Mitigating the Problem of Young Driver Risk-Taking

David B. Brown, PhD, P.E.
brown@cs.ua.edu

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Preface

Much of the content of this report might be controversial in that it deals with recommendations made to parents and professionals. It has been said that "all advice is implied criticism," and we feel this may be the perception of some, although that is the last thing that is intended. Hopefully all readers of this report will recognize that no group and no individual on this earth today is perfect, and thus we should all continuously pursue improvement.

That being the case, we wish to apply that principle to this report. We ask that anyone who sees anything in this report can be improved, please contact its author, Dr. David B. Brown, with the recommendations by e-mail at:

brown@cs.ua.edu

Recommendations for improvement can be general – web links to articles are welcomed. They may also be quite specific, especially if you feel that a given recommendation presented here is in any way counterproductive. We pledge to do our best to make corrections and improvements in this document so that the best possible information is available now and in the future. This will remain a living document as long as it is on SafeHomeAlabama.gov. Please indicate within the e-mail if you have any reservations about our indicating that a given recommendation came from you. We will only do that with your explicit permission in the e-mails you send.

Introduction

The goal of this report is the improvement of traffic safety by mitigating young-driver (aged 16-20) risk-taking. We recognize that there is a wide range of problematic risky behaviors in addition to, or separate from, risk-taking while driving. A significant number of young people are identified and in need of *direct help* to address serious problems, such as maltreatment, neglect, substance abuse, crime, gang or youth violence, truancy, suicide/self-harm, runaway tendencies, sexual exploitation/abuse, and/or other issues. Any of these problems may emanate from the family or the peer group of the young people involved. They all affect society in general, and most of them, if not addressed, will ultimately cause great harm to the young people affected. While there is a good chance that many of the recommendations given in this report can address some of these very problematic issues, the primary intent of this study was to present countermeasures that will mitigate the problems of *young driver risk-taking*.

By excluding direct consideration of these other very severe issues, we are not saying that they are less important than behavior while driving. We fully recognize that young drivers who have a history of such problems also have a tendency to contribute to an increased likelihood of their causing crashes. However, we do not want to interfere in any way with programs that address these serious issues directly. Also, the use of traffic safety resources in such areas could be counterproductive in three ways: (1) they might involve professionals who do not have expertise in the relevant particular behavioral area, and thus work at cross purposes with the more effective targeted programs; (2) they could take resources away from more effective countermeasures that address traffic safety directly, and (3) they might distract from the central issue that we wish to address here: the young risk-taking driver.

It is very important that the Traffic Safety Community whole-heartedly support all efforts in resolving youth risky behaviors, for it is obvious that if young people and their support groups see and understand the downsides of extreme risk-taking in general, this will have a residual beneficial effect on traffic safety when they get to a driving age. As an example, a young driver who is resolved to rejecting the risks of taking drugs (including alcohol) in general will have a good chance of also understanding and avoiding the dangers of speed, driving without proper restraints, etc. The assistance that young people receive from any of these positive behavioral therapies will generally result in a positive effect on resisting their tendency toward risk-taking while driving.

To illustrate the differentiation of driving and other types of risks by an example, our demographic studies (see C121, C122 and C123 in Appendix B) showed that well under 2% of crashes caused by young drivers involved drug or alcohol abuse (now called Impaired Driving or ID). While we do not intend to minimize the consequences of this small number of crashes (some of which involved fatalities) it is clear that the vast majority of risk-taking of young drivers in Alabama is not the result of substance abuse. And yet, substance abuse in the general population of young people (within or outside of Alabama) is a serious problem that must be addressed per se.

It is the goal of this report to demonstrate other areas of risk-taking that are involved and that can be addressed by recommendations found in the literature. While the more serious behavioral problems in youth may have a very detrimental effect on how certain young people drive, many who are not affected by any of these serious issues in a major way (i.e., requiring intervention) *still engage in risky driving behaviors*. These will be given primary concern here in the proposals for youth driving risk mitigation.

In the report that follows, reference numbers will generally appear in parenthesis in the narrative. These numbers form the Word section heading for the major section "Internet Page Web Links." This was done to enable readers to use Word navigation to access the references very quickly in order to generate the source document referenced.

Definition of the Problem

Teenagers are three to four times more likely to die from risk-taking and accidents (vehicle crashes and other types) than non-elderly adults due to lapses in judgment and illogical decision-making (12). This has not only been established well and reported in the literature, but these findings are well established by special studies based on data from crashes within Alabama for which young drivers (aged 16-20) are stated to be the causal drivers by the reporting officers. These results obtained from a study in 2017 have been well documented (20), and readers are encouraged to review this foundational study before going on. However, it is important that we do not see the *consequences* of young driver behavior are the source of the problem. These are only symptoms and indicators of a much deeper rooted problem that has much subtler causes.

To get closer to the source of the problem, the following was obtained primarily from reference (3):

"Practitioners have long been familiar with the hormonal changes and physical developments of puberty, but more recently, magnetic resonance imaging (MRI) has cast new light on the workings and development of the living brain, providing neurological evidence for why risky behaviors increase in adolescence." The key points of this part of the article follow:

- The brain does not become fully developed until about the age of 25. Prior to that, to the degree that it is not yet fully developed, teenagers are hampered in their ability to reason and think logically.
- Added to this is the increased release of dopamine to subcortical reward centers in the immature brain (see also 16). This encourages attractions to new and immediately exciting experiences, which produce sensation-seeking. This tendency has been found greater in males than in females.
- The limbic system is a part of the brain structure that is slow in maturing. Among other functions, it exercises control over emotions, behavior and motivation. Being of immature development in most teenagers, it does not prevent them from relying on their more primitive reactions to emotions (often called "gut reactions").

- This natural combination of rewards and lack of restraints makes younger drivers more prone to engage in dangerous risk-taking behavior, and they are not sufficiently able to interpret emotions without some intervention from a trusted authority figure.

Why is it that teens are so much more susceptible to peer influences? According to an article in Psychology Today, "… brain imaging studies have shown that several areas of the brain make adolescents more sensitive to the rewards of peer relationships than adults. This motivates teens to focus on their peers in decision-making situations that involve risky behavior" (9). This is traceable to the fact that teens are more distressed when they do not get support from their peers. This would tend to explain the reason that teen drivers take more risks when in the presence of multiple peer passengers. It is not that they do not understand the potential harm of taking risk, it is just that they place greater priority on social approval (16).

Attempts to provide teens information in this regard could be counterproductive (for some), giving them a desire to engage on what are pointed out to be the riskiest of behaviors. At best "Studies from the Centers for Disease Control's Youth Risk Behavior Surveillance find that teaching students about the objective risks, of such things as drug use or unprotected sex, does not lower their likelihood of doing them to any large degree" (16).

This defines and illustrates the problem, and our literature searching has found no medical or psychiatric methods being considered to correct it. Unfortunately, this has led to a "why bother?" attitude among some in the Traffic Safety Community, since they can see nothing that can solve this problem. However, there are many who see approaches to reducing the effects of this problem in a variety of ways. Thus, the remainder of this report will talk about *mitigating* the problem, as opposed to *solving* it. A number of proposals will be given to be considered by those who are concerned (including the young drivers themselves). These will be organized in the next section by the entities that we feel are in the best position to implement the countermeasures, namely *Family, Schools, Peer Groups, Legislation and Law Enforcement, and the Traffic Safety Community*. Two appendices are given after that. The first summarizes the analytics findings for the demographics of 16-20 year-old drivers in Alabama who have caused crashes over the past five years (2014-2018). The second gives the analytics details upon which these summary statements are based.

Proposals for Problem Mitigation

The proposals for youth risk-taking mitigation come almost totally from high level summary reports in the open literature. The reference number is given for each of the recommendations; so to get more information or further background for any recommendation, please click the URL given for that reference number in the Internet Page Web Links section. Most of these will contain additional references to refereed journal articles, which also provide context and background for the recommendations.

A question might be asked as to the reason that we do not cite the original refereed journal study sources as our references. There were a number of reasons for this decision: (1) in many case these original scholarly studies are not readily (if at all) available on the Internet; (2) for anyone who is interested in the more intricate scholarly studies, their references are immediately available in the articles that are given; (3) these original source studies are often quite complex, and they are generally written for other researchers, as opposed to the research summary articles that target those who are quite interested but do not have detailed expertise in the subject areas; (4) often the refereed journal articles deal with such a limited and specialized subject as to be of little use to many readers; and (5) the summary studies that we reference are generally quite readable and practical, and they often contain much more real-world advice than what we give here.

The recommendations below are organized according to the entities that would be expected to implement the recommendation *(Family, Schools, Peer Groups, Legislation and Law Enforcement, and the Traffic Safety Community)*. Some of the same recommendations might be found under more than one of these entities. There should be no inference that a countermeasure is given in only one reference, or that the articles are in any way mutually exclusive. In the following section, the link reference is given in brackets [] generally at the end of each paragraph, although in some cases the link will be to a quotation. Brackets were used so that they would not be confused with other uses of parenthesis within the narratives.

Family

Family here is primarily parents; however, the influence of concerned siblings and other relatives (e.g., aunts, uncles, grandparents, guardians, etc.), as well as "extended family" members could be instrumental as well.

1. Parents and other mentors must recognize that the logical process in their own minds is quite different from that of a young person. As an extreme example, telling a young person how dangerous an activity is could actually increase the extreme risk-taker's desire to give that activity a try. Those seeking thrills in risk might want to experience and survive the worst possible risk. In this regard, the communication to be applied to mitigate risk-taking should be quite measured and planned out (with consideration of the suggestions below), as opposed to emotional outbursts that often characterize attempts at parent to children communications. [1]
2. Typically, most teens have egocentric view of the world, and they will display general agreement with family members on the consequences of risky behavior. However, in their minds they may be thinking, "these are things that ONLY happen to other people." Since teen traffic tragedies are quite common, it could be useful to take advantage of such events. A sincere personal statement like "If I caused something like that I am not sure I could live with myself" if stated honestly might cause the young person to identify with the parent, if not the victims of the crash. Contrast this with the authoritative example: "See, I told you that would happen!" which puts the young person on the defensive thinking: "hey, that crash was not my fault." Examples must involve people who are as close to being like the target young person as possible to maximize identification, and it may be

better to show demonstrations of sympathy for the victims and their relatives as opposed to using such events as object lessons. [1]

3. Early intervention into developing self-control is quite important. Some research has determined that self-control is malleable up to the age of ten to twelve, but clearly waiting to the driving age is not apt to be nearly as effective. It can be improved to some extent by socialization, but this takes it largely out of the hands of parents. [3]
4. For family support to be effective in reducing risk-taking tendencies, it must provide: (1) structure, (2) limits, (3) rules, (4) monitoring, (5) predictability, (6) supportive relationships with family members, and (7) clear expectations for behavior and values. Where these items might be in conflict with each other, good judgment for balance and optimization is essential. This is a warning against going to extremes with any of these recommendations. [6]
5. Demonstrate your real concern for your kids and for their friends. Do not be afraid to show your emotions in this regard, since their response to a risk-taking opportunity will generally be an emotional one, as opposed to a logical one. The emotion should be one of love and concern as opposed to anger. They will remember your real concern if it is genuine. If things are not going well in a discussion, let it go and try again later. Do not feel compelled to win every argument, or to succeed in every try. You might have to lose a few battles to win the war. [1]
6. Risk-taking is essential to obtaining a healthy maturity in adulthood. Parental isolation of their children from all risks is both unhealthy and impossible. It is critical that parents do not view the freedom that they give their children as being an all-or-nothing proposition. Rather, it is like many other things that require balance and optimization. This is not an easy task, but just recognizing the problem is the first step to improvement. It is recommended that parents take a negotiated stance that is neither overly restrictive nor un-protective. As important is their not giving mixed messages, while recognizing that the maturing process will require continuous allowance and modification for more freedom as they age. Yes, it is not easy. [2]
7. Generally, authoritative parenting is favored over parental non-intervention. Such is "characterized by a healthy bond and loving relationship between parent and young person, while the parent upholds high expectations and clear boundaries." This style of positive parenting can be learned, and it leads to higher self-esteem and a subjective sense of well-being. The primary key is the trust that the young person has for the parent, and the recognition that disciplinary measures are for their benefit. [3] "Be a part of your kids' lives, openly communicating with them starting at a young age, attending their events and knowing who their friends are." [11] The details in both of these articles [3 and 11] are highly recommended.
8. At this age, the car keys may be the last vestige of discipline that parents have over their children. Teens must be recognized at this point as agents in control of their own lives, and thus given this opportunity to fail. Considerable judgment is required to balance this with strict discipline if it is obvious that they are rapidly moving in a self-destructive direction. When this action (taking the keys) is implemented, the young drivers should

have a complete understanding of the parents' reasons for it, and hopefully redirect themselves toward more positive behavior. The time and conditions of the restriction should be reasonable, depending on the individual and the offense. [3]

9. Parents can have a strong effect over the choice of peer group for younger teens. The extent to which these peer groups will continue to influence them as they reach the 16-20 age of driving depends to a large extent on the peer group environment that is maintained throughout these ages. There is no greater influence on a teen-ager's behavior than their peer group. People, and especially young people, become like their peer groups, and behavior can usually only be modified by a change in this environment. There is strong evidence that peer groups influence risk-acceptance, "whether in the quest for social identity or kudos, for escapism or thrill, or simply to fit in." [2] See Peer Groups below.
10. The following are topics for parental actions to improve adolescents' judgments while their "executive functions" are still under construction: (1) give responsibilities; (2) engage in mutual, albeit non-directive, goal planning; (3) involve in critical analysis for major family decisions; (4) build self-control; (5) prioritize and plan ahead. [12]
11. It is important that the parental approach mature with the teen, often resulting in a far different approach with those approaching 16 than with younger teens. An in-depth study by TeenMentalHealth.org cited the following differences: (1) Beginning to recognize their part in fulfilling adult responsibilities; (2) Increased role in positive family dynamics; (3) Increased ability to make decisions independently; (4) Increased ability to express thoughts, ideas, and emotions; (5) Generally, a decreased concern with appearance (both physically and behaviorally); (6) Increased self-assurance; (7) Decreased incorporation of peer values; (8) Improved problem solving skills; (9) Strengthened sense of personal values. Obviously, most of these attributes are quite positive, and parents need to take full advantage of their benefits. While they are stated as generally true, allowance must be made for individual exceptions. [13]
12. Recognize the impact of nonverbal communication, e.g., tone of voice, facial expressions, body position, etc. The following are tips given to improve communication: (1) Listen, (2) Don't interrupt, (3) Be aware not only of what you say but of how you say it, (4) If he/she is getting upset, ask them to explain what they thought you said – often it can be quite different from your intent, (5) Follow up with the question: "Is everything OK?" since there could be issues outside of your conversation, (6) Speak clearly (think before you talk and choose your words carefully), (7) Assure you understand by restating anything you interpret to be an issue, (8) Give the reasons for your position, (9) Allow the presentation of his/her reasons and show that you understand them and are giving them full consideration, (10) Stay calm – do not allow your emotions to overcome your self-control, (11) Feel free to take a "time out" so both of you can get some space; think it over, and come back later to try again to resolve any major issues, (12) Do not feel compelled to win the argument; it is far better to lose an argument but agree on the right course of action to take. [13]
13. A summary of a scholarly study provided four suggestions to parents: (1) provide environments to create safe activities that focus on young teens' need for sensation-seeking, e.g., rock climbing, hiking, hunting, fishing, off-road biking, go-karting, kayaking, etc.,

things that ideally provide both excitement and social relationships; (2) limit risky behavior by supervising teens' interactions with peers and providing rules for peer interactions; (3) learn about and enforce graduated driving laws – see GDL under Legislation and Law Enforcement below; and (4) "For older adolescents, parents can consult with teens about peers to build on their growing ability to self-regulate;" and (5) "encourage them to identify and develop strategies for navigating peer situations where risky activity is likely to occur." [9]

14. Another article that encouraged a degree of risk taking as a countermeasure reasoned that risk-taking is a natural part of adolescent development. While not promoting behavior that has a high probability of causing harm, the premise is developed that too much squelching of risk taking can be detrimental to healthy development. The article was developed mainly for boys, but it does have a qualifier at the end stating that much of what is said applies to many girls as well. Stated are five high level principles to build motivation and promote healthy risk taking: (1) Don't instantly "go to no;" (2) Provide "training wheels," figuratively referring to easing into the riskier activities; (3) Let them make mistakes; (4) Be his/her ally; (5) Trust them. These articles are recommended to round out parents' view of risk-taking by showing its positive effects. [14] [15]
15. Elicit discussion from the young person. For example, get them to explain the reason that their risk-taking acquaintance is now in the hospital. Why do you think that happened? Where did they go wrong? Be non-directive, but be extremely positive and rewarding when they "hit the nail on the head." Do not argue with them if they exhibit a "this could never happen to me" attitude. They may well be trying to put you at ease, or to say that they will not be taking such risks. News articles demonstrating the consequences of youth-risk-taking occur at fairly frequent intervals. Try again when the opportunity arises, but *do not let this be the only time you give them a chance to express themselves.* They catch on fast. So, engage them frequently in explaining to you a whole range of things that are of interest to them. Be interested in all of their life – not just when they are in danger. [1]
16. One study involving a large number of participants proposed that the reduction in general risk taking by young people since the 1980s (something that we found measured only in the UK) was the result of improved parenting practices. "It may be that better relationships with parents, and improved parental monitoring and supervision are part of the explanation for declining risk behaviors." Although this correlation was difficult to quantify, to a large extent this hypothesis was consistent with most recommendations given above. [4]

Schools

There are very few of the principles expressed above that will not prove useful to those in the school systems that are trying to lead teens away from risk taking, and the principles above should be reviewed by those in the school systems. Those which follow were chosen because they seem especially applicable to the formal school environment.

