	2./0%		
AM 10 5.55	4 29%	2 74%	2 14%	2 79%	3.84%	3.21%	3.24%	3.23%		
6:00 AM to 6:59	74	65	53	58	51	51	60	412		
AM	3.83%	4.24%	3.66%	3.86%	3.37%	2.73%	2.56%	3.39%		
7:00 AM to 7:59	38	88	83	78	73	88	56	504		
AM	1.97%	5.74%	5.73%	5.19%	4.83%	4.71%	2.39%	4.15%		
8:00 AM to 8:59	45	48	56	53	39	53	57	351		
AM	2.33%	3.13%	3.87%	3.52%	2.58%	2.84%	2.43%	2.89%		
9:00 AM to 9:59	36	47	55	57	57	56	52	360		
10-00 AM to 10-50	1.86%	3.07%	3.80 %	3./9%	3.//%	3.00%	2.22%	2.36%		
AM AM 10:00	2 17%	3.52%	2 97%	3.52%	3.70%	3 16%	2.90%	3.09%		
11:00 AM to 11:59	57	70	54	56	44	60	70	411		
AM	2.95%	4.57%	3.73%	3.72%	2.91%	3.21%	2.98%	3.38%		
12:00 Noon to	61	58	54	54	70	53	73	423		
12:59 PM	3.16%	3.78%	3.73%	3.59%	4.63%	2.84%	3.11%	3.48%		
1:00 PM to 1:59	71	85	59	63	69	58	98	503		
	3.67%	5.54%	4.07%	4.19%	4.56%	3.10%	4.18%	4.14%		
2:00 PM to 2:59 PM	/6	92	59	91	/0	95	98	581		
2:00 PM to 2:59	3.33%	0.00%	4.07%	0.03%	4.03%	0.00%	4.10%	4./0%		
PM	5.28%	5.94%	7.73%	5.05%	6.68%	5.24%	4.39%	5.62%		
4:00 PM to 4:59	93	99	97	107	82	99	95	672		
PM	4.81%	6.46%	6.70%	7.11%	5.42%	5.30%	4.05%	5.53%		
5:00 PM to 5:59	92	103	109	104	105	97	110	720		
PM	4.76%	6.72%	7.53%	6.91%	6.94%	5.19%	4.69%	5.93%		
6:00 PM to 6:59 PM	100	/9	94	/3	8/	114	116	663		
7:00 PM to 7:59	0.17%	0.15%	0.43%	4.00%	5.75%	0.10%	4.34%	0.40%		
PM	4 40%	5.09%	5 73%	5 65%	4 89%	5.67%	5 33%	5 24%		
8:00 PM to 8:59	84	79	84	78	66	104	132	627		
PM	4.35%	5.15%	5.80%	5.19%	4.37%	5.56%	5.63%	5.16%		
9:00 PM to 9:59	73	78	72	91	100	122	119	655		
PM	3.78%	5.09%	4.97%	6.05%	6.61%	6.53%	5.07%	5.39%		
10:00 PM to 10:59	65	65	52	63	69	129	116	559		
11.00 DM to 11 50	3.36%	4.24%	3.59%	4.19%	4.56%	6.90%	4.94%	4.60%		
PM	2 07%	49	3.59%	3.26%	3.97%	130	5 33%	505 4.16%		
	2.01%	3.20%	0	1	0.07%	4	4	15		
Unknown	0.16%	0.20%	0.00%	0.07%	0.00%	0.21%	0.17%	0.12%		
TOTAL	1933	1533	1448	1504	1512	1869	2346	12145		
TOTAL	15.92%	12.62%	11.92%	12.38%	12.45%	15.39%	19.32%	100.00%		

6.4 Restraints Not Used in Rural Crashes – Times

Crosstab analysis of time of day by day of the week for rural crashes 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 rural areas, pulled out since the severity in rural areas is generally higher.