1. Because of the immaturity of certain parts of the brain (discussed above), adolescents have limited ability to favor delayed rewards over the immediate gains, which is one of the things that makes risk-taking so attractive. The design of approaches to motivating young people must take this into account. Consider, for example, immediate significant monetary rewards for driving without receiving a ticket, perhaps sponsored by the insurance industry, as opposed to (or in addition to) a reduction in the future cost of insurance. [3]
2. A number of programs have been developed for improving self-control within the formal school system, and these should be explored and utilized fully by school officials. The importance of applying these programs at an early age cannot be over-emphasized. After the age of about ten or twelve, such programs drop in effectiveness. Early intervention with statements toward their ultimate application to driving could have a very lasting and positive effect. The seeds need to be planted early. [3]
3. One study recognized that those most likely to be engaging in harmful risk behaviors are often the most disengaged from voluntary participation in service. While this correlation does not necessarily imply causation, it does serve to provide a proxy for identifying potential future problem individuals. Youth involvement in service to their school or fellow students is a type of risk, and it might satisfy a need that is otherwise perceived to be gratified only by risky behavior. [4]
4. Schools can have a positive influence in promoting the following protective factors: emotional self-regulation, high self-esteem, good coping skills, and problem-solving skills. Considerable value was seen in positive mentoring within the school systems. Reduction in risk-taking was also proposed to follow from the "engagement and connections in two or more of the following contexts: at school, with peers [assuming a positive peer group – see below], in athletics, by part time employment, involvement in religion, and a generally positive culture. Schools were seen as a means for providing such opportunities for engagement. [6]
5. Seek available resources to assist in group efforts to reduce risk-taking. As one example, consider the printable worksheets for risk taking mitigation. This is just one example of potential risk-reduction tools. We are not recommending any specific tool, but encourage school officials to survey the many that are available. Any that might be adopted should be given intensive scrutiny since some of the content might be viewed as permission for a level of risky behavior that could be counterproductive. [8]
6. "Essentially, the curriculum in high school needs to be more affective. It needs to be more engaging in terms of humor, vitality, joy, and even negative emotions, like strong opinions and anger, to bring out those qualities and channel them, so that they aren't expressed in dangerous ways outside of school. … Why don't we have students engaging in more apprenticeships and more internships, which can be a wonderful way to help them build decision-making skills and work through emotions in a real-world but controlled setting? Teens want to be out in the world—in fact, that's what evolution has prepared them for. … The biggest challenge is to create an environment in the classroom and school that matches those negative risks outside the classroom with positive risks or environmental factors, to cancel out some of the power of

what's going on outside the classroom." We strongly recommend that all educators read this entire article. [10]

7. A consensus report from a high-level conference on this subject recommended that school programs in this regard incorporate "ways to recognize and develop healthy relationships with friends and romantic partners beginning early in adolescence, and help students find social benefits from "positive risks, such as leading class discussions or tackling challenging projects." [16]

Peer Groups

1. Peer groups can create a major risk factor within themselves for the individuals involved. However, if properly chosen, they can become a major protective factor. A significant question is: "who chooses them." Parents can have a large influence through the mid-teens, but once a driver's license is acquired, there is little doubt that most young people will do their own choosing. If a good foundation was established, and the younger children make life-long friends, this could impact their choice of peer group right through their older teens and early 20s. [3]
2. Clearly with age, the influence of the family decreases, and the impact of peers becomes increasingly significant. A major question that the young driver should ask of his/her peer group is: do you really care about my welfare, or am I just satisfying your quest for entertainment? When it is possible, shifting young people away from negative social associations and towards more protective networks could be of great value in reducing risk-taking tendencies. The problem is that, as they approach the age of driving, such a shift must come from the young people themselves, since at this age they are practically beyond parental control with regard to peer group selection. [3]
3. Peer groups have become increasingly on-line as opposed to the need for direct participation in a group. In a group study done in the UK, "some attendees felt that it may be simply that other activities have replaced these 'traditional' risk behaviors. For instance, if children and young people are spending more time online or in structured extra-curricular activities, then they will have less time and opportunity to participate in traditional risk behaviors." The fact that some on-line games are addictive indicates that they can emulate that activities they are simulation, and produce a risk-taking sensation within themselves. If allowed at the younger ages, this may become quite difficult for parents to control as their children mature. [4]
4. If young people can satisfy their risk-taking instincts by harmless computer games that simulate risk taking, this could have a positive effect. On the other hand, some of the extreme computer games have been blamed for various anti-social behaviors. The degree of participation in computer games might be something that could be influenced by parents and schools at the younger ages, but much study needs to go into it before programs are launched one way or the other, and these studies must consider the degree that such effects carry over into the 16-20-year-old age group One study in the UK affirmed that "the increased popularity of computer games has not coincided with an increase in violent crime among young people." This is mentioned as a consideration at this point recognizing that the entire subject requires major study within itself. [5]

5. Something more is required than just convincing younger drivers that certain behaviors are likely to cause crashes, and that any given crash could end up with that driver (and others) being disabled for life or killed. It is a good assumption that they are already well aware of this reality and they have been schooled on it many times. "Risky driving behaviors occurred *even among young drivers who perceived the behaviors as risky*; that is, knowing a behavior was risky did not stop some young drivers from engaging in that behavior." Emotional involvement is necessary. One suggestion was to get a peer group leader (it might be someone older, even a coach) to get the group to close their eyes and visualize what would happen if they were to hit a pedestrian or kill a sibling in a crash. The group leader needs to pick a situation that fits the group. For example, if some have been speeding in the parking lot near younger kids, the visualization of their killing one of the might be considered. After the exercise, the leader could pull out his/her keys and get the group to associate the visualization experience with their own keys. "When you look at your keys to start your car, if you relive this experience, *it will not happen.* But if it is the furthest thing from your mind, then chances are, it will be driving as usual." This can only be pulled off by someone for whom they have considerable respect. [7]

Legislation and Law Enforcement

A study in the UK found that risk-taking trends had a small but significant downward trend over the past ten to 15 years. The study group speculated that specific policy interventions, like the more effective enforcement of under-age drinking laws could result in such an effect. Such can be determined by comparing any new or increased enforcement with other targets for which it is not being applied (as controls). For example, it seems of little doubt that the reason that substance abuse is not a problem with the 16-20 drivers in Alabama is the 21 age of drinking law. Interestingly, seatbelt laws have also proven quite effective among most young people (more so than with older drivers). [4] Recommendations in this section will discuss the potential for legislation and law enforcement to mitigate the youth risk-taking tendencies.

1. There is general agreement within the Traffic Safety Community that Graduated Drivers Licensing (GDL) systems are effective in reducing the crash rate of novice drivers. Their advantage is that many of the requirements are *protective* as opposed to requiring a change in the risk-taking attitude of the young driver. While the overall approach of GDL is not questioned, determining the relative effectiveness of each of the many features of these systems is highly problematic because they are rarely implemented individually. The following is a list of such, that appears to be fairly comprehensive, from an Australian publication [7a]:
    - Minimum license holding periods – novice drivers would have to abide by the restrictions of their current license prior to moving to the next higher level. A crash or citation could require that they not move up for another trial period.
    - Mandatory minimum supervised driving hours at the Learner Permit level. This does no good unless parents support it.

- Maximum speed restrictions. New technology might be able to monitor this, but it is not generally available now.
- Blood alcohol limits to zero effective BAC.
- Hazard perception testing. The problem is no looking ahead far enough to anticipate potential problems so that when they do materialize it is often too late to do anything about them.
- High-powered vehicle restrictions.
- Towing restrictions (preventing this of novice drivers).
- Night time hour restrictions (e.g., to half hour before sunrise and after sunset).
- Passenger restrictions (number and ages). "Drivers aged 16-17 were shown to be at increased risk per mile driven of being killed in a crash when carrying young passengers, and the risk increased further as the number of young passengers increased." [18, 19]
- Mobile phone restrictions. Not just texting – any use of a mobile phone while driving can occupy that part of the brain that is needed for effective driving, even when the driver might not be otherwise distracted.

Careful study and evaluation must be applied if these various features are to produce optimum results, recognizing that the goal is to isolate the young driver from the corresponding increased risk associate with each of the restrictions. [7a]

2. Selective enforcement for younger drivers. GDL laws are of little use unless there is an effective enforcement program to assure that compliance is being attained. The selective enforcement programs in Alabama typically focus on speed, substance abuse and restraints. When a young driver is found to be in violation of these or any other violations, the officer should determine and cite any GDL violations that are detected. These citations should be given as wide publication as they legally can in order to demonstrate to younger drivers that GDL is real. Reducing a young driver to a lower graduation could also be quite effective if successfully publicized. [21]
3. Selective enforcement should address the greatest causes. The three most critical risky behaviors that must be addressed when it comes to young-driver caused fatalities include the following:
    - Speeding [4.1 times the average fatality rate],
    - Late night crashes between 9PM, and 5AM [3.8 times average], and
    - Multiple younger aged, i.e., 13-19, passengers [1.4 times average].

    To further demonstrate the critical issue of speeding: "… the fatality rate of non-motorists [typically pedestrians] in crashes where the teen driver is speeding is almost eight times that in crashes involving a teen driver obeying the speed limit. Obviously, strict enforcement of the speed laws coupled with feedback to the GDL process would be quite effective. (17)
4. Seatbelt laws. The enforcement and promotion of seatbelt laws has been a major success story in Alabama. Contrary to young people's risk acceptance in other areas, their use rate of restraints is significantly higher than that of older drivers (see C323 in Appendix B below). The reported use rate for younger drivers was 95.87%, while it was only 90.22% for older drivers. When the risk-taking factor of speed was involved, however,

their rate went down to 90.43%, (see C323 for crashes involving speeding), which was significantly below the older drivers. This demonstrates that multiple risks are often taken simultaneously – something that CAPS research has found to be true for drivers of all ages. If the reasons for the effectiveness of ID and restraint laws can be determined, they might be leveraged into reducing other risky behaviors. There can be little doubt that enforcement has played a major part in this success.

Traffic Safety Community

We are not going to provide a checklist for the Traffic Safety Community because all of the items above are relevant, and we do not wish to minimize the importance of any of them. The first step is for those who are involved and concerned with traffic safety in general (what we are calling the "Traffic Safety Community") to become as familiar with the proposed countermeasures as their available time might permit. Most are probably already part of one or more of the involved entities discussed above. If not, familiarity can be attained by first reviewing what is given above, and then delving down further by reviewing the summary reports to which these countermeasures are linked. If possible, we urge those interested to take a further step, and that is to investigate the references that are given within these summary reports.

Of course, knowing the issues and the proposed mitigation countermeasures is not going to solve these problems unless they are translated into action. For the most part members of the Traffic Safety Community are not the primary people who interact with young drivers (or those approaching this age) unless they are also primary players (called *involved entities* above). We have divided the primary players (i.e., those who directly interact and influence young people in the relevant age groups) into four groups: Family, Schools, Peer Groups and Legislation and Law Enforcement, recognizing that many members of these groups also participate in traffic safety in general.

If not in one of these four groups, the role of the Traffic Safety Community is to communicate with those who are. Let them know what the experts are saying along these lines and that it should not be viewed as a lost cause. Encourage them to read this study on SafeHomeAlabama.gov. There are actions that can be taken to mitigate young driver risk taking. Such actions in other areas of risk taking have proven to be successful, and to the extent that the same tactics can be used in traffic safety, similar results can be anticipated.

Finally, as indicated in the Preface of this report, we encourage everyone who is involved to read this article critically and to provide feedback on any way you feel it can be improved.

Internet Page Web Links

The following are also given as section heading to facilitate access via Word's navigation bar.

1. Young people, risk-taking and improving risk communications to adolescents; Youth and Policy.
https://www.youthandpolicy.org/articles/young-people-risk-taking/

2. Young People, Risk Taking and Risk Making: Some Thoughts for Social Work1); Forum, Qualitative Social Research.
http://www.qualitative-research.net/index.php/fqs/article/view/56/115

3. Research in Practice; Strategic Briefing
https://sscb.safeguardingsomerset.org.uk/wp-content/uploads/2016/06/CSE-Risk-taking-adolescents-and-child-protection.pdf

4. What is happening to children and young people's risk behaviors? UK Assets Publishing Service.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/452059/Risk_behaviours_article.pdf

5. Risk behaviors and negative outcomes. UK Assets Publishing Service.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/452169/data_pack_risk_behaviours_and_negative_outcomes.pdf

6. Risk & Protective Factors. Youth.gov.
https://youth.gov/youth-topics/substance-abuse/risk-and-protective-factors-substance-use-abuse-and-dependence

7. Does risky driving behavior increase young drivers' risk of crashing? George Institute, Australia.
https://www.youngdriverfactbase.com/the-issues/behaviour1/

7a. Why have different laws for new drivers? George Institute, Australia.
https://www.youngdriverfactbase.com/the-issues/summary1/

8. Risk Taking Behavior. PrintableWorksheets.in.
https://printableworksheets.in/worksheet/risk-taking-behaviour

9. Why Are Teen Brains Designed for Risk-taking? Psychology Today.
https://www.psychologytoday.com/us/blog/the-wide-wide-world-psychology/201506/why-are-teen-brains-designed-risk-taking

10. Honoring the Teen Brain: A Conversation with Thomas Armstrong. Educational Leadership.
http://www.ascd.org/publications/educational-leadership/may19/vol76/num08/Honoring-the-Teen-Brain@-A-Conversation-with-Thomas-Armstrong.aspx?utm_source=twitter&utm_campaign=Social-Organic&utm_medium=social

11. Teen Safety: What Every Parent Needs to Know. Dinner Table MBA.
https://dinnertablemba.com/teen-safety/

12. Risk-taking and the Teen Brain. Parent Toolkit.com
https://www.parenttoolkit.com/social-and-emotional-development/news/responsible-decision-making/risk-taking-and-the-teen-brain

13. Understanding Teen Behavior. TeenMentalHealth.org
http://teenmentalhealth.org/learn/teen-behaviour/

14. Encourage Risk-Taking. Your Teen (two web pages).
https://yourteenmag.com/health/teenager-mental-health/how-to-motivate-boys

Raising Positive Risk Takers. Your Teen
https://yourteenmag.com/health/teenager-mental-health/raising-positive-risk-takers

15. Teen Risk-Taking: Tips for Parents. MyHealth.Alberta.ca
https://myhealth.alberta.ca/Alberta/Pages/teen-risk-taking-tips-for-parents.aspx

16. The Teen Brain: How Schools Can Help Students Manage Emotions and Make Better Decisions. Education Week.
https://www.edweek.org/ew/articles/2018/10/10/the-teen-brain-how-schools-can-help.html?preview=1&user_acl=0

17. Assessing Fatality Rates in Crash Involvement for Motorists and Non-Motorists in Teen Driver Crashes by Risk Factor. AAA Foundation for Traffic Safety.
https://aaafoundation.org/wp-content/uploads/2018/10/FINAL-_18-0658_AAAFTS-Everyones-at-Risk-Brief_1010-1.pdf

18. Teen Driver Risk in Relation to Age and Number of Passengers. AAA Foundation for Traffic Safety.
https://aaafoundation.org/wp-content/uploads/2018/01/TeenDriverRiskAgePassengersReport.pdf

19. Characteristics of Fatal Crashes Involving 16- and 17-Year-Old Drivers with Teenage Passengers. AAA Foundation for Traffic Safety.
https://aaafoundation.org/wp-content/uploads/2018/01/2012FatalCrashCharacteristicsTeenDriversAndPassengersReport.pdf

20. Analysis of the Most Critical Factors in Young (16-20 Year Old) Driver-Caused Vehicle Crashes. SafeHomeAlabama.gov.
http://www.safehomealabama.gov/wp-content/uploads/2018/12/Young-Driver-IMPACT-2011-15-2016-Update-v03.pdf

21. GDL Compliance and Enforcement During Intermediate License Phase. Children's Hospital of Philadelphia, Center for Injury Research and Prevention.
https://injury.research.chop.edu/teen-driving-safety/gdl-compliance-and-enforcement-during-intermediate-license-phase

Appendix A. Demographics Summary of "Young" Alabama Causal Drivers

The purpose of this section is to convey a clear understanding of what subset of drivers we are talking about in using the term *young drivers*. While the age of these drivers is 16-20, the demographic analysis performed did not consider all such drivers. It only considered those who caused the crashes under consideration. The analysis, called IMPACT within CARE, automatically compares all attributes for any two subsets. In this case the test subset were causal drivers within the age range of 16-20 (inclusive), and the control subset includes all drivers aged 21 and greater and those 16-20 drivers who did not cause the crash. In order to see the effect of risk on the results, these comparisons were done for all crashes and for speed crashes, since speed is the best proxy that we have found for risky behavior. These comparisons, the relevant ones of which are given in the Appendix B of this report, enabled all key differences between the two subsets to be easily identified and, if significance was found, to be subjected to further analysis.

The discussion that follows in this section will summarize the characteristics that are especially associated with or contrasted to risk-taking. Very little discussion will be given to the fact that younger drivers are more prone to take risks, since an extremely large number of research results have confirmed this conclusion, including one special study conducted by CAPS entitled "Analysis of the Most Critical Factors in Young (16-20 Year Old) Driver-Caused Vehicle Crashes" that can be accessed here: Young Driver Issues. In this regard, we have found that speeding is a good proxy for risk taking. This will be discussed in more detail with regard to attribute C107, both in the summaries below and in the detailed IMPACT displays. Generally there is a high correlation in speeding with other risky behaviors, such as failing to use restraints, impaired driving and distracted driving.

The following attributes were run by CARE/IMPACT to get insight into young driver demographics. They are ordered and numbered corresponding to the IMPACT display in Appendix B.

- C107 CU (Causal Unit) Driver Raw Age of Young Drivers. The young drivers under consideration are ages 16-20 years inclusive. There was a fairly large increase in their crashes through age 18, followed by a leveling off for ages 19 and 20.
- C107 CU Driver Raw Age for Crashes that Involve Speeding. Speeding is a proxy for risk-taking in general, and we will use it in many of the comparisons below to gauge youth risk-taking, i.e., to see what difference there is when risk-taking is involved. This display shows that the younger ages 16-17 are more apt to have crashes that involve speeding, and so we conclude that the inclination to take risks generally diminishes with age, a result supported by most research into risk-taking.

Note: in the "speed involved" IMPACT comparisons that follow, the red will be young drivers' crashes where speed was a factor (red bars) compared against (blue bars) this same age group where speed was not cited as a contributing factor. If the comparisons are not indicated to be

"speed involved" then the comparison is between the 16-20 year-old drivers (red bars) and those who are older (blue bars).

- C107 CU Driver Raw Age for all Vehicle Crashes (2014-2018). As explained in the narrative under the display, the 16-20 are dramatically over-represented in the number of crashes, and while inexperience might be one explanation, the evidence is very strong that their willingness to accept risk plays a larger part in causing these crashes. Some of this evidence is introduced in the next display.
- C107 CU Driver Raw Age Restricted to Speeding Related Crashes. This provides a direct comparison of speed-related crashes against those that are not speed-related. Clearly, the young drivers have proportionately more speeding related crashes, which is a measure of the willingness to take risks. See the blurb under this IMPACT display below for more information.
- C003 Year of Crash. The comparison here is between the younger (16-20) drivers and all older drivers by year. CY2015 was significantly over-represented for the younger drivers, but they became significantly under-represented in 2017 and 2018. We do not see this to be the start of any trend unless it continues for at least a few more years into the future.
- C008 Time of Day. The time of day shows considerable concentration before and after school, with general over-representation after the PM rush hours and under-representation in the early morning hours when drugs and alcohol are the expected cause.
- C008 Time of Day for Crashes that Involve Speeding. There is a dramatic change in the overall time distribution when crashes are limited to those involving speed (indicating risk taking). The later evening hours as well as the late night/early morning hours are now over-represented. As expected and demonstrated by the next display, the heavy concentration around the weekends.
- C008 Time of Day by Day of the Week for Youth Speed-Involved Crashes. Party times; early Saturday and Sunday, and late Friday and Saturday nights, as expected. The interaction of social influences is quite important in attempting to reduce risk taking.
- C010 Rural or Urban. In the general case the rural-urban mix is about as expected, the comparison being the younger drivers (red bars) against all other drivers (blue bars).
- C010 Rural or Urban for Youth Crashes that Involve Speeding. Again, there is a dramatic change for speeding, and proportion of youth speeding-involved crashes in the rural areas is about 2.634 times what is expected compared to the younger drivers' non-speeding crashes. The rural roadways tend to facilitate the ability to speed, but this still shows the tendency toward risk-taking when the opportunity presents itself.
- C011 Highway Classification. In the general case, the County and State roads are significantly over-represented by young driver crashes as compared to older drivers.
- C011 Highway Classification for Crashes that Involve Speed. This comparison reflects the rural shift to both County Roads (that are now showing 2.728 times expected), and Interstates, which were under-represented in the general comparison. We can conclude in general that risk-taking does not occur in the general locations; that is, there is a relationship between the Highway Classification and the inclination to take risks.

- C015 Primary Contributing Circumstance (PCC) Over-Representations. Very few of the over-represented PCCs are not associated with risk-taking. Most of them are directly related to speed. Some of them, such as Misjudge Stopping Distance, could be attributed to inexperience. The combination of inexperience and risk acceptance is a major multiplier of young driver crash numbers.
- C015 Primary Contributing Circumstance (PCC) Under-Representations. From a culture and demographic point of view, the most important finding here is that of DUI. Only 1.33% of the crashes are assigned to this cause. While it should not be totally ignored, this does demonstrate that the problem of risk-taking is not going to be solved by eliminating the alcohol and other drug problems in the young-driver population. This is a very important finding, since considerable traffic safety resources could be expended chasing after this relatively small proportion of crashes, with minimal hope of actually impacting the small number. Substance abuse is a problem killing teens in and of itself, and it is being dealt with by a number of programs, all of which, if successful, will have a positive impact on traffic safety.
- C020 Distracting Driving Officer's Opinion. Younger drivers would naturally be more computer literate and most of them would never be caught without their cell phone. It is no surprise that we see them significantly over-represented in the electronic communication and other device items. Given this cultural attribute, the use of their own electronic devices in formulating countermeasures must be considered. There are a number of apps that parents can install that prevent driving while using the cell phone. In addition, messages to discourage the use of electronic devices while driving can be smartphone based.
- C025 Crash Severity. Young people use protective equipment to a greater degree, and being younger, they tend to be more resilient to injuries. The probability of any crash having one or more fatalities in 0.37%, which is 1 in 270 as compared to the general probability of 0.60%, which is 1 in 167. The number 433 (fatal injuries) might seem relatively small, but we must remember that the source of these fatal crashes is a mere five-year age span. There is only one other five-year span that is higher than this, which is 21-25, with 459, which probably drives twice the mileage as the 16-20 group. The next one down is 26-30 with 427, and the number goes down almost linearly with age. On a per-mile basis, the 16-20 age group is producing more fatal crashes than any other five-year group.
- C025 Crash Severity for Crashes that Involve Speed. The important finding with regard to speed related crashes is that the probability of any given crash being fatal more than triples to 1.23% (1 in 81). Alabama crash data has established that the probability of any crash being fatal doubles with every 10 MPH increase in impact speed of (starting at 40 MPH). Clearly the other two most severe crash types also increase by very large factors.
- C033 Locale. Since the timing of most 16-20 age driver crashes is before and after school, their over-representation in school zones is not surprising. Note, however that the number is only 3661 (3.14%), so the high over-representation does not tell the entire story. Much can be observed just by arranging the frequencies in raw numerical order, which produces the following (worst-first): Shopping or Business, Open Country, and Residential, all of which are close to an order of magnitude larger than School.

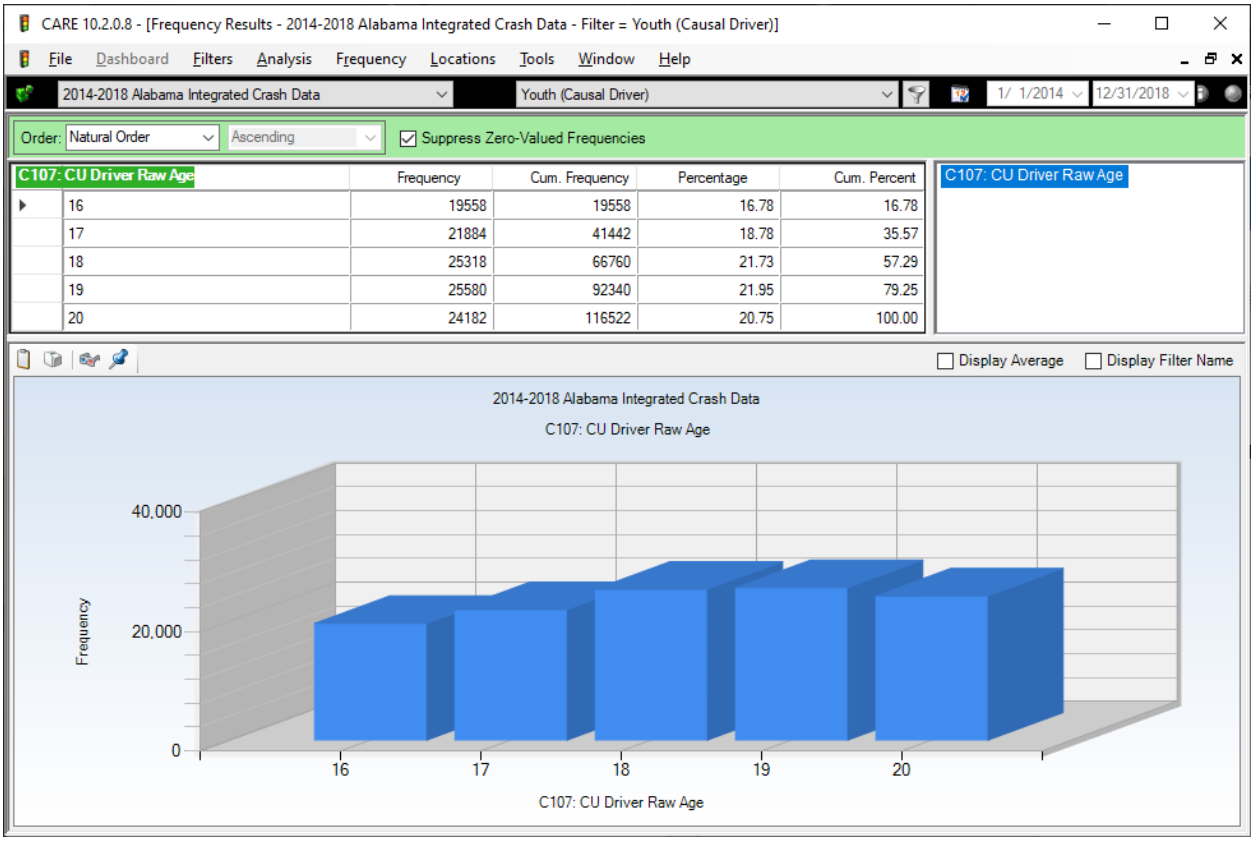
- C033 Locale for Crashes that Involve Speeding. Here again we have a dramatic change in the direction of rural areas. This change in the locale of the crashes is indicative of those who might live in the rural areas being more inclined to accept risks.
- C108 CU Driver Race. These are lined up by frequency -- -note that African Americans are significantly under-represented in the16-20 age driver group when compared to their proportion in the older subset. White/Caucasian is the only race that is significantly over-represented.
- C109 CU Driver Gender. We conclude that the over-representation of females is due to their general lack of experience compared to that of males. This can be determined by further analysis that shows over-representation in such areas a misjudge stopping distance, and a generally small proportion of crashes involving risk.
- C109 CU Driver Gender for Crashes that Involve Speeding. Males are over-represented when the comparison involves speed. This validates what is generally stated in the literature: that males are more inclined to take risks than are females.
- C110 CU Driver Residence Distance. As would be expected, the younger drivers tend to do their driving within 25 miles of home, as compared to older drivers.
- Potential Substance Abuse. These three attributes confirm the Primary Contributing Circumstance (C015) above. Effectively, substance abuse is a relatively small part of the traffic safety problem.
    - C121 CU Driver Condition.
    - C122 CU Driver Officer Opinion Alcohol.
    - C123 CU Driver Officer Opinion Drugs.
- C226 CU Vehicle Damage. Considering all young driver crashes, the proportion of Major and Disables indicates that their vehicles sustained significantly greater damage.
- C227 CU Vehicle Towed. The proportion towed confirms the findings of C226.
- C323 CU Driver Safety Equipment. Younger drivers do exceptionally well with the proper use of restraints, which probably goes a long way to accounting for their good survival rate. Shoulder and Lap Belt Used is at 95.87% for young drivers as opposed to 90.22% for the older drivers. The only deficiency seems to be the relative few that were wearing DOT-Compliant Motorcycle Helmet, depending on the number that were driving motorcycles. C101 Causal Unit Type shows that 409 causal units were motorcycles, and thus, the proportion with the proper motorcycle helmet was 301/409=74%. This is not particularly good, but it is more realistic than the "Subset Percent" of the IMPACT.
- C323 CU Driver Safety Equipment for Crashes that Involved Speeding. The presence of speed is indicative of risk taking in other areas, a failure to use proper restraints.
- C328 CU Driver Injury Type. These results are quite comparable to C025.
- C328 CU Driver Injury Type for Crashes Involving Speed. As would be expected, the increased speed causes considerable increased severity.
- C409 CU Traffic Control. No passing zone violations are exceedingly risky, especially on two-lane roads (e.g., County Roads).
- C409 CU Traffic Control for Speed Related Crashes. No passing zones are especially violent when speed is involved.

Appendix B. Analytics for Demographics of Alabama Young Causal Drivers

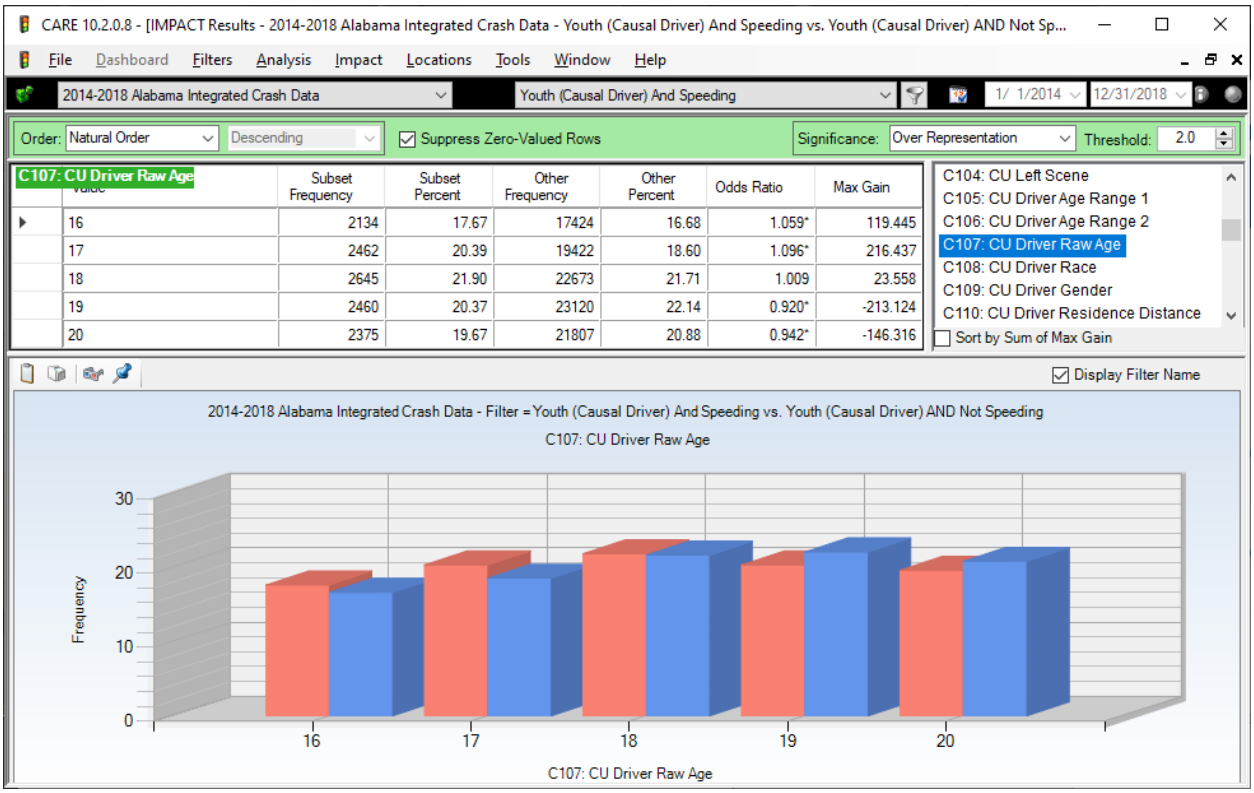
Definitions:

- Young or youth indicates drivers of age16-20.
- Causal Drivers – driver of the unit that the reporting officer indicate was most likely to have been the major cause of the crash.
- Data under consideration: Calendar Years 2014-2019.
- The "Crashes that Involve Speeding" comparisons are between *young people* whose crashes involve speeding (red bars) and *young people* whose crashes do not involve speeding (blue bars).

C107 CU (Causal Unit) Driver Raw Age of Young Drivers



C107 CU Young Driver Raw Age for *Crashes that Involve Speeding*



The "Crashes that Involve Speeding" comparisons are between young people whose crashes involve speeding (red bars) and young people whose crashes do not involve speeding (blue bars). The sum across all of the comparisons will give the total number of young driver crashes, which from above is 116,522. While a relatively small proportion of these involve speed, the proportion is large enough to provide an indication of what values of the attribute are most influenced by risk taking in general. In this case, the 16 and 17 year olds are over-represented, there is no significant difference for the 18 year olds, and the 19 and 20 are under-represented. This tends to confirm the theory that the older drivers have improved brain development, a characteristic that continues at least until age 25.

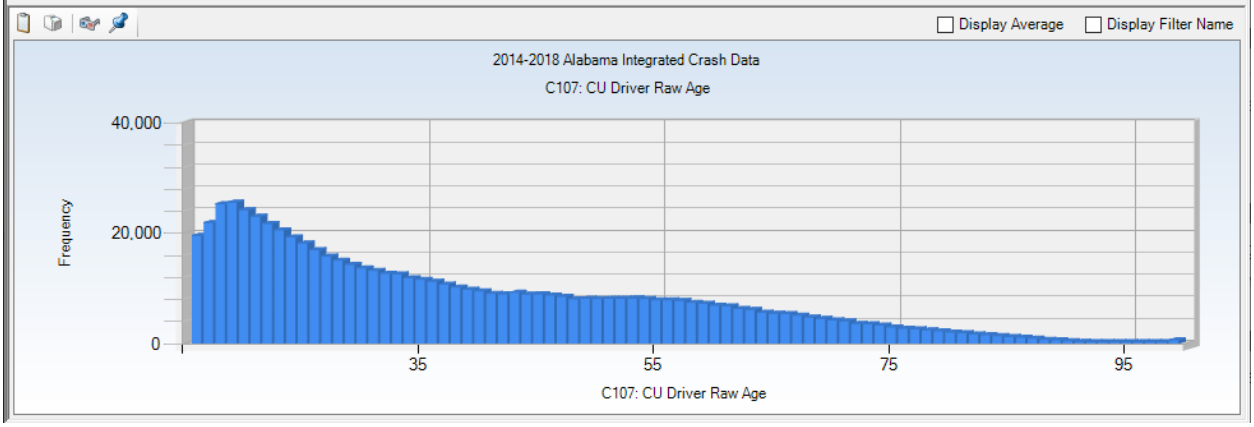
C107 CU Driver Raw Age for all Vehicle Crashes (2014-2018)

2014-2018 Alabama Integrated Crash Data | All records (do not apply a filter) | 1/ 1/2014 | 12/31/2018

Order: Natural Order | Ascending | Suppress Zero-Valued Frequencies

C107: CU Driver Raw Age	Frequency	Cum. Frequency	Percentage	Cum. Percent
16	19558	19558	2.93	2.93
17	21884	41442	3.28	6.21
18	25318	66760	3.79	10.00
19	25580	92340	3.83	13.83
20	24182	116522	3.62	17.46
21	23015	139537	3.45	20.91
22	21699	161236	3.25	24.16
23	20542	181778	3.08	27.23
24	19251	201029	2.88	30.12
25	18163	219192	2.72	32.84
26	16956	236148	2.54	35.38
27	15800	251948	2.37	37.75
28	15018	266966	2.25	40.00
29	14286	281252	2.14	42.14
30	13621	294873	2.04	44.18
31	13203	308076	1.98	46.16
32	12656	320732	1.90	48.05
33	12556	333288	1.88	49.93
34	11823	345111	1.77	51.71
35	11543	356654	1.73	53.44

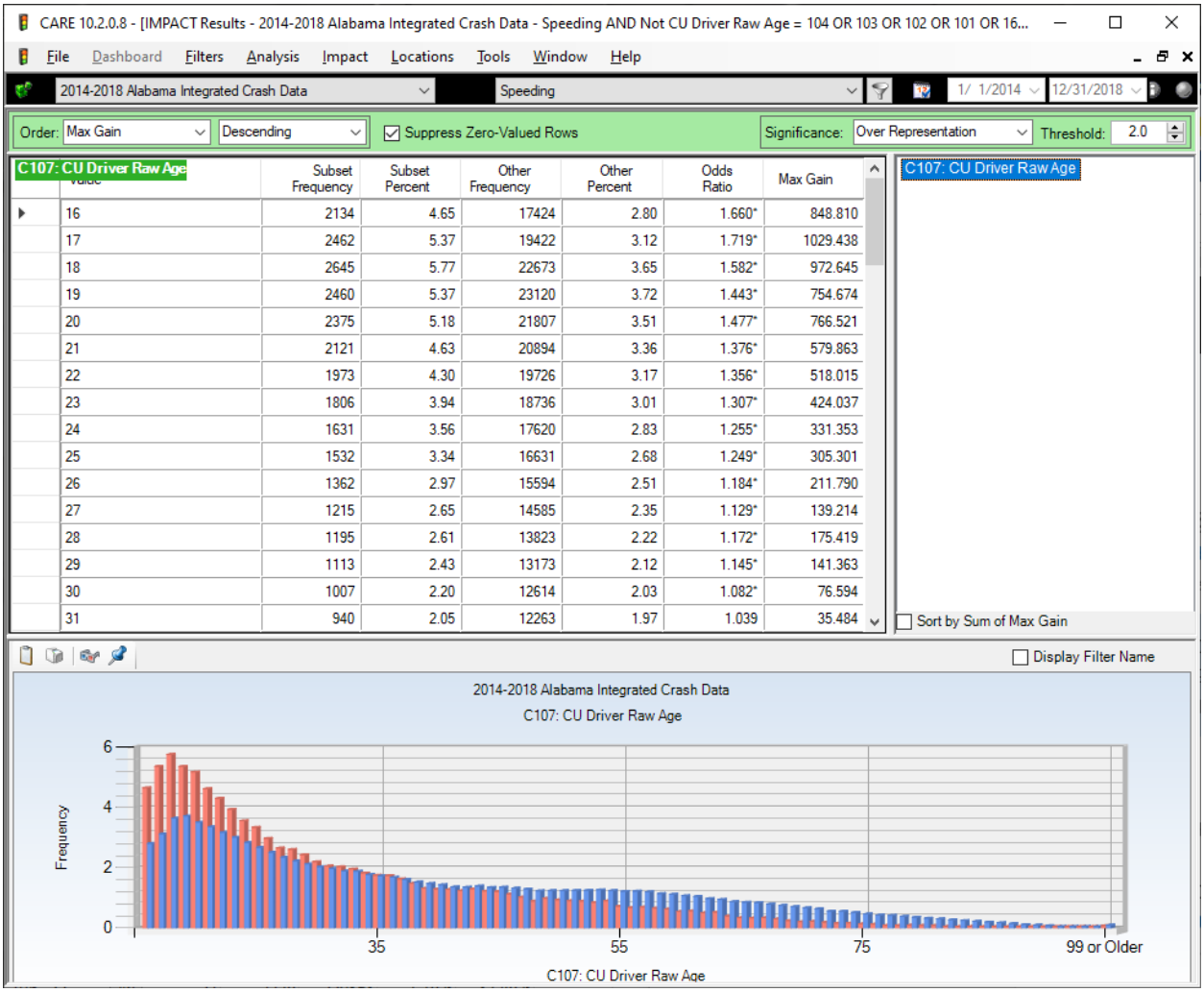
C107: CU Driver Raw Age



The total number of crashes that qualify (ages known, motor vehicles, etc.) over the five years of the study (2014-2018) is 667,448. This averages to 7946 per each age for all ages. The number of crashes for each of the ages 16-20 is 23,304, which is almost three times the expected from all age groups. Assuming the number of drivers in the 16-20 group might be higher than those 51 and older, we could compare their average against that for 21-50, which is 12,596 for each year, as compared to the 23,304 for the 16-20, a comparison that show they are 1.85 times the number of crashes that would be expected. Recognizing that there are many professional drivers and regular commuters in this 21-50 age group, there is no way that it can be rationalized that the 16-20 over-representation is due to a larger number of miles driven.

C107 CU Driver Raw Age Restricted to Speeding Related Crashes

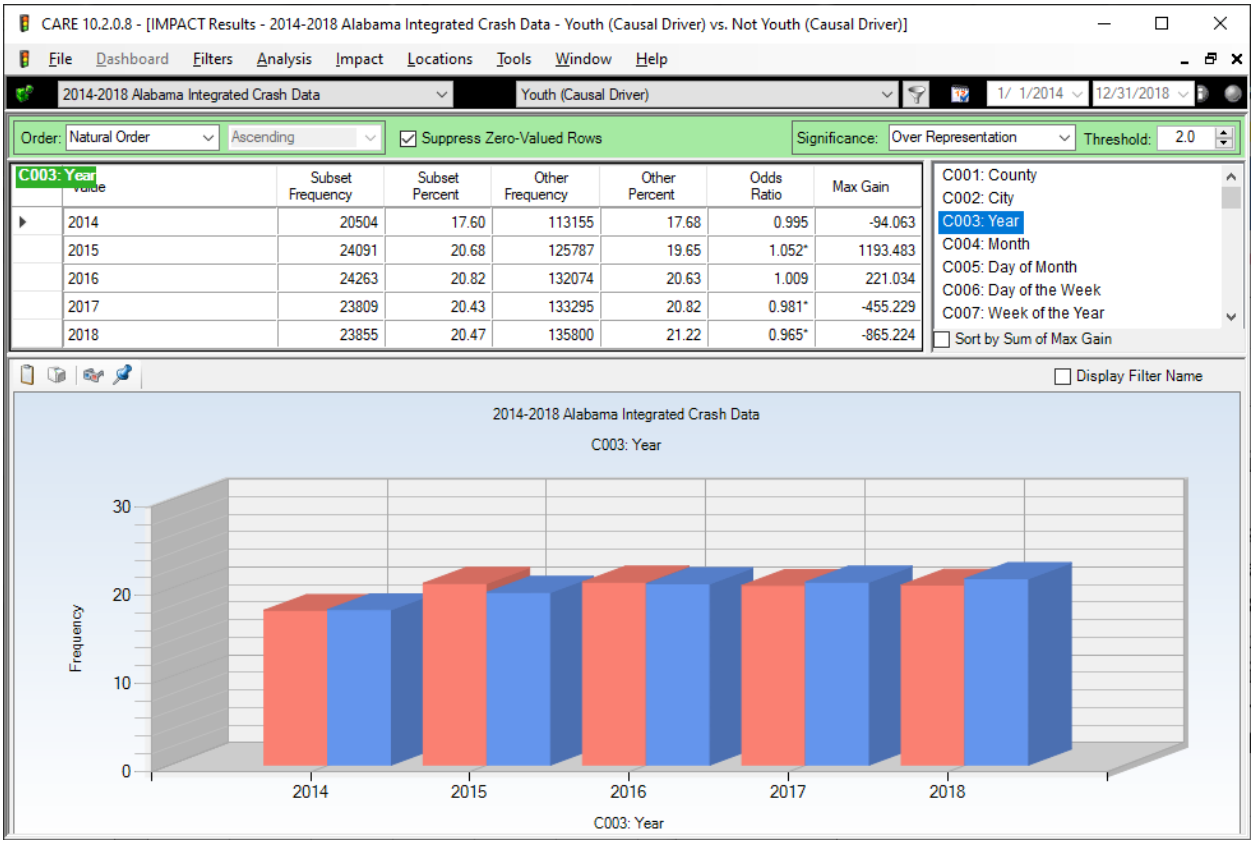
Speed is a proxy for risk taking. Following compares Speeding with Non-Speeding crashes.