CARE 10.1	.0.7 - [Cros	stab Results -	2011-2015	Alabama Inte	grated Crasł	n Data - Filter	= Driver NO	DT Properly Re	– 🗆 🗙	
🖳 <u>F</u> ile <u>D</u> ashb	ooard <u>F</u> ilters	<u>A</u> nalysis <u>C</u> rosstab	<u>L</u> ocations	<u>T</u> ools <u>W</u> indow	<u>H</u> elp				_ 8 ×	
¢°	2011-2015 Alabar	ma Integrated Crash Da	ta V	Driver NOT Properly	Restrained AND Ag	e 16-20 🗸 🗸	9 1/	1/2011 v 12/31/201	15 V 🔋 🕨 🚯	
Suppress Zero Values: Rows and Column: Day of the Week : Row: Time of Day 🚱										
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	TOTAL		
12:00 Midnight to	49	9	9	19	14	11	39	150		
12:59 AM	8.46%	2.10%	1.67%	3.68%	2.83%	1.85%	5.69%	3.91%		
AM AM to 1:59	5 70%	164%	2 22%	2.33%	2 22%	2.86%	5.98%	3 47%		
2:00 AM to 2:59	34	10	4	6	6	12	40	112		
AM	5.87%	2.34%	0.74%	1.16%	1.21%	2.02%	5.83%	2.92%		
3:00 AM to 3:59	35	9	4	6	8	11	32	105		
AM	6.04%	2.10%	0.74%	1.16%	1.62%	1.85%	4.66%	2.74%		
4:00 AM to 4:59 AM	24	5	1 20%	4	10	14	2/	91		
5:00 AM to 5:59	4.15%	7	1.30%	11	2.02%	2.30%	3.54%	94		
AM	3.97%	1.64%	1.67%	2.13%	3.23%	1.68%	2.62%	2.45%		
6:00 AM to 6:59	19	12	15	15	4	10	19	94		
AM	3.28%	2.80%	2.78%	2.91%	0.81%	1.68%	2.77%	2.45%		
7:00 AM to 7:59	15	32	39	43	42	42	16	229		
AM	2.59%	7.48%	7.22%	8.33%	8.48%	7.07%	2.33%	5.97%		
8:00 AM to 8:59	11	9	16	13	19	11	11	90		
0:00 AM to 0:50	1.50 %	2.10%	2.30%	2.02%	3.04%	1.60%	1.00%	2.34%		
AM 10 5.55	2 42%	2.80%	2 78%	2 71%	3.03%	2.36%	2 04%	2 55%		
10:00 AM to 10:59	17	15	19	15	15	15	29	125		
AM	2.94%	3.50%	3.52%	2.91%	3.03%	2.53%	4.23%	3.26%		
11:00 AM to 11:59	21	14	17	24	11	14	18	119		
AM	3.63%	3.27%	3.15%	4.65%	2.22%	2.36%	2.62%	3.10%		
12:00 Noon to	24	17	20	25	20	17	26	149		
12.551 M	4.15%	3.9/%	3./0%	4.84%	4.04%	2.86%	3./9%	3.88%		
PM	3.45%	20	20 4.63%	3.88%	3.64%	3.20%	30 5.10%	4.09%		
2:00 PM to 2:59	23	23	26	42	29	26	21	190		
PM	3.97%	5.37%	4.81%	8.14%	5.86%	4.38%	3.06%	4.95%		
3:00 PM to 3:59	37	45	63	35	43	48	26	297		
PM	6.39%	10.51%	11.67%	6.78%	8.69%	8.08%	3.79%	7.74%		
4:00 PM to 4:59	20	27	33	47	28	45	33	233		
E-00 DM to E-E0	3.45%	6.31%	6.11%	9.11%	5.66%	/.58%	4.81%	6.0/%		
5:00 PM to 5:59 PM	3.63%	631%	9.63%	44 8.53%	46 9.29%	6.23%	4.37%	6.70%		
6:00 PM to 6:59	33	25	34	22	24	37	33	208		
PM	5.70%	5.84%	6.30%	4.26%	4.85%	6.23%	4.81%	5.42%		
7:00 PM to 7:59	24	23	23	21	20	33	32	176		
PM	4.15%	5.37%	4.26%	4.07%	4.04%	5.56%	4.66%	4.59%		
8:00 PM to 8:59	22	28	32	19	30	27	26	184		
	3.80%	6.54%	5.93%	3.68%	6.06%	4.55%	3./9%	4./9%		
9:00 PM to 9:59 PM	3.80%	24 5.61%	26 4.81%	26	29 5.86%	40 6 73%	33 4 81%	5.21%		
10:00 PM to 10:59	20	16	20	17	17	42	43	175		
PM	3.45%	3.74%	3.70%	3.29%	3.43%	7.07%	6.27%	4.56%		
11:00 PM to 11:59	18	12	20	15	20	42	43	170		
PM	3.11%	2.80%	3.70%	2.91%	4.04%	7.07%	6.27%	4.43%		
Unknown	0	0	0	1	0	0	1	2		
	0.00%	0.00%	0.00%	0.19%	0.00%	0.00%	0.15%	0.05%		
TOTAL	5/9	428	540 14.07%	516	495	594	686 17.87%	3838		
	13.03%	11.10%	14.07.76	10,44%	12.50%	10.40%	17.07%	100.00%		