Red bars are the proportions of speeding crashes; the blue bars are those crashes that did not involve speeding. The 16-20 age group is higher than expected even in the blue bars, as shown in the frequency analysis immediately above. However, this effect is multiplied for them when the comparison is of speeding involved crashes. The Odds Ratio gives the value of this multiplier; for 16-20 it is 1.660, 1.719, 1.582. 1.443 and 1.466, respectively. These ratios only drop to 1.249 for 25 year olds, but after that there is a large drop to 1.082 for 30 year olds. This is still statistically significantly higher than the non-speeding proportion, which is not significantly higher after age 30. Clearly the 16-20-year-old drivers are taking more risks in their speed, which is a proxy for risk taking in general.

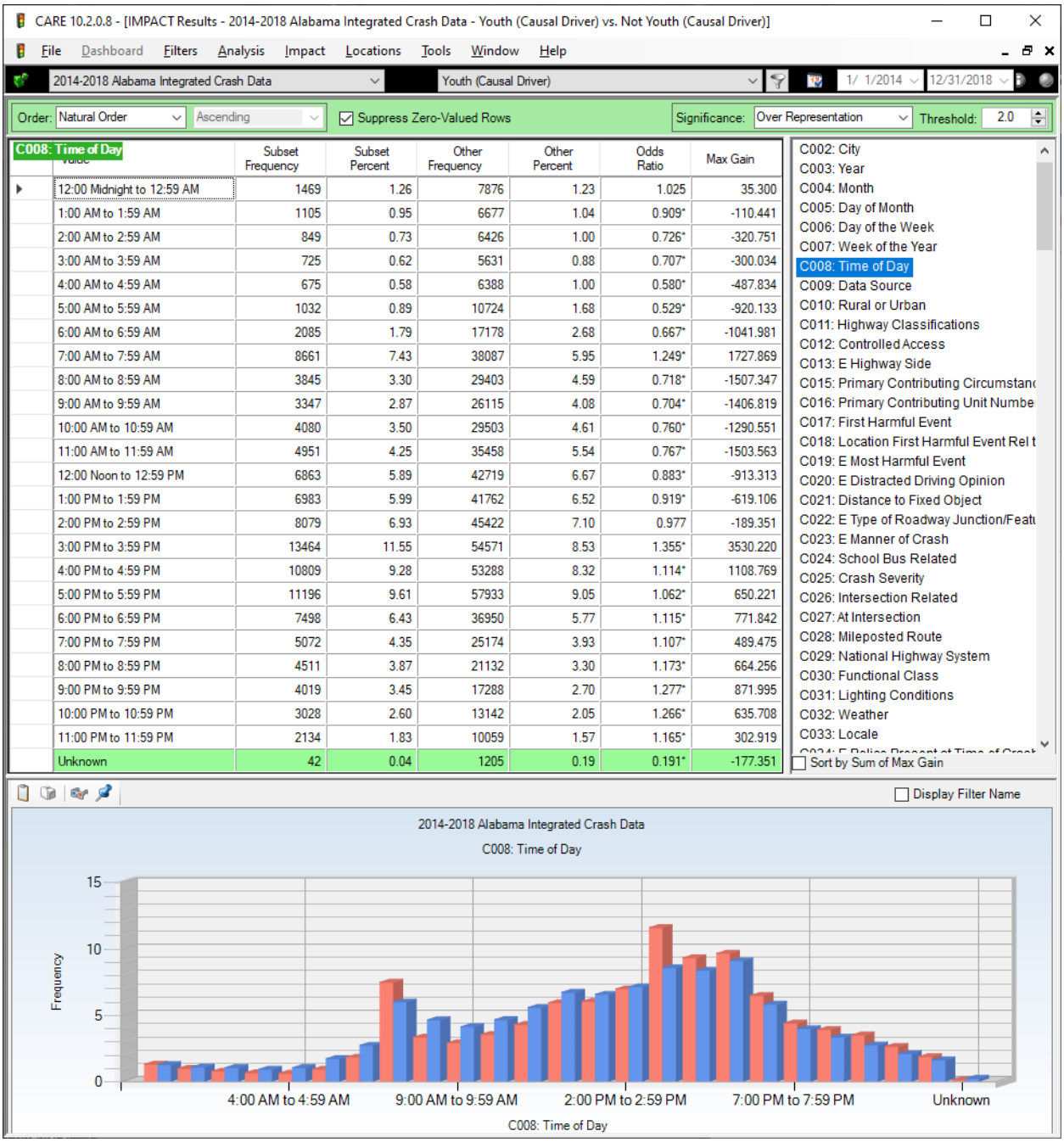
The following IMPACT displays compare 16-20-year-old drivers against all those above this age. The purpose of these comparisons is to surface the demographics of the 16-20 year old group that make them different from their older driving counterparts.

C003 Year of Crash



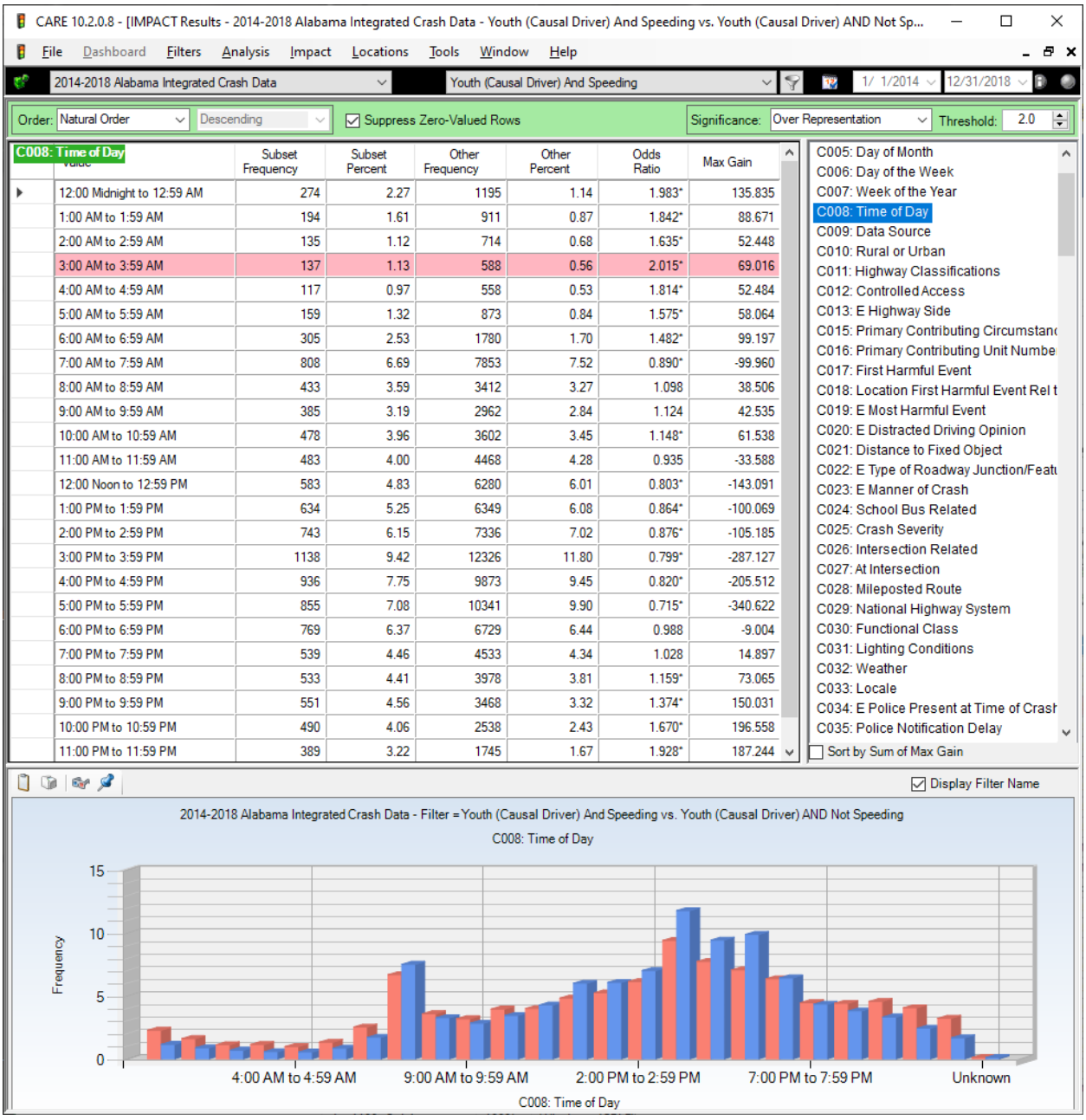
This display gives an idea as to how the number of 16-20 crashes have increased and decreased over the five years, and how that compares to the older drivers.

C008 Time of Day



These results show that a large proportion of younger age driving is before and after school.

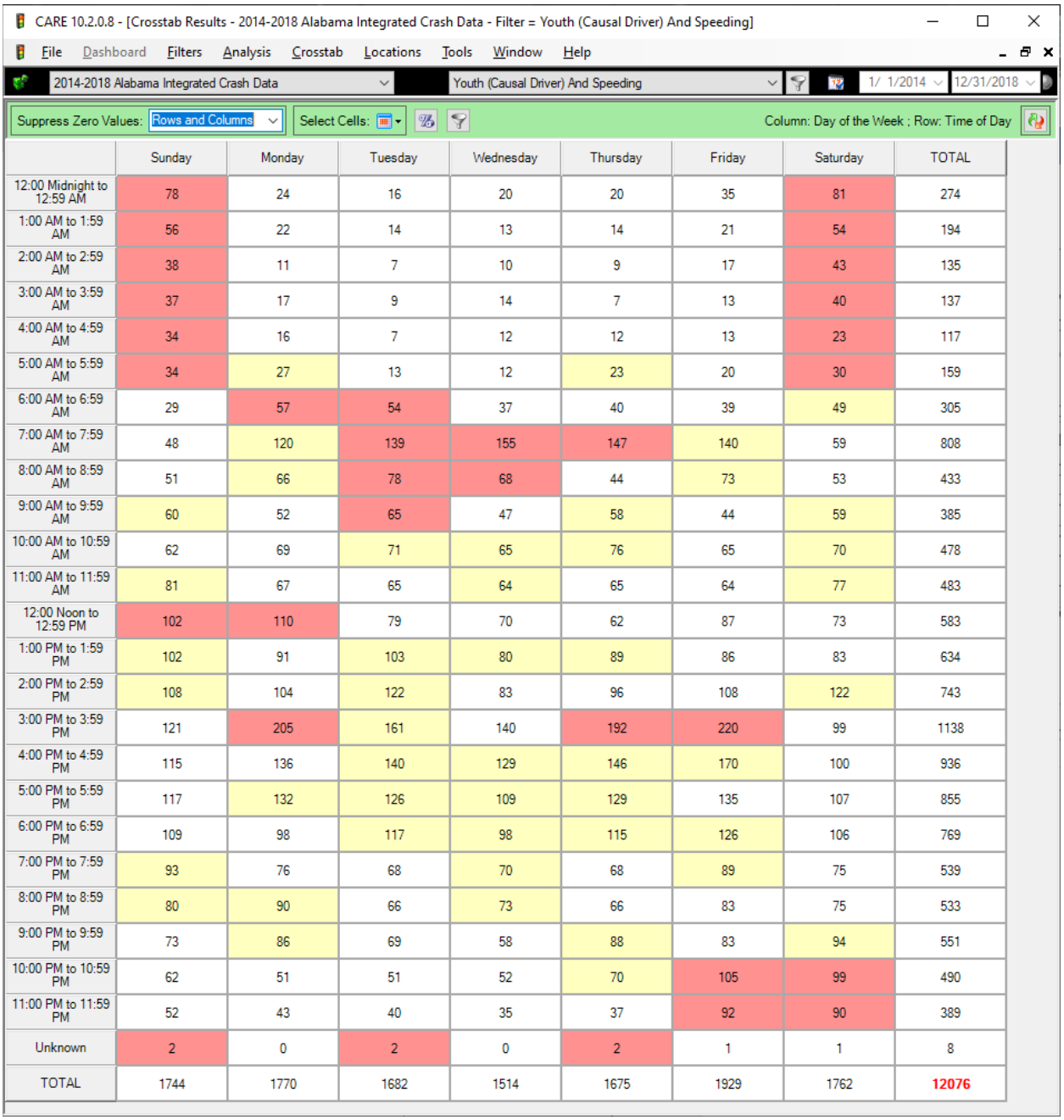
C008 Time of Day for Youth *Crashes that Involve Speeding*



A very much different picture emerges when we consider that crashes involving risk.

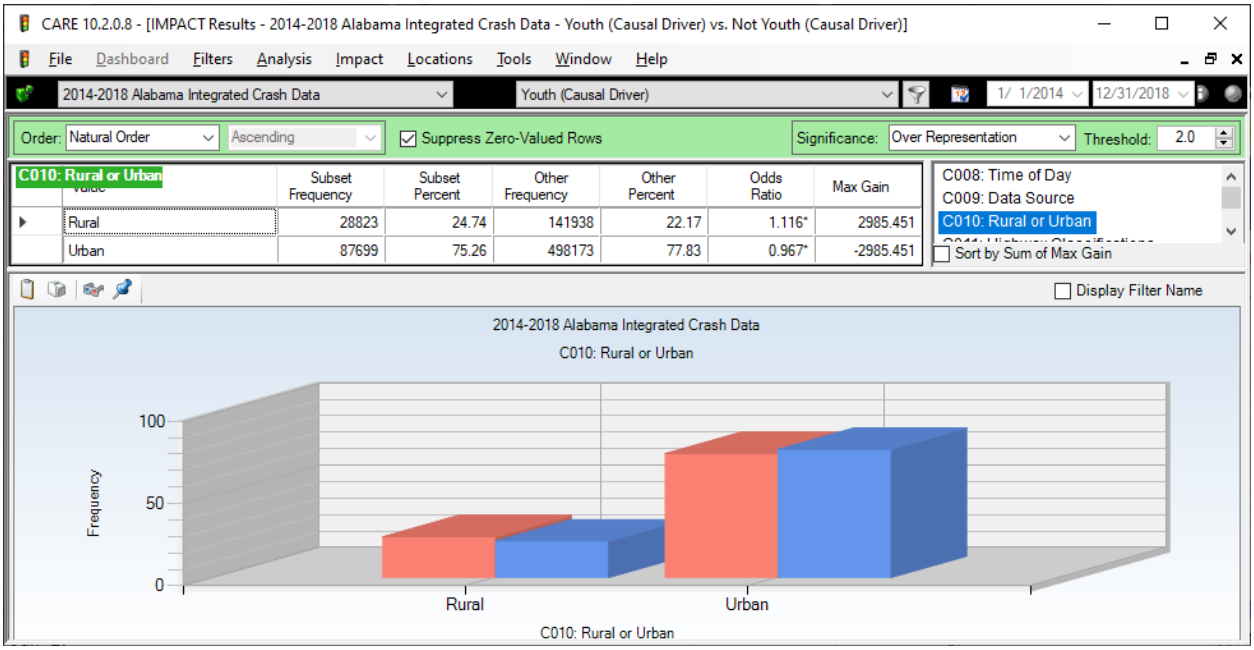
Several of the general analyses below are followed by their counterparts "… for Crashes that Involve Speeding." Since speed is probably the best proxy for risk taking, the objective of each of these is to focus in on values of the attribute that are most associated with risk taking.

C008 Time of Day by C006 for Youth *Crashes that Involve Speeding*



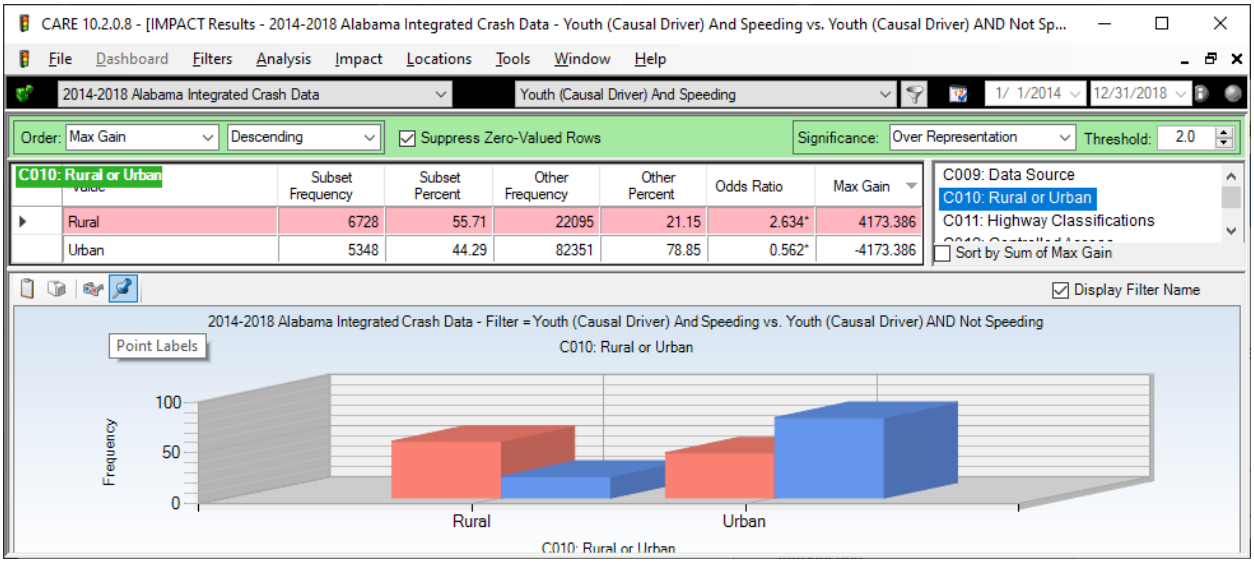
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	TOTAL
12:00 Midnight to 12:59 AM	78	24	16	20	20	35	81	274
1:00 AM to 1:59 AM	56	22	14	13	14	21	54	194
2:00 AM to 2:59 AM	38	11	7	10	9	17	43	135
3:00 AM to 3:59 AM	37	17	9	14	7	13	40	137
4:00 AM to 4:59 AM	34	16	7	12	12	13	23	117
5:00 AM to 5:59 AM	34	27	13	12	23	20	30	159
6:00 AM to 6:59 AM	29	57	54	37	40	39	49	305
7:00 AM to 7:59 AM	48	120	139	155	147	140	59	808
8:00 AM to 8:59 AM	51	66	78	68	44	73	53	433
9:00 AM to 9:59 AM	60	52	65	47	58	44	59	385
10:00 AM to 10:59 AM	62	69	71	65	76	65	70	478
11:00 AM to 11:59 AM	81	67	65	64	65	64	77	483
12:00 Noon to 12:59 PM	102	110	79	70	62	87	73	583
1:00 PM to 1:59 PM	102	91	103	80	89	86	83	634
2:00 PM to 2:59 PM	108	104	122	83	96	108	122	743
3:00 PM to 3:59 PM	121	205	161	140	192	220	99	1138
4:00 PM to 4:59 PM	115	136	140	129	146	170	100	936
5:00 PM to 5:59 PM	117	132	126	109	129	135	107	855
6:00 PM to 6:59 PM	109	98	117	98	115	126	106	769
7:00 PM to 7:59 PM	93	76	68	70	68	89	75	539
8:00 PM to 8:59 PM	80	90	66	73	66	83	75	533
9:00 PM to 9:59 PM	73	86	69	58	88	83	94	551
10:00 PM to 10:59 PM	62	51	51	52	70	105	99	490
11:00 PM to 11:59 PM	52	43	40	35	37	92	90	389
Unknown	2	0	2	0	2	1	1	8
TOTAL	1744	1770	1682	1514	1675	1929	1762	12076

C010 Rural or Urban

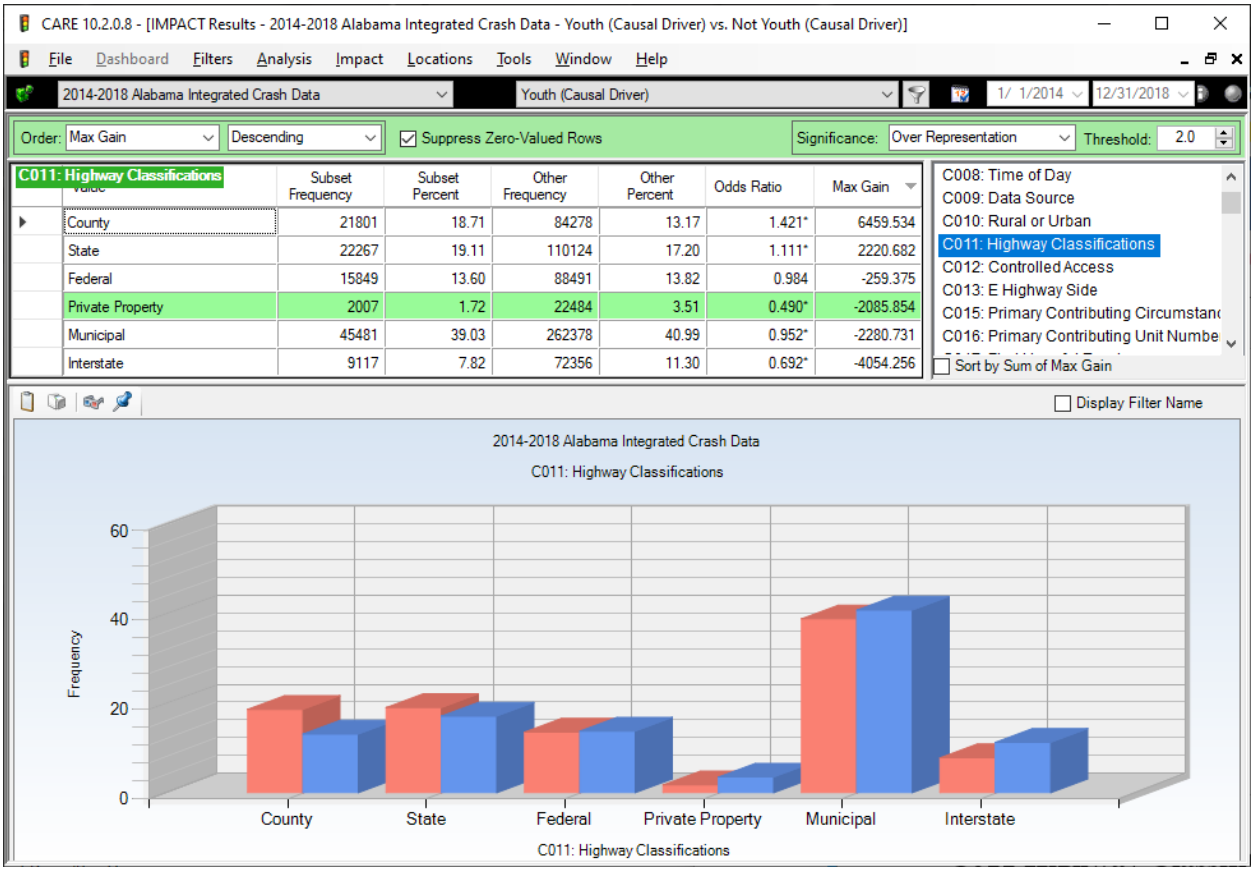


Younger drivers are slightly, but significantly, over-represented in the rural areas, which would tend to lead us to believe that they live in these areas. However, this distribution difference over the past five years becomes quite pronounced when speeding is involved.

C010 Rural or Urban for *Crashes that Involve Speeding*

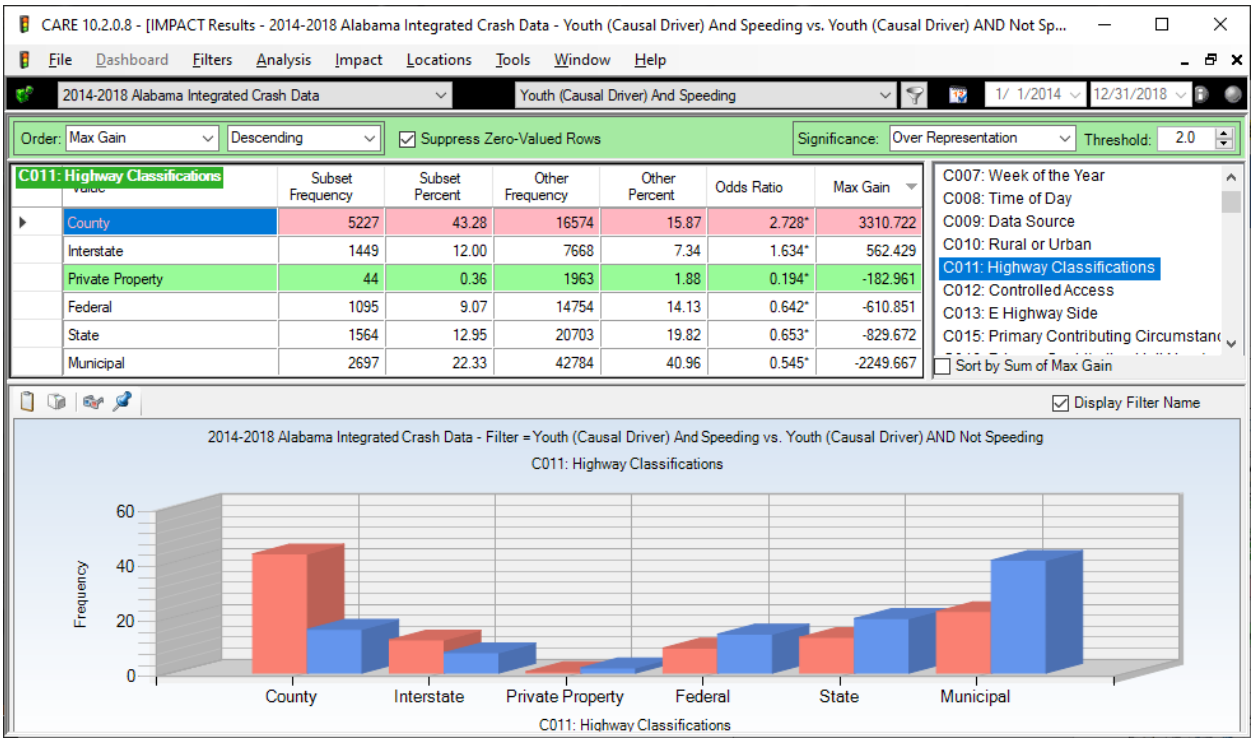


C011 Highway Classification

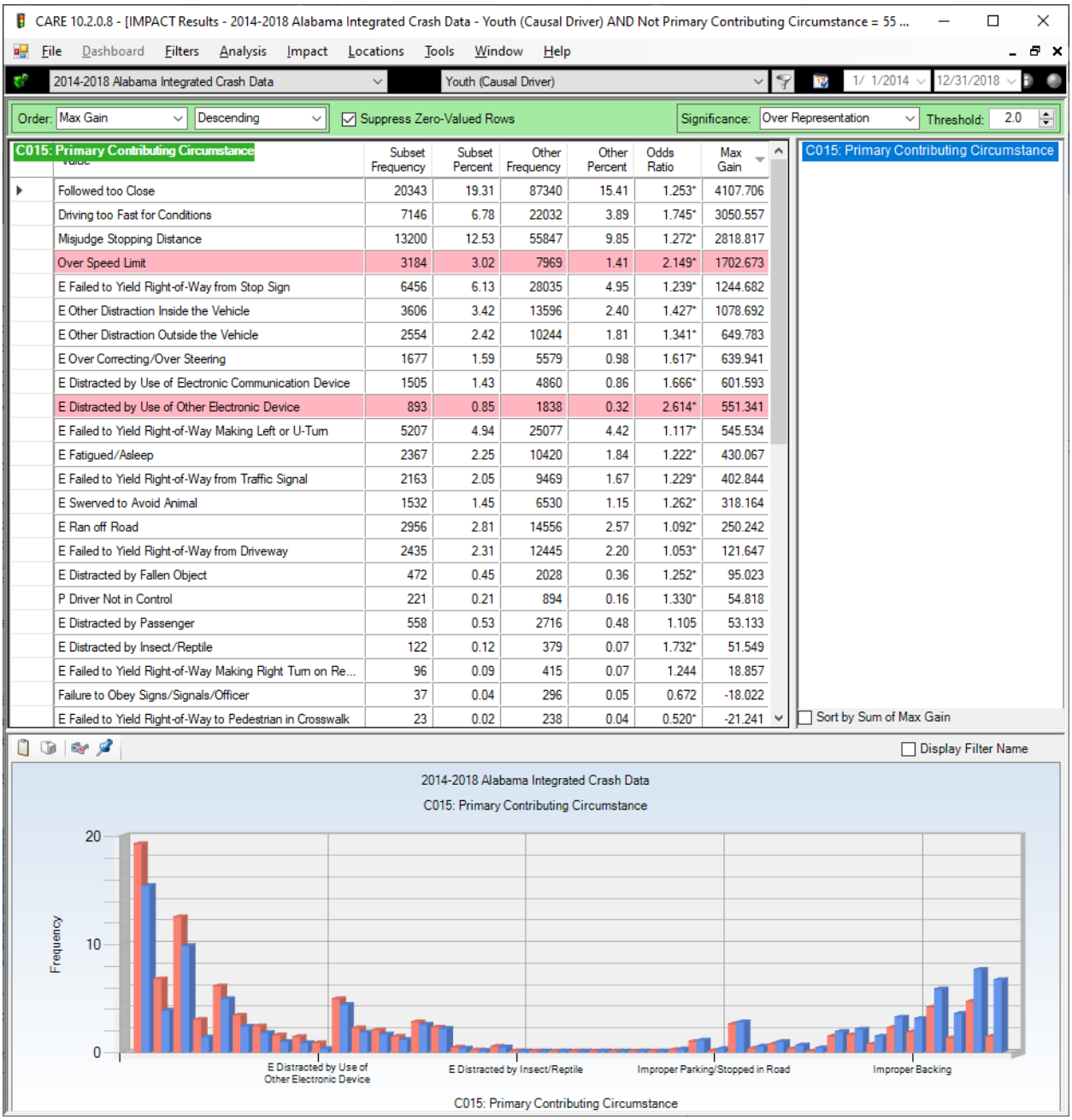


The rural-urban mix is much more pronounced when considering the Highway Classifications. Younger drivers seem to gravitate more to the county roadway systems, and they are significantly under-represented in both Municipal and Interstate roadways. This is even more pronounced when the comparison involves speed, and note that now Interstates are over-represented.

C011 Highway Classification Youth *Crashes that Involve Speed*



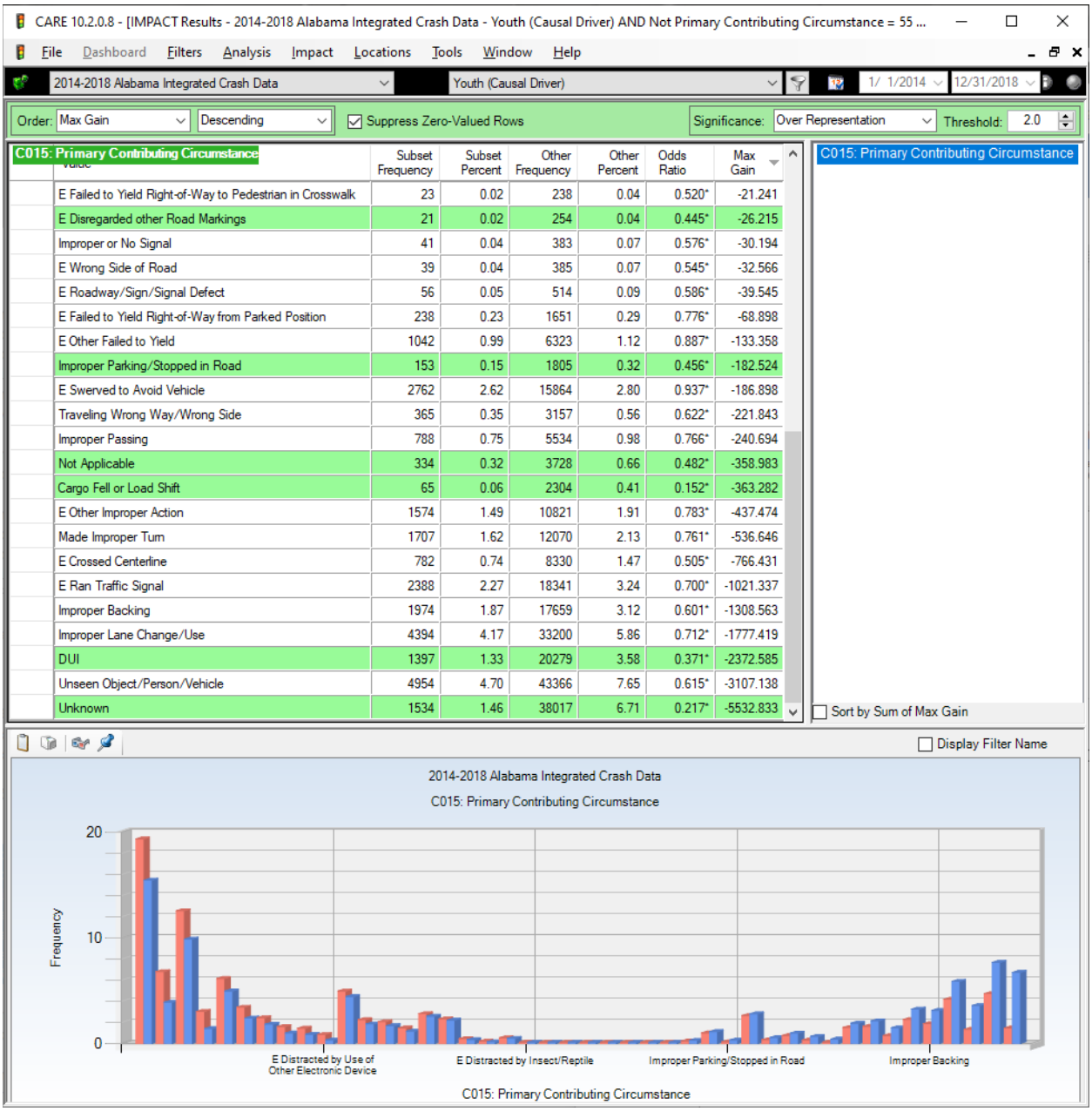
C015 Primary Contributing Circumstance (PCC) Over-Representations



C015: Primary Contributing Circumstance	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Followed too Close	20343	19.31	87340	15.41	1.253*	4107.706
Driving too Fast for Conditions	7146	6.78	22032	3.89	1.745*	3050.557
Misjudge Stopping Distance	13200	12.53	55847	9.85	1.272*	2818.817
Over Speed Limit	3184	3.02	7969	1.41	2.149*	1702.673
E Failed to Yield Right-of-Way from Stop Sign	6456	6.13	28035	4.95	1.239*	1244.682
E Other Distraction Inside the Vehicle	3606	3.42	13596	2.40	1.427*	1078.692
E Other Distraction Outside the Vehicle	2554	2.42	10244	1.81	1.341*	649.783
E Over Correcting/Over Steering	1677	1.59	5579	0.98	1.617*	639.941
E Distracted by Use of Electronic Communication Device	1505	1.43	4860	0.86	1.666*	601.593
E Distracted by Use of Other Electronic Device	893	0.85	1838	0.32	2.614*	551.341
E Failed to Yield Right-of-Way Making Left or U-Turn	5207	4.94	25077	4.42	1.117*	545.534
E Fatigued/Asleep	2367	2.25	10420	1.84	1.222*	430.067
E Failed to Yield Right-of-Way from Traffic Signal	2163	2.05	9469	1.67	1.229*	402.844
E Swerved to Avoid Animal	1532	1.45	6530	1.15	1.262*	318.164
E Ran off Road	2956	2.81	14556	2.57	1.092*	250.242
E Failed to Yield Right-of-Way from Driveway	2435	2.31	12445	2.20	1.053*	121.647
E Distracted by Fallen Object	472	0.45	2028	0.36	1.252*	95.023
P Driver Not in Control	221	0.21	894	0.16	1.330*	54.818
E Distracted by Passenger	558	0.53	2716	0.48	1.105	53.133
E Distracted by Insect/Reptile	122	0.12	379	0.07	1.732*	51.549
E Failed to Yield Right-of-Way Making Right Turn on Re...	96	0.09	415	0.07	1.244	18.857
Failure to Obey Signs/Signals/Officer	37	0.04	296	0.05	0.672	-18.022
E Failed to Yield Right-of-Way to Pedestrian in Crosswalk	23	0.02	238	0.04	0.520*	-21.241

Go down the list and assign the PCC to either immaturity (lack of driving experience; e.g., Misjudge Stopping Distance, Overcorrecting) or risk taking (e.g. Speeding, Failure to Yield …). Several distraction categories probably have to be assigned to both.

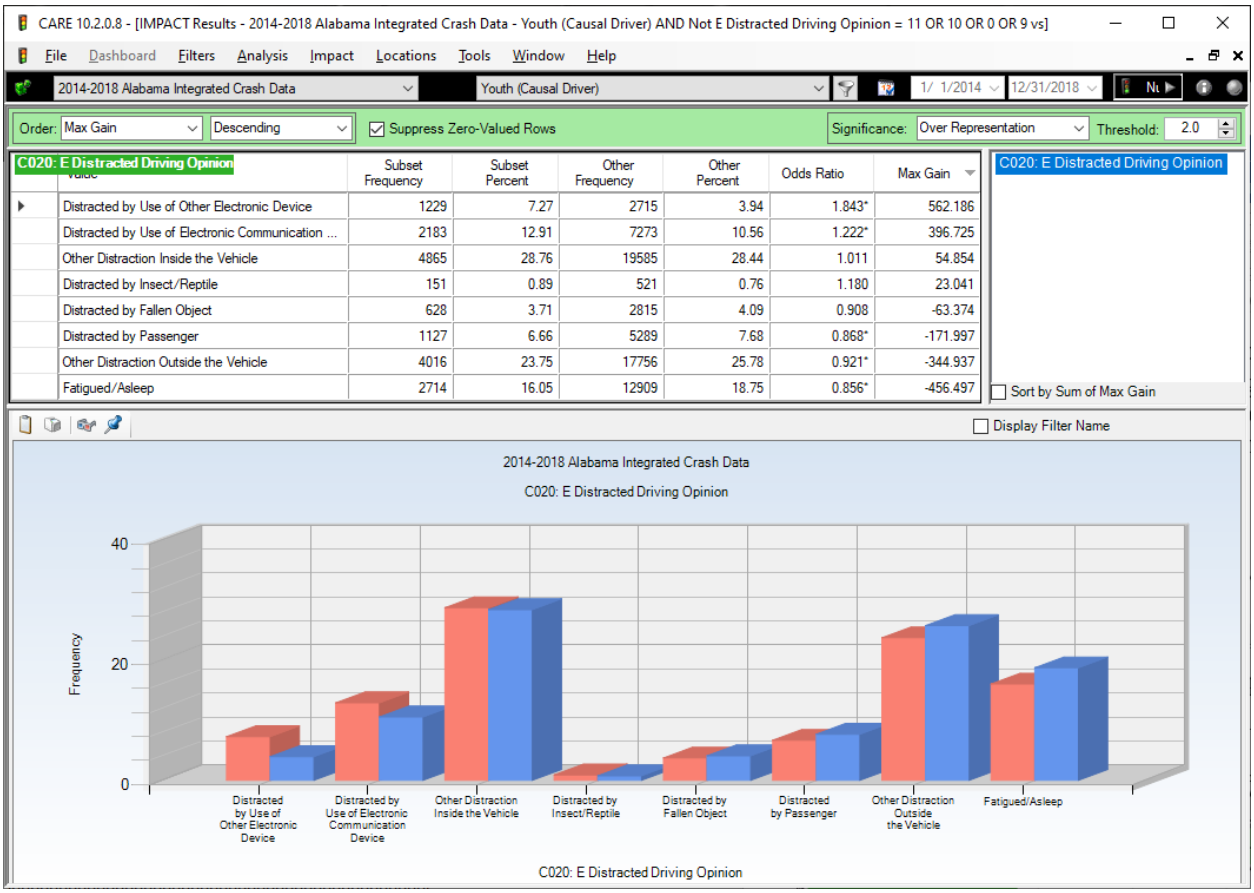
C015 Primary Contributing Circumstance (PCC) Under-Representations