6.5 Restraints Not Used Causal Driver Age 16-20 – Times

Crosstab analysis of specific times of day by day of the week for crashes in which the causal driver was between the ages of 16-20 also help target specifically problematic times in which younger drivers are more likely to get into crashes. The most consistently overrepresented times include early morning hours on weekend days.

CARE 10.1	.0.7 - [Cross	tab Results -	2011-2015	Alabama Inte	grated Crash	n Data - Filter	= Driver NO	T properly Re	· — 🗖	×
🛃 <u>F</u> ile <u>D</u> ashb	ooard <u>F</u> ilters	<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 ×
6 °	2011-2015 Alaban	na Integrated Crash D	ata 🗸	Driver NOT properly	Restrained and Age	21-25 🗸 🗸	💡 🌇 1/ 1	/2011 y 12/31/20	15 🗸 🔋 🕨	۲
Suppress Zero Values: None 🗸 Select Cells: 🖘 🌱 Column: Day of the Week ; Row: Time of Day 👰										
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	TOTAL		
12:00 Midnight to 12:59 AM	45 7.22%	15 2.14%	26	16	18	16	43 5 90%	179		
1:00 AM to 1:59	48	11	10	16	15	2.00%	5.80%	173		
2:00 AM to 2:59	7.72%	2.31%	2.14%	3.59%	2.92%	3.78%	7.01%	4.53%		
AM	11.09%	3.35%	1.93%	2.24%	2.92%	2.52%	7.14%	4.87%		
3:00 AM to 3:59 AM	41 6.59%	5	7	10	10	23	67 9.03%	163 4.26%		
4:00 AM to 4:59	38	14	5	15	9	16	50	147		
5:00 AM to 5:59	6.11% 34	2.94%	1.07%	3.36%	21	2.88%	6.74%	3.85%		
AM	5.47%	3.14%	1.71%	2.02%	4.09%	3.24%	4.99%	3.72%		
6:00 AM to 6:59 AM	4.34%	24 5.03%	2.57%	4.71%	3.51%	3.06%	20	3.64%		
7:00 AM to 7:59	20	21	24	26	17	24	16	148		
8:00 AM to 8:59	13	4.40%	23	17	10	4.32%	18	107		
AM	2.09%	3.14%	4.93%	3.81%	1.95%	1.98%	2.43%	2.80%		
9:00 AM to 9:59 AM	9	3.77%	4.07%	4.71%	3.90%	2.34%	2.16%	3.04%		
10:00 AM to 10:59	12	19	13	10	21	20	17	112		
11:00 AM to 11:59	1.93%	3.98%	2.78%	2.24%	4.09%	3.60%	2.29%	2.93%		
AM	1.93%	3.14%	4.07%	3.36%	4.48%	2.34%	2.96%	3.11%		
12:00 Noon to 12:59 PM	21 3.38%	3.14%	21 4.50%	3.59%	27 5.26%	21 3.78%	3.23%	145 3.79%		
1:00 PM to 1:59	17	18	17	23	28	14	18	135		
2:00 PM to 2:59	2./3%	3.77%	3.64%	5.16% 25	5.46%	2.52%	2.43%	3.53%		
PM	3.38%	5.66%	5.35%	5.61%	5.07%	5.05%	3.23%	4.60%		
3:00 PM to 3:59 PM	23	31 6.50%	33 7.07%	17	22	34 6.13%	29 3.91%	189 4.95%		
4:00 PM to 4:59	26	29	31	28	34	25	17	190		
5:00 PM to 5:59	4.18%	6.08% 37	6.64%	6.28%	6.63%	4.50%	2.29%	4.9/%		
PM	4.02%	7.76%	6.85%	5.16%	7.80%	6.31%	3.91%	5.78%		
6:00 PM to 6:59 PM	26	2/	35	28 6.28%	33 6.43%	36 6.49%	32 4.31%	21/ 5.68%		
7:00 PM to 7:59	21	24	17	26	20	32	27	167		
8:00 PM to 8:59	3.38%	5.03%	3.64%	5.83%	3.90%	5.//%	3.64%	4.3/%		
PM	3.22%	4.19%	3.64%	2.91%	4.29%	3.96%	5.26%	4.00%		
9:00 PM to 9:59 PM	2.57%	22 4.61%	24 5.14%	4.93%	26 5.07%	26 4.68%	31 4.18%	167 4.37%		
10:00 PM to 10:59	21	21	18	19	18	46	33	176		
11:00 PM to 11:59	3.38%	4.40%	3.85%	4.26%	3.51%	8.29%	4.45%	4.60%		
PM	2.57%	3.35%	4.71%	4.26%	3.90%	5.41%	3.64%	3.92%		
Unknown	1 0.16%	2 0.42%	0.00%	1 0.22%	0.00%	0.00%	0.13%	5 0.13%		
TOTAL	622	477	467	446	513	555	742	3822		
	10.27 %	12.48%	12.22 %	11.0/ %	13.42 %	14.02 %	13.41%	100.00%		