C015: Primary Contributing Circumstance	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
E Failed to Yield Right-of-Way to Pedestrian in Crosswalk	23	0.02	238	0.04	0.520*	-21.241
E Disregarded other Road Markings	21	0.02	254	0.04	0.445*	-26.215
Improper or No Signal	41	0.04	383	0.07	0.576*	-30.194
E Wrong Side of Road	39	0.04	385	0.07	0.545*	-32.566
E Roadway/Sign/Signal Defect	56	0.05	514	0.09	0.586*	-39.545
E Failed to Yield Right-of-Way from Parked Position	238	0.23	1651	0.29	0.776*	-68.898
E Other Failed to Yield	1042	0.99	6323	1.12	0.887*	-133.358
Improper Parking/Stopped in Road	153	0.15	1805	0.32	0.456*	-182.524
E Swerved to Avoid Vehicle	2762	2.62	15864	2.80	0.937*	-186.898
Traveling Wrong Way/Wrong Side	365	0.35	3157	0.56	0.622*	-221.843
Improper Passing	788	0.75	5534	0.98	0.766*	-240.694
Not Applicable	334	0.32	3728	0.66	0.482*	-358.983
Cargo Fell or Load Shift	65	0.06	2304	0.41	0.152*	-363.282
E Other Improper Action	1574	1.49	10821	1.91	0.783*	-437.474
Made Improper Turn	1707	1.62	12070	2.13	0.761*	-536.646
E Crossed Centerline	782	0.74	8330	1.47	0.505*	-766.431
E Ran Traffic Signal	2388	2.27	18341	3.24	0.700*	-1021.337
Improper Backing	1974	1.87	17659	3.12	0.601*	-1308.563
Improper Lane Change/Use	4394	4.17	33200	5.86	0.712*	-1777.419
DUI	1397	1.33	20279	3.58	0.371*	-2372.585
Unseen Object/Person/Vehicle	4954	4.70	43366	7.65	0.615*	-3107.138
Unknown	1534	1.46	38017	6.71	0.217*	-5532.833

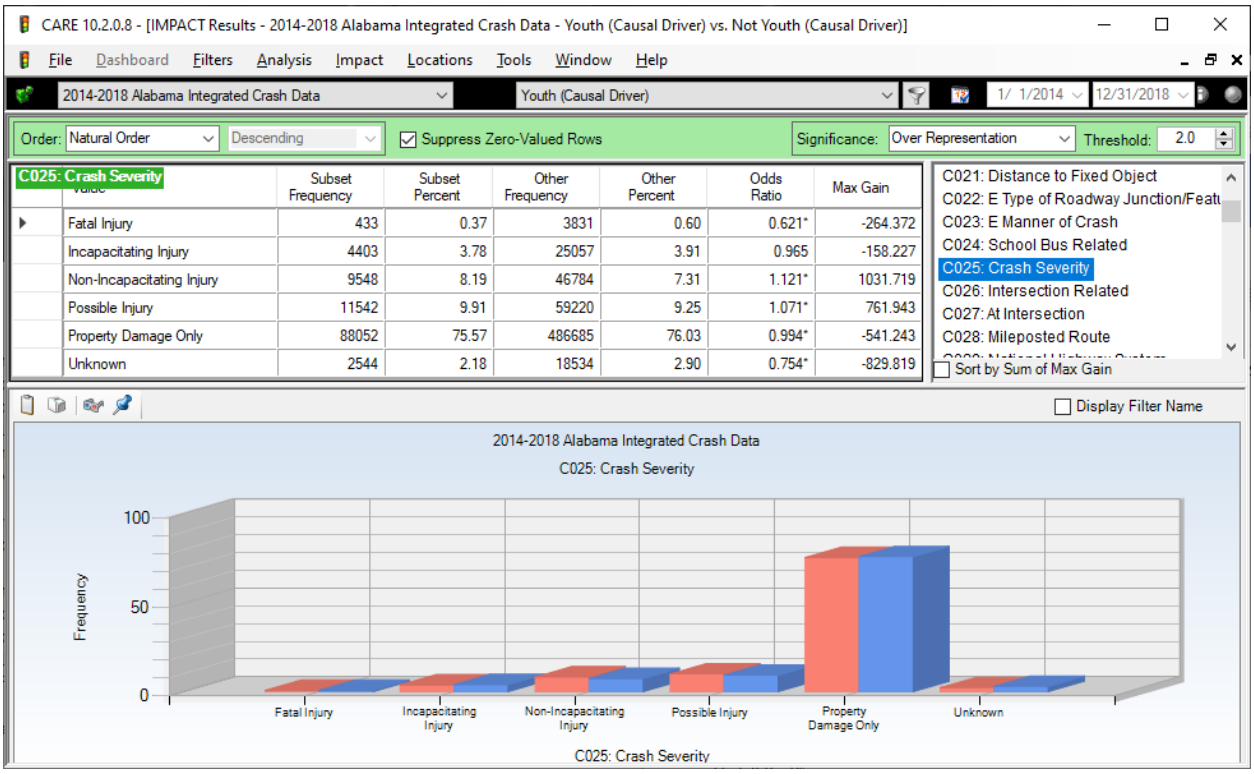
The above two displays eliminated cases with less than 20 occurrences, as well as cases with no significant differences. Important cultural clue: DUI is only 1.33% as compared to 3.58% for the older drivers. This accounted for only 1,397 crashes, and while it is a major factor to be considered, it demonstrates that there is risk-taking in driving that has little to do with the use of alcohol or drugs.

C020 Distracting Driving Officer's Opinion



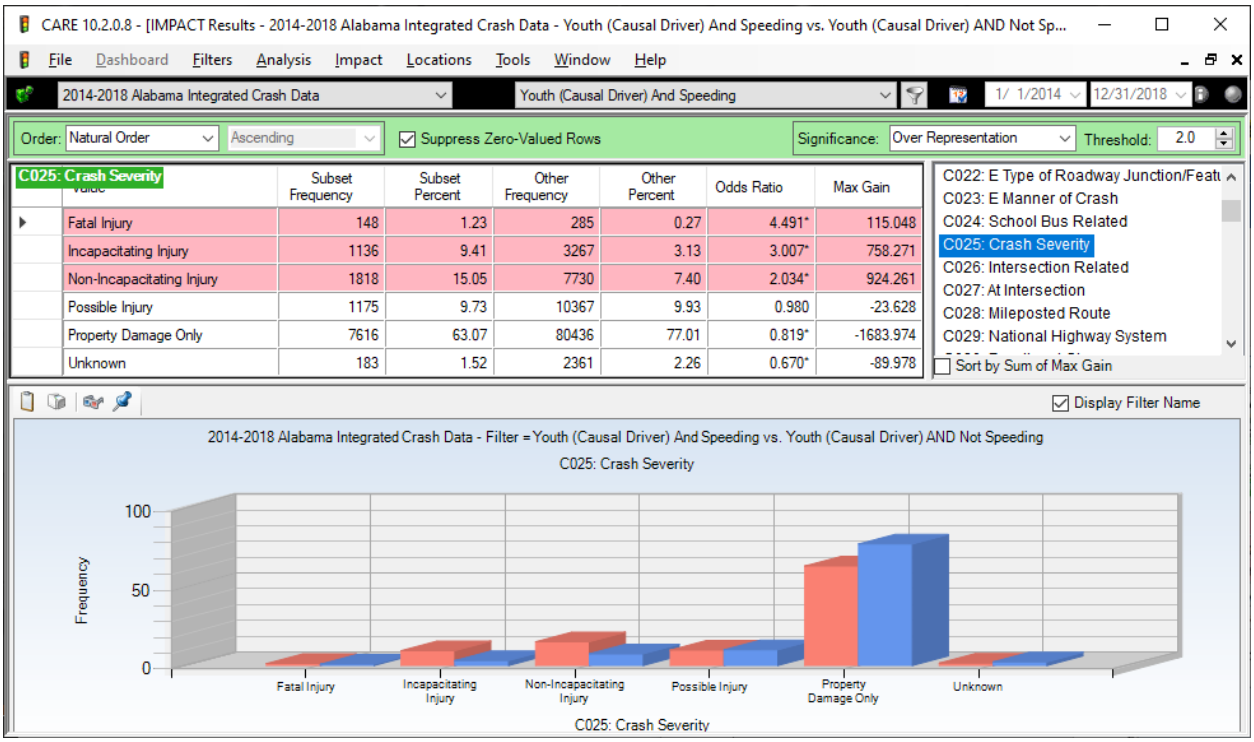
This comparison eliminated cases where distraction was not the issue so that the various types of distraction could be more clearly seen. Distracted Driving has received much more attention in the recent five years, and studies independent of crash data have shown the problem to be much worse than that reported in the crash records, since it is difficult for the reporting officers to find evidence of it. However, we can assume that for purposes of this comparison, the same problems occur on both sides, and thus, the relative proportions can be quite informative. For example, it seems clear that younger drivers take proportionately far more risks with phones and other electronic devices, as compared to other sources of distraction.

C025 Crash Severity



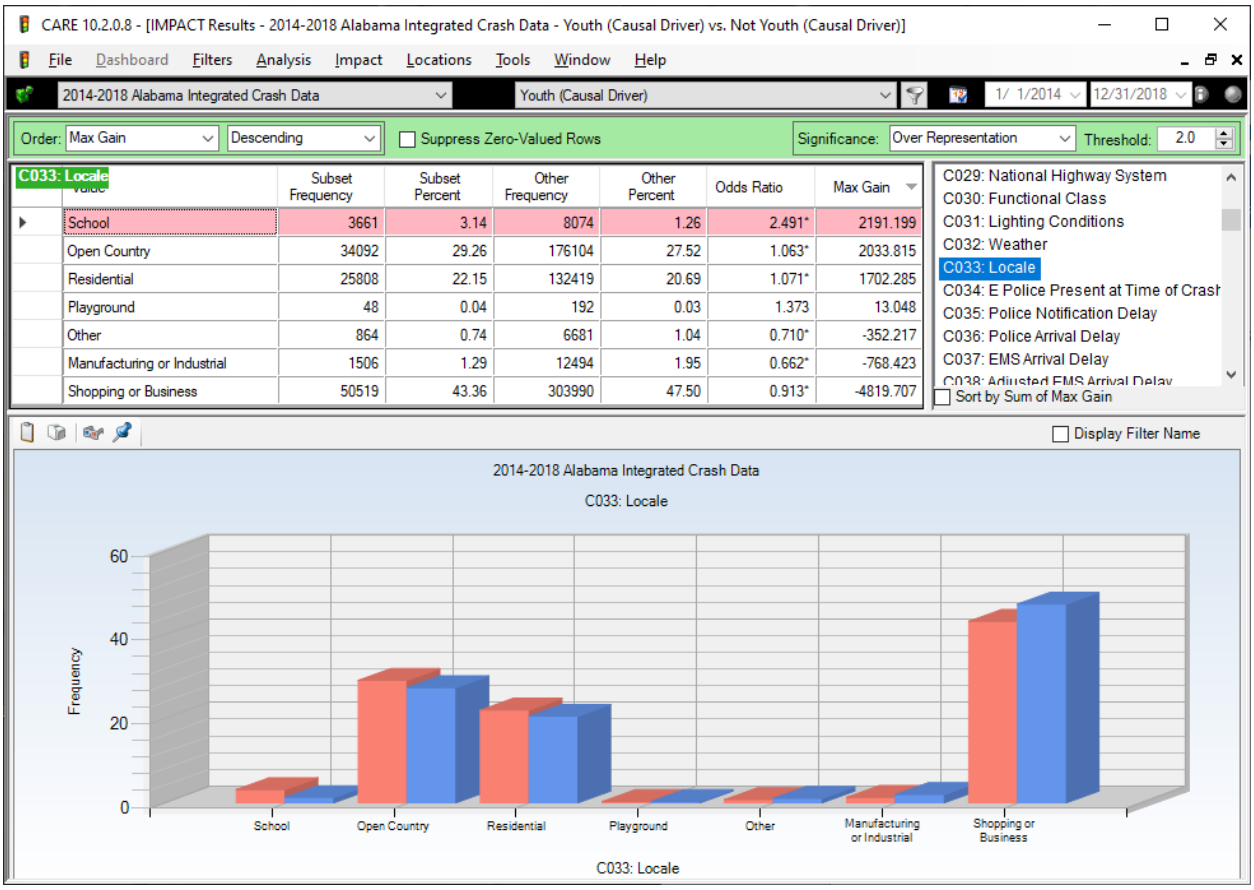
The lower severity of injury is typical of crashes that involve younger drivers. See the discussion with regard to safety equipment (C323) and the causal driver injury type (C328). The causal drivers in this crash subset are the younger drivers.

C025 Crash Severity for *Crashes that Involve Speed*



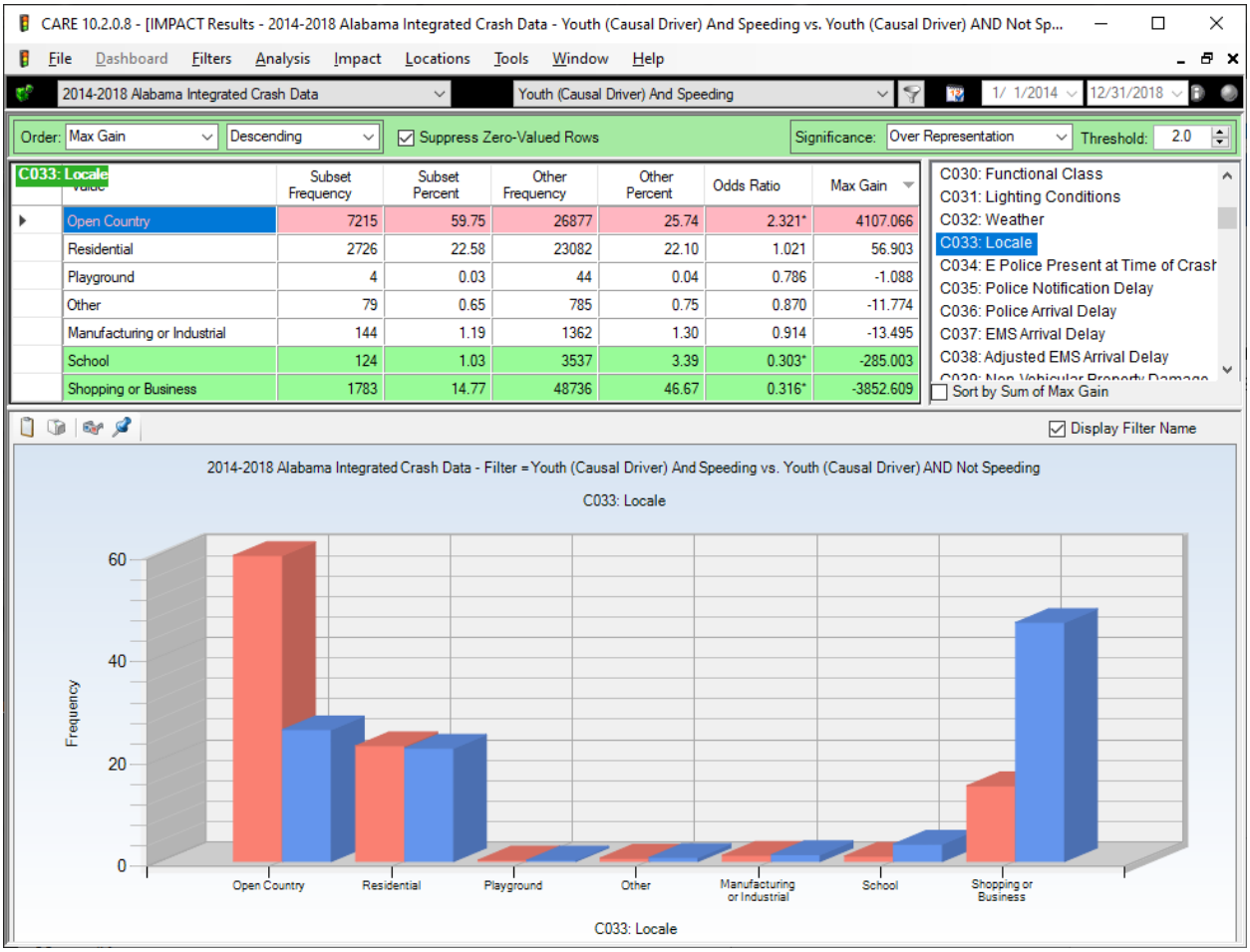
The old adage "speed kills" is more than verified. The picture here is completely different than when all crashes are considered.

C033 Locale



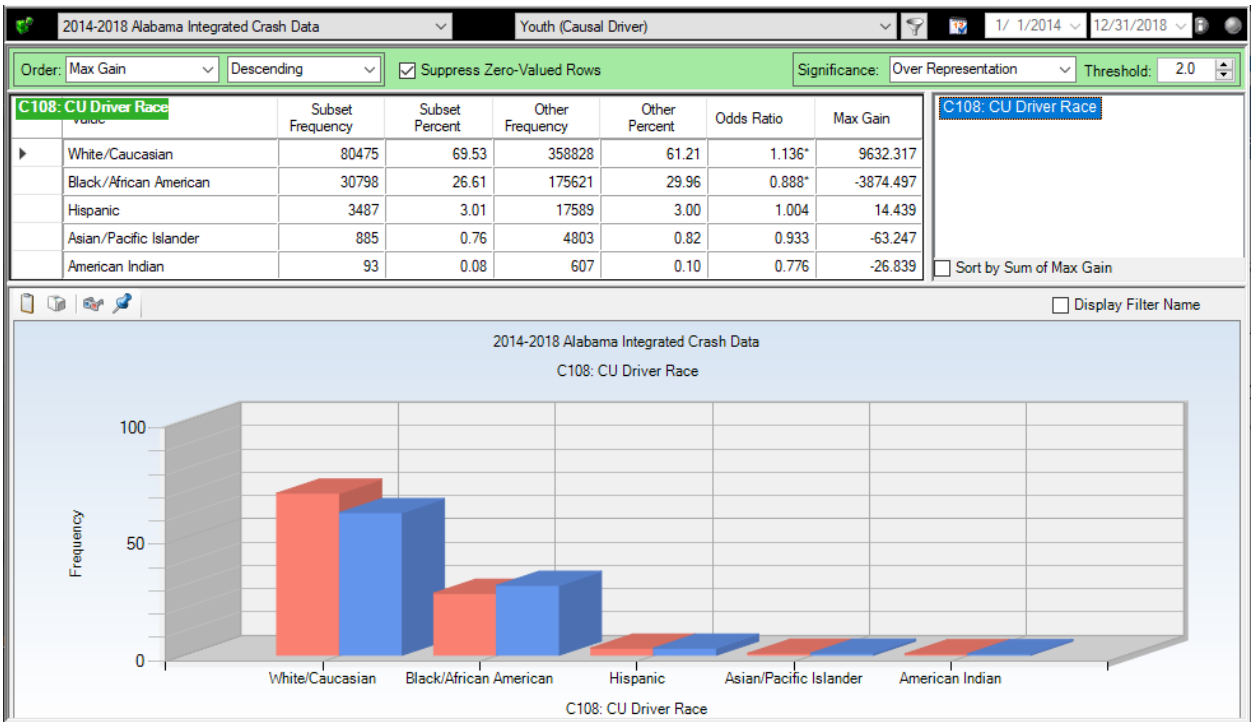
School over-representation further reinforces what was found above in the time attribute, that a primary destination of young drivers is to and from school.

C033 Locale for Youth *Crashes that Involve Speeding*

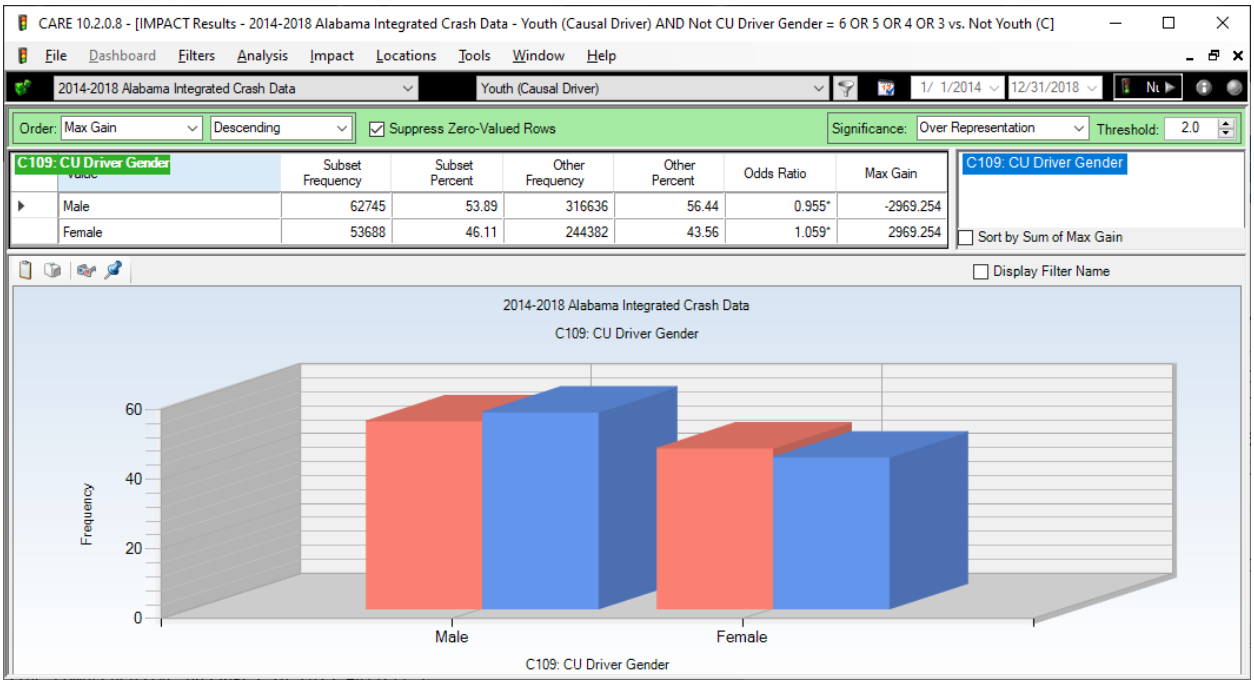


Crashes that involve risk taking are probably not (generally) those commuting to and from school. These seem heavily directed toward open country.

C108 CU Driver Race

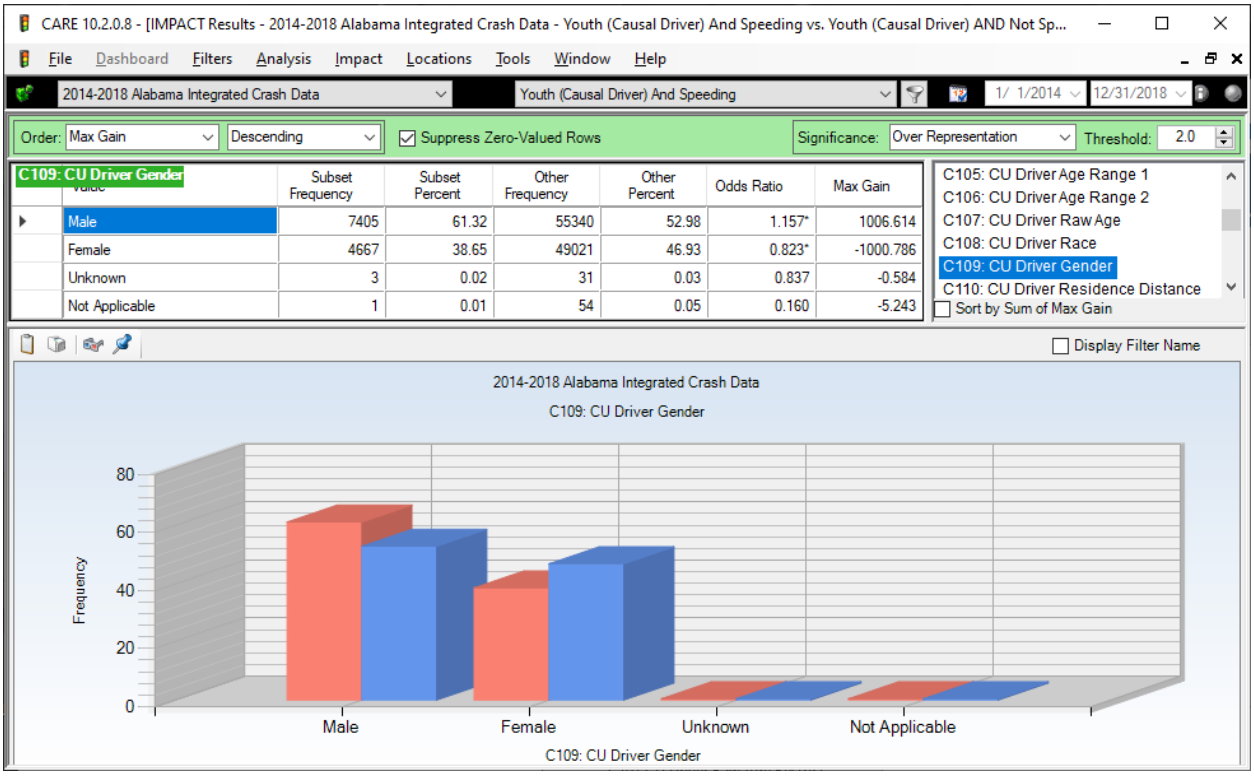


C109 CU Driver Gender



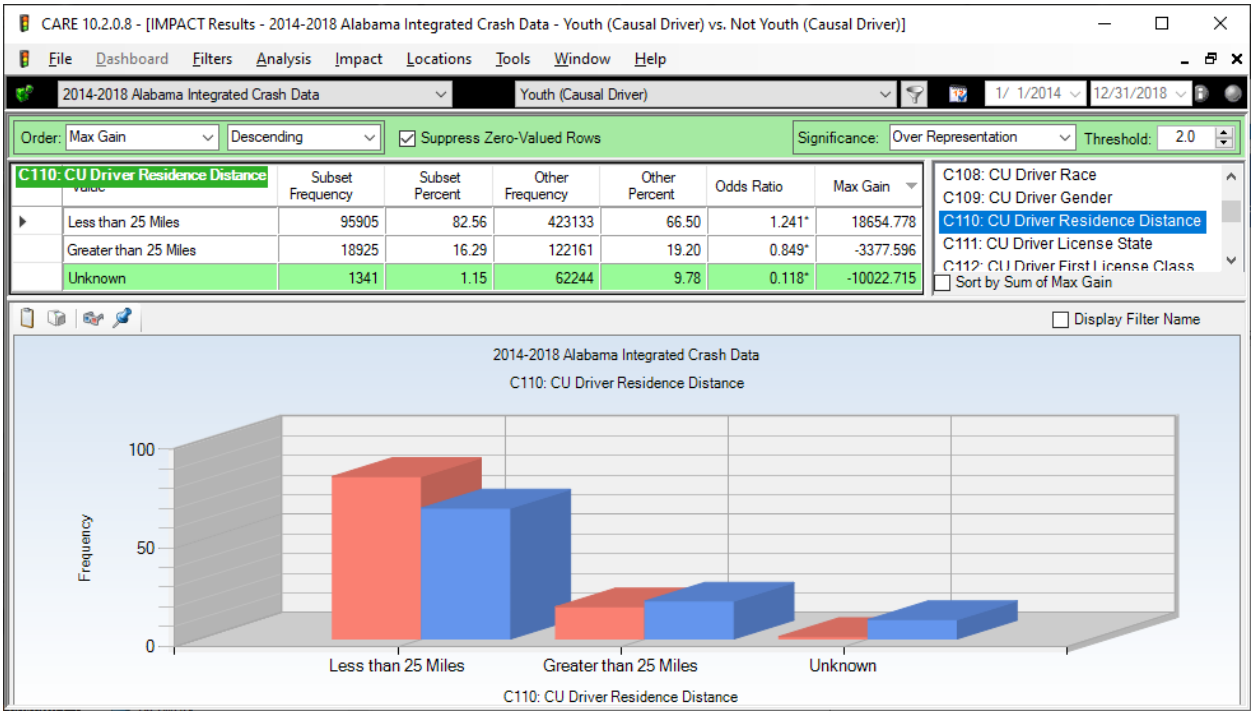
Females have (43.56-46.11%=) 2.55% higher proportion that would be expected when comparing the younger female drivers with those older. Further analysis was performed (see below) to resolve the extent to which female drivers engaged in risky behavior.

C109 CU Driver Gender *for Crashes that Involve Speeding*



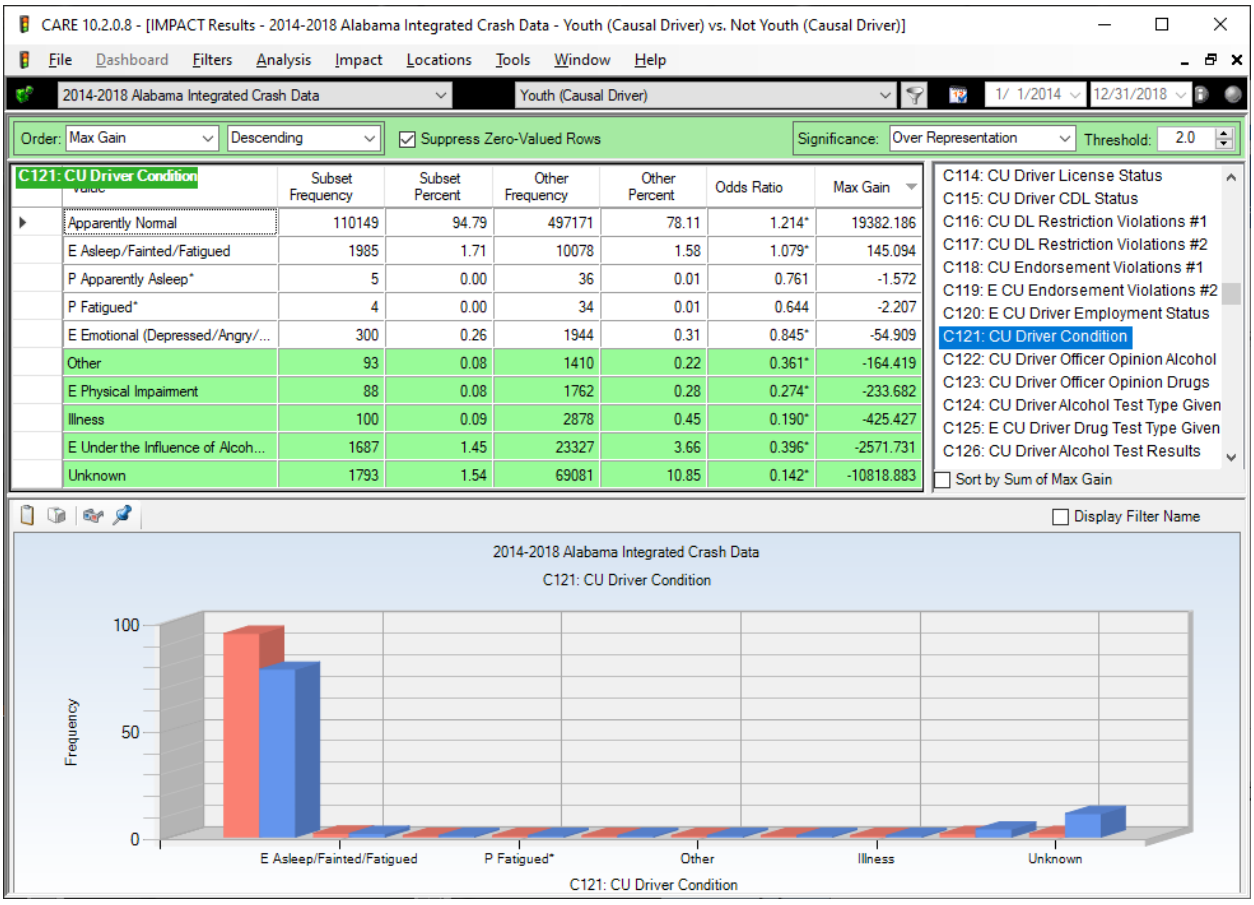
Clearly it is the males who are the primary risk takers, but the number of females also involved is significant (nearly 40%).

C110 CU Driver Residence Distance



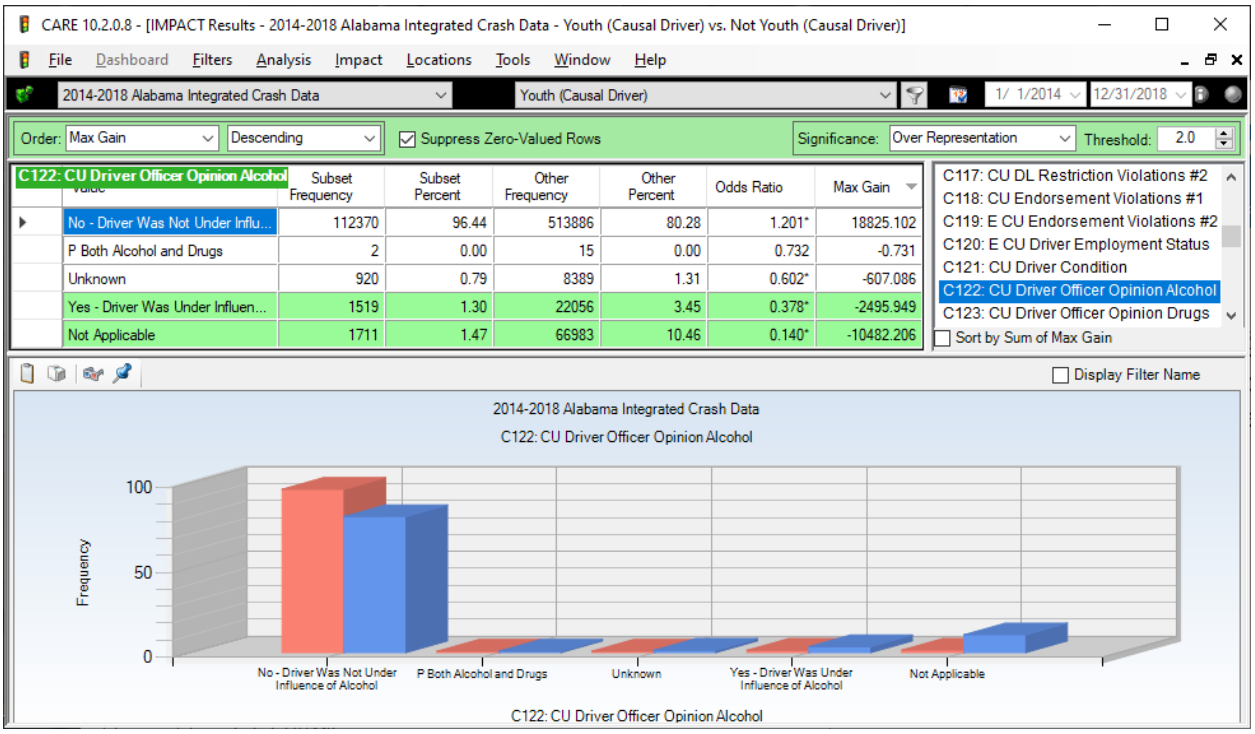
Relatively few younger drivers (16.29%) had crashes at distances greater than 25 miles from home.

C121 CU Driver Condition

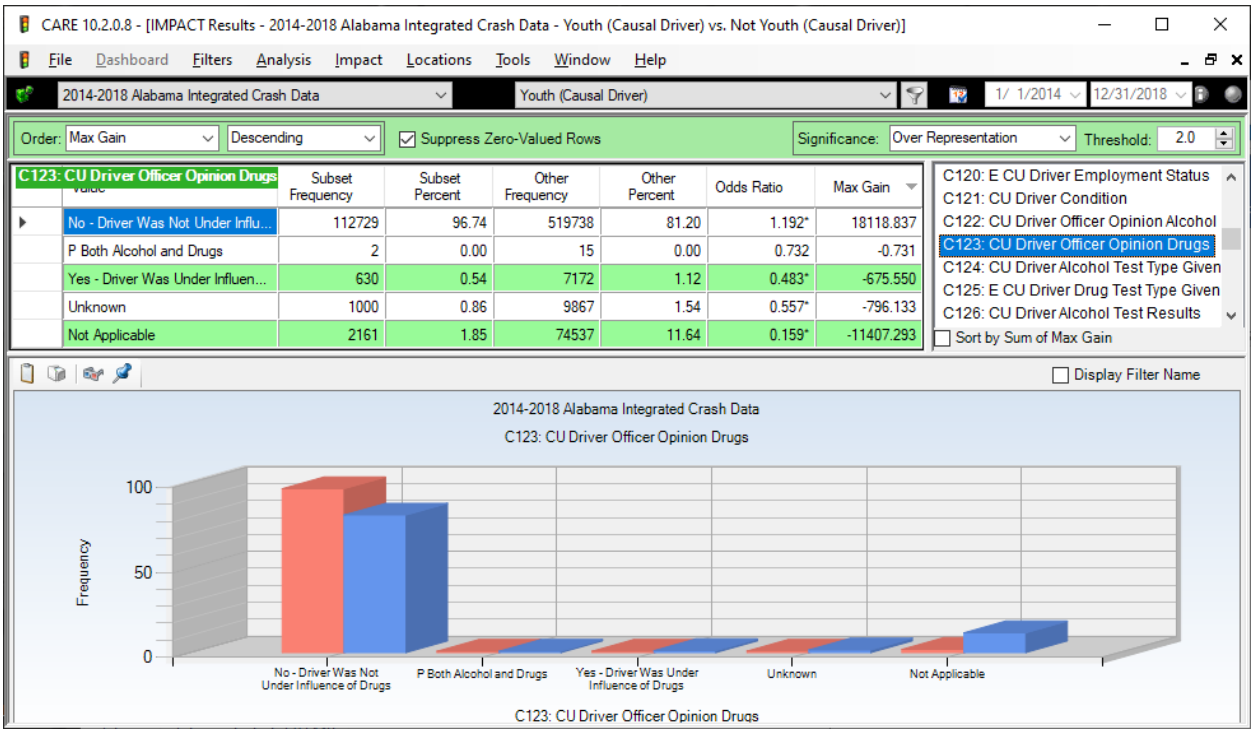


Driver condition “Apparently Normal” at close to 95% is an indication that the younger drivers were generally not subject to substance abuse while driving. This is further confirmed by the officers’ opinion attributes below.

C122 CU Driver Officer Opinion Alcohol

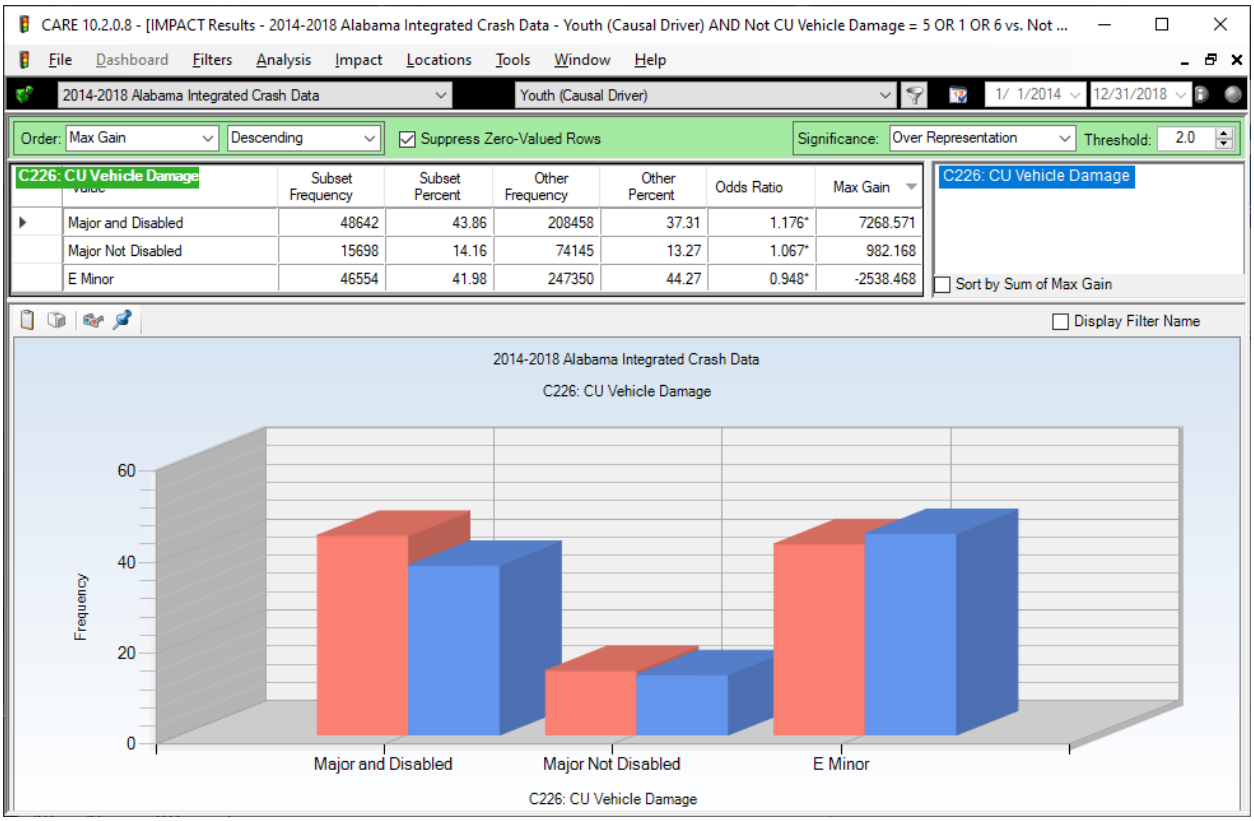


C123 CU Driver Officer Opinion Drugs



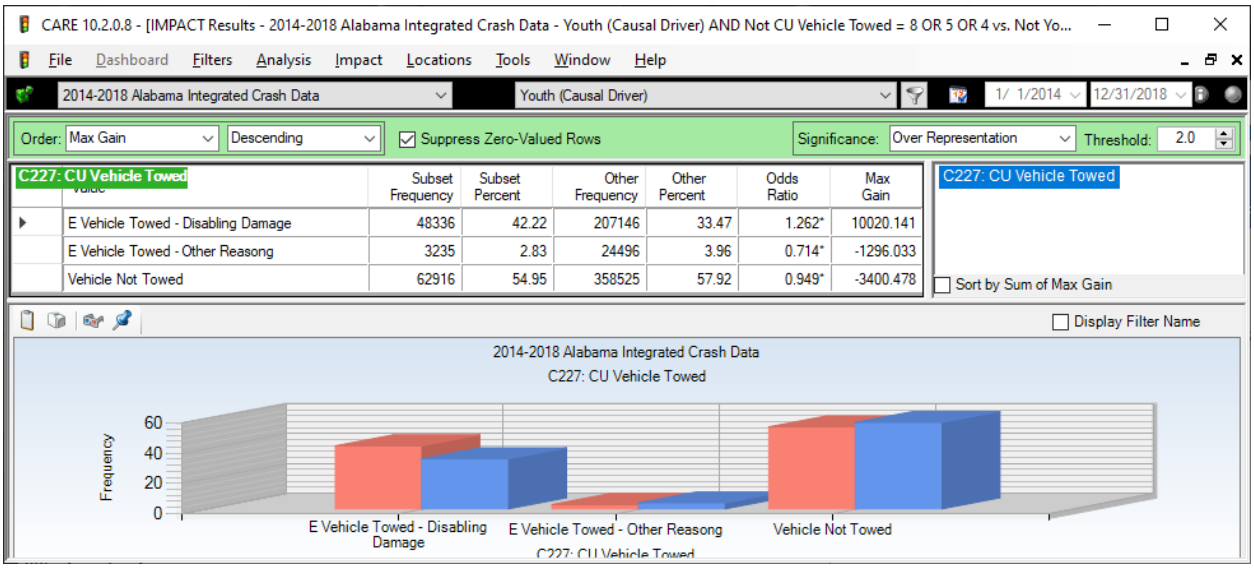
Officers' opinion positive for drugs is a little over a half of a percent; for alcohol, this proportion was 1.3%. We can generally conclude that substance abuse is not a major factor in accounting for the dramatically higher than expected proportion of young people in crashes.