6.6 Restraints Not Used Causal Driver Age 21-25 – Times

Crosstab analysis of specific times of day by day of the week for crashes in which the causal driver was between the ages of 21-25 also help target specifically problematic times in which drivers in a different age range are more likely to get into crashes. The most consistently overrepresented times include early morning hours on weekend days and afternoon hours on weekdays.

7 Analysis of Ejection

In the IMPACT outputs that follow, the red bars represent those who were ejected; the blue bars, those not ejected. This analysis is not by crash and driver as was true of those above; rather, it is counting all occupants of the vehicles who were either ejected of not ejected.





The analysis above tells us how much the probability of ejection increases when not properly restrained. The probability of a occupant of a vehicle being ejected when properly restrained is 6.85%, which is about one in 15. The odds ratio for no restraint used is over 30, indicating that the non-restrained person is over 30 times more likely to be ejected than those who are properly restrained.



7.2 Severity Increase with Ejection

The probability that an ejected occupant is killed is close to 200 times that of an occupant that is not ejected. While not nearly as high an multiple, the two higher injury classifications are also much higher. The Incapacitating Injury classification is increased over 20 times, and the Non-Incapacitating Injury classification increases by a factor of about 7.



8 Analysis of Back Seat Occupants

Back seat occupants who are not properly restrained have over 16 times the probability of being killed as do those who are properly restrained. The other highest two severity classifications are also greatly increase, although not by as great multipliers: 4.164 for Incapacitating Injury and 2.509 for Non-Incapacitating Injury.

Looking at the numbers, over the five year period there were 413 back seat occupants killed, which is about 82 per year. Question: how many of these would have been saved had they been properly restrained? Applying the 0.34% to the total unrestrained as opposed to the actual 5.48% yields 25.63 total fatalities, which would mean that the total fatality savings over the five years would have been 387 fatalities, a saving of 77 lives per year.

9 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, Jackson, Escambia, Cullman and Blount.
 - 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 (worse) areas are the rural county areas in Walker, Mobile, Cullman, and Escambia Counties.
 - The most underrepresented (best) cities are Montgomery, 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 was the only roadway classification that was 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 specific target groups (see below).
- 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 1960-2002, 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 overrepresented on interstate and state roadways. "Possible Injuries" were overrepresented on municipal highways.
 - Analysis of injuries shows that the proportion of injuries (including fatalities) in unrestrained driver crashes is overrepresented from 1 to 6 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 16-35).
 - Male drivers account for a majority of crashes in which restraints are not used, and they are overrepresented by a factor of 1.32.
- 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.
- Ejection and Back Seat Analysis

- The non-restrained person is over 30 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 77 lives per year.

End of Attachment B