C226 CU Vehicle Damage



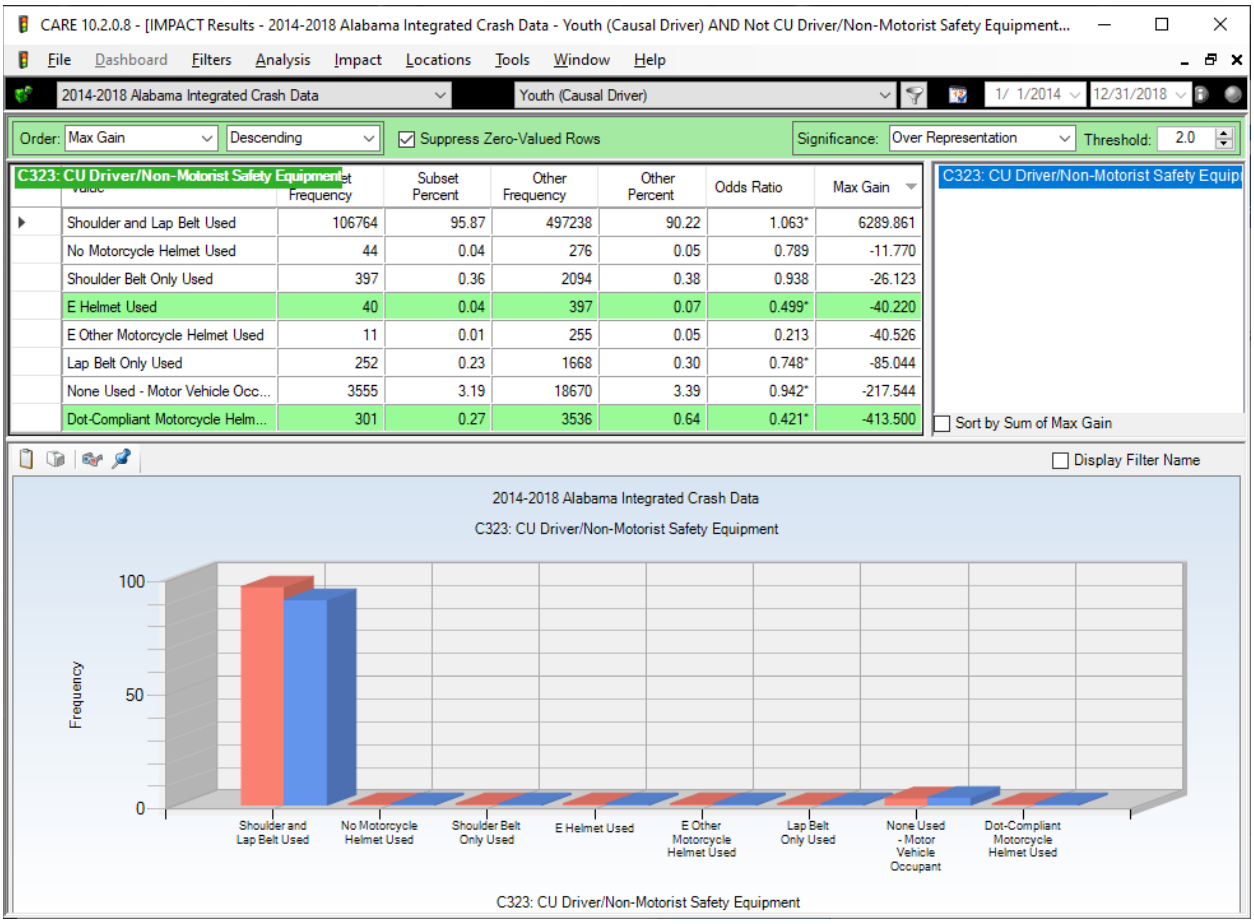
This attribute indicates that the degree of damage of young driver crashes is generally greater than that of older drivers. This could be an indication of higher speed prior to the crash or a lack of experience in minimizing the effects of the crash.

C226 CU Vehicle Towed



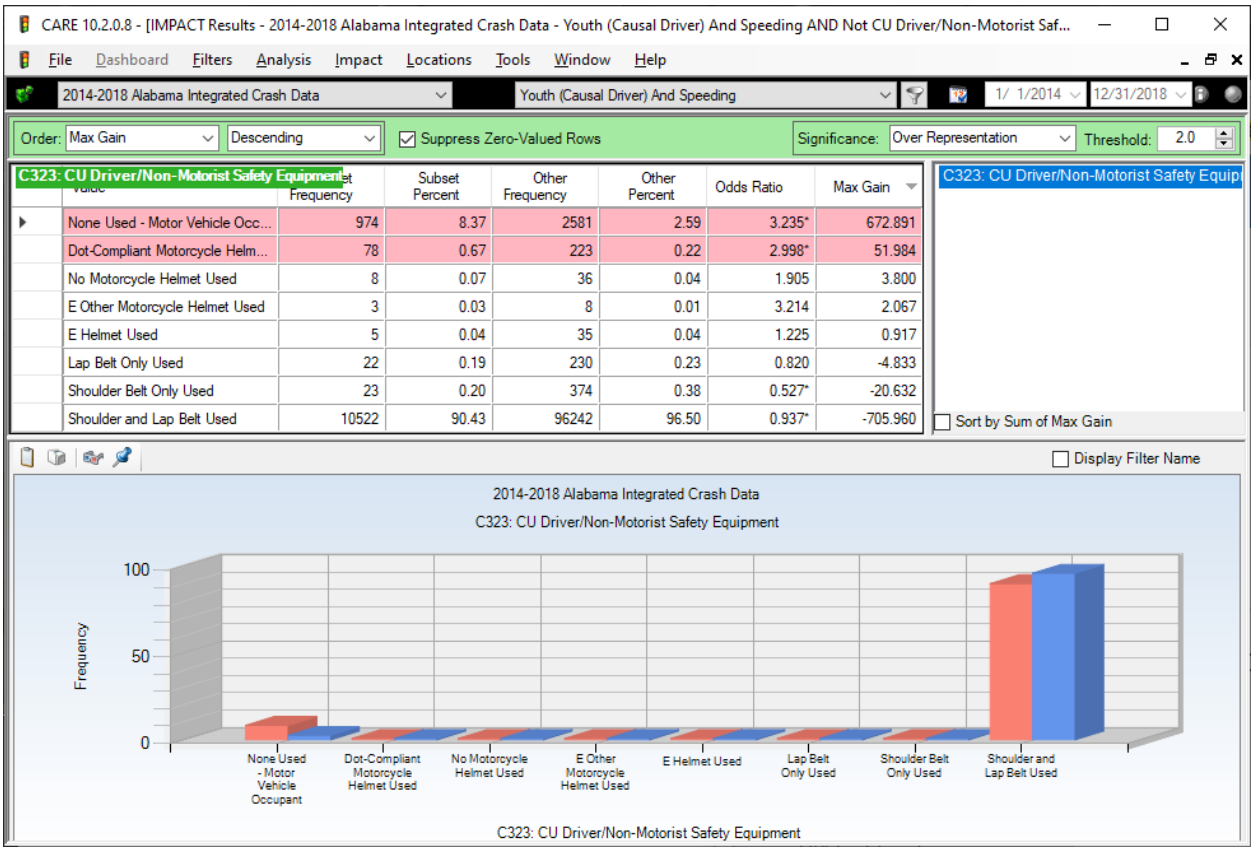
This further reinforces the damage findings immediately above. The "Other Reasons" for a vehicle to be towed is usually the inability of the driver to continue driving it due to Impaired Driving. Its under-representation is consistent with the findings of C122 and C123, officers' opinion as to the involvement of drugs and alcohol, above.

C323 CU Driver Safety Equipment



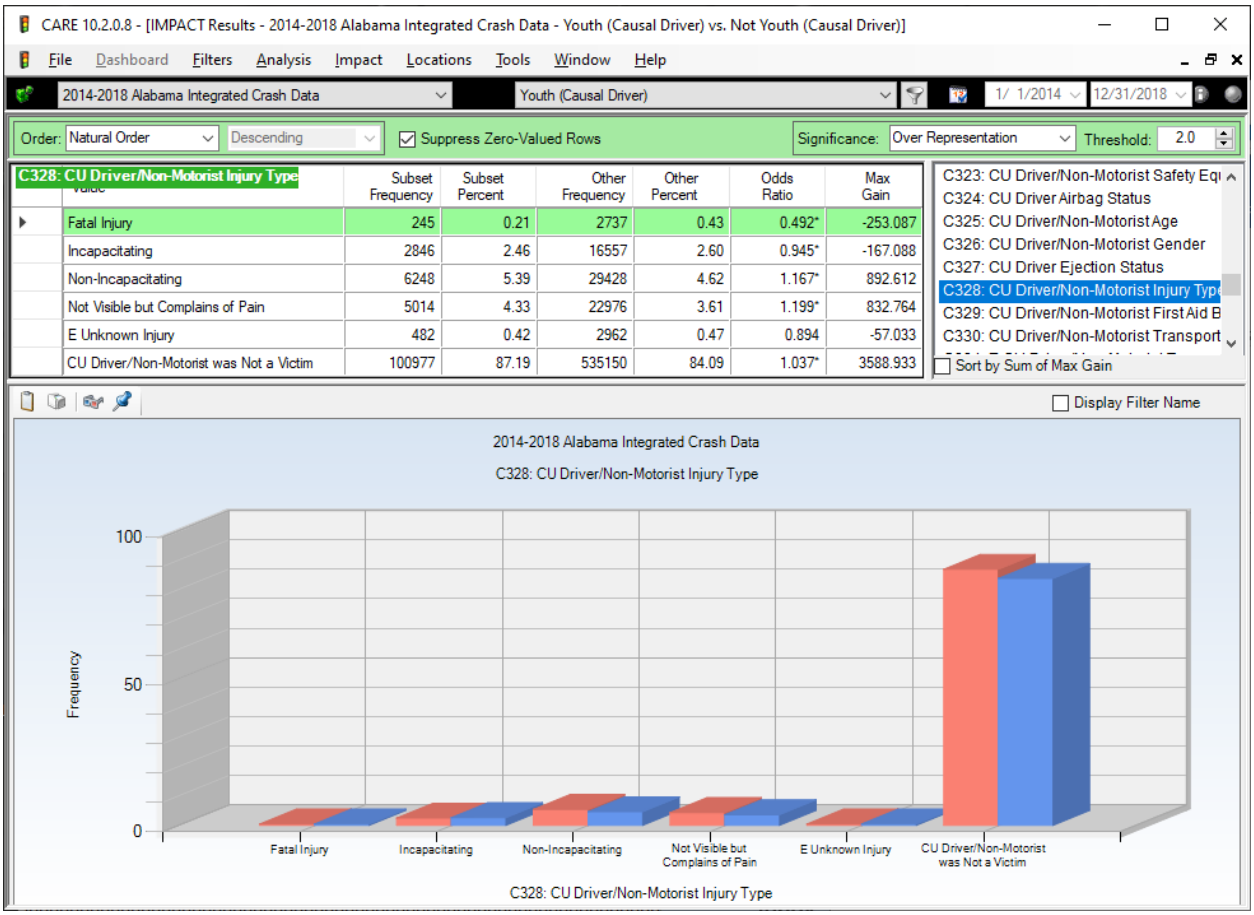
Young drivers are generally not taking risks when it comes to the use of safety equipment. This is a credit to the many programs that promote the use of seatbelts and other protective equipment, and it is an indication that such programs can work with young drivers. This is probably one of the major reasons that young driver crashes are significantly less severe than those of older drivers (see C025).

C323 CU Driver Safety Equipment for *Crashes that Involved Speeding*



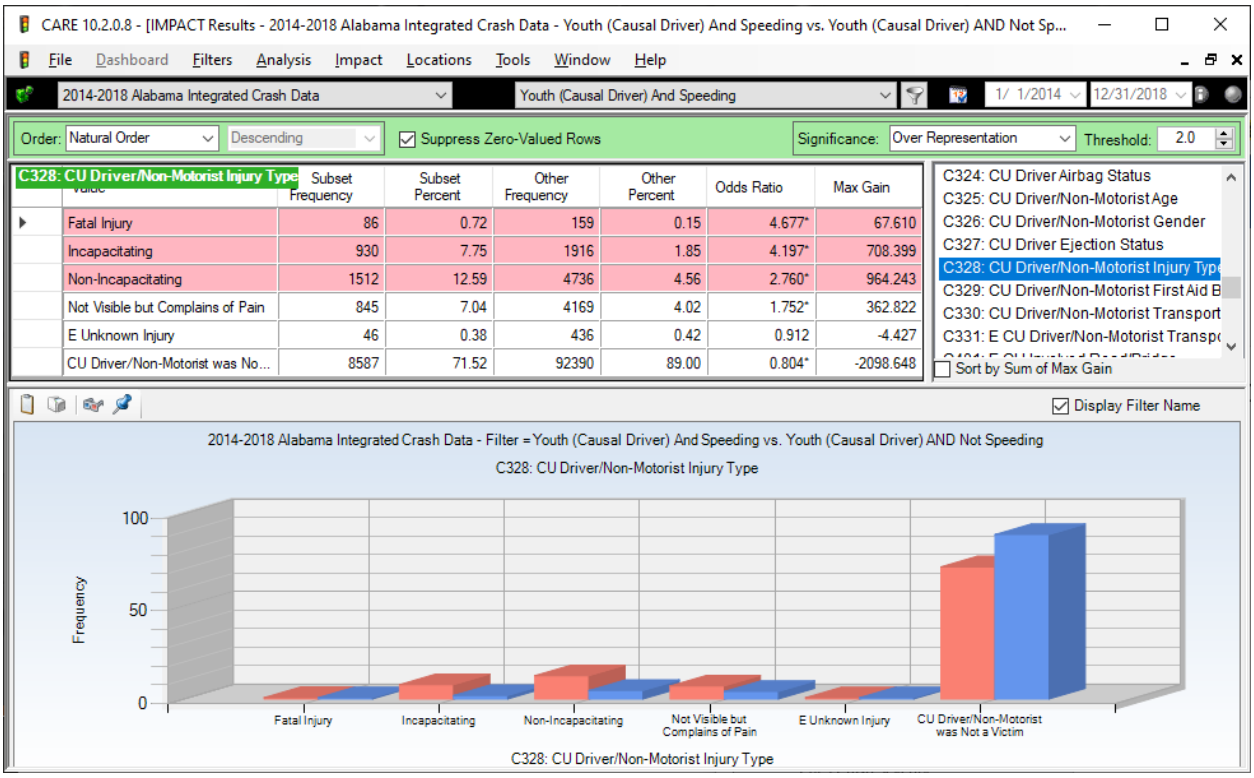
When crashes compare young driver speed vs. non-speed, the picture is very much different. This demonstrates that the risk-taking proxy of speed is effective in predicting the risk-taking with regard to the use of restraints.

C328 CU Driver Injury Type



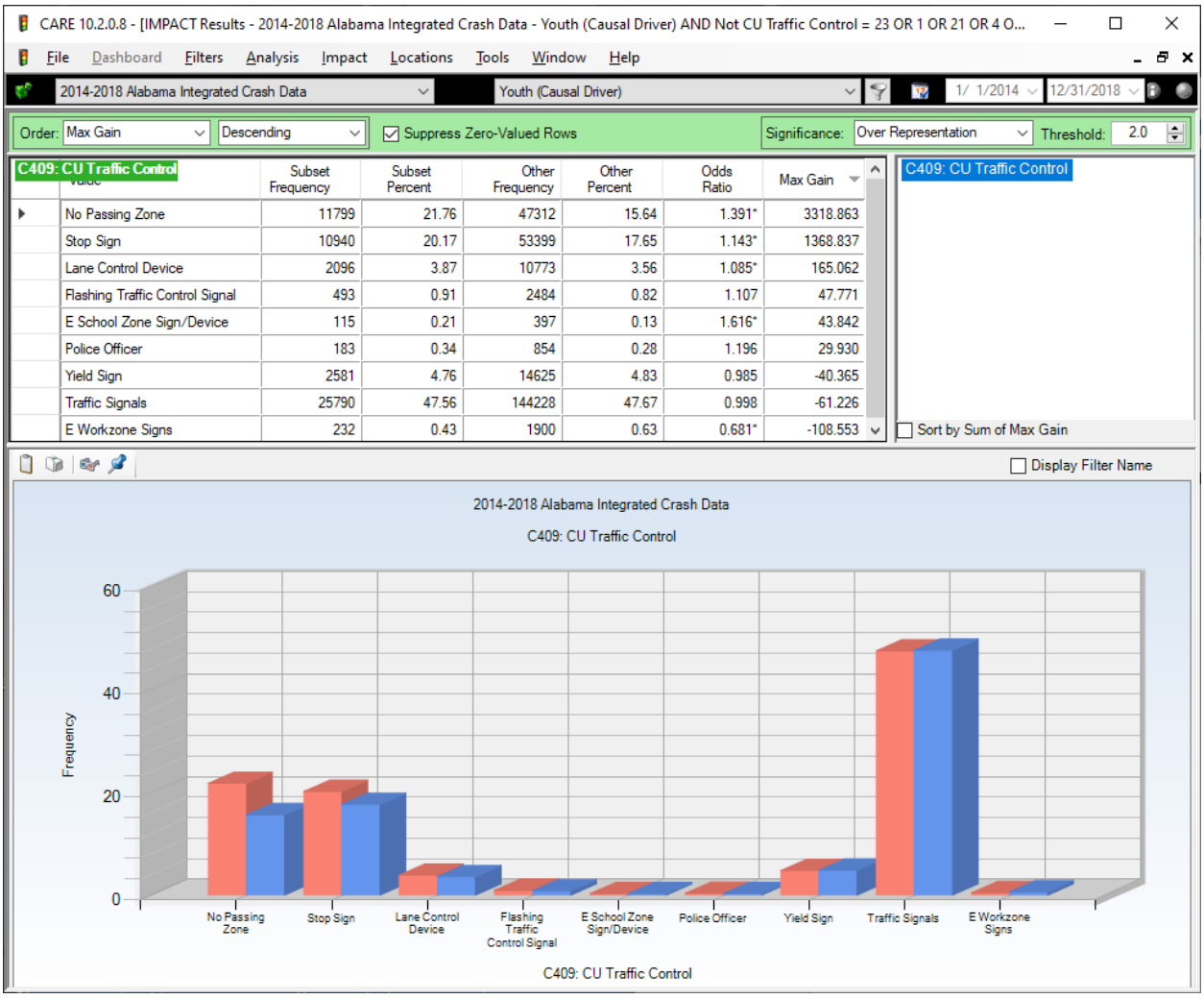
The results here are comparable to those of C025. However, C025 is a measure of the worst injury in the crash, as opposed to that of the driver. This result shows that the driver has a better survival chance than occupants of the crash (all occupants both in the causal and the victim vehicles) in general. This reflects their use of restraints and other safety equipment.

C328 CU Driver Injury Type for *Crashes Involving Speed*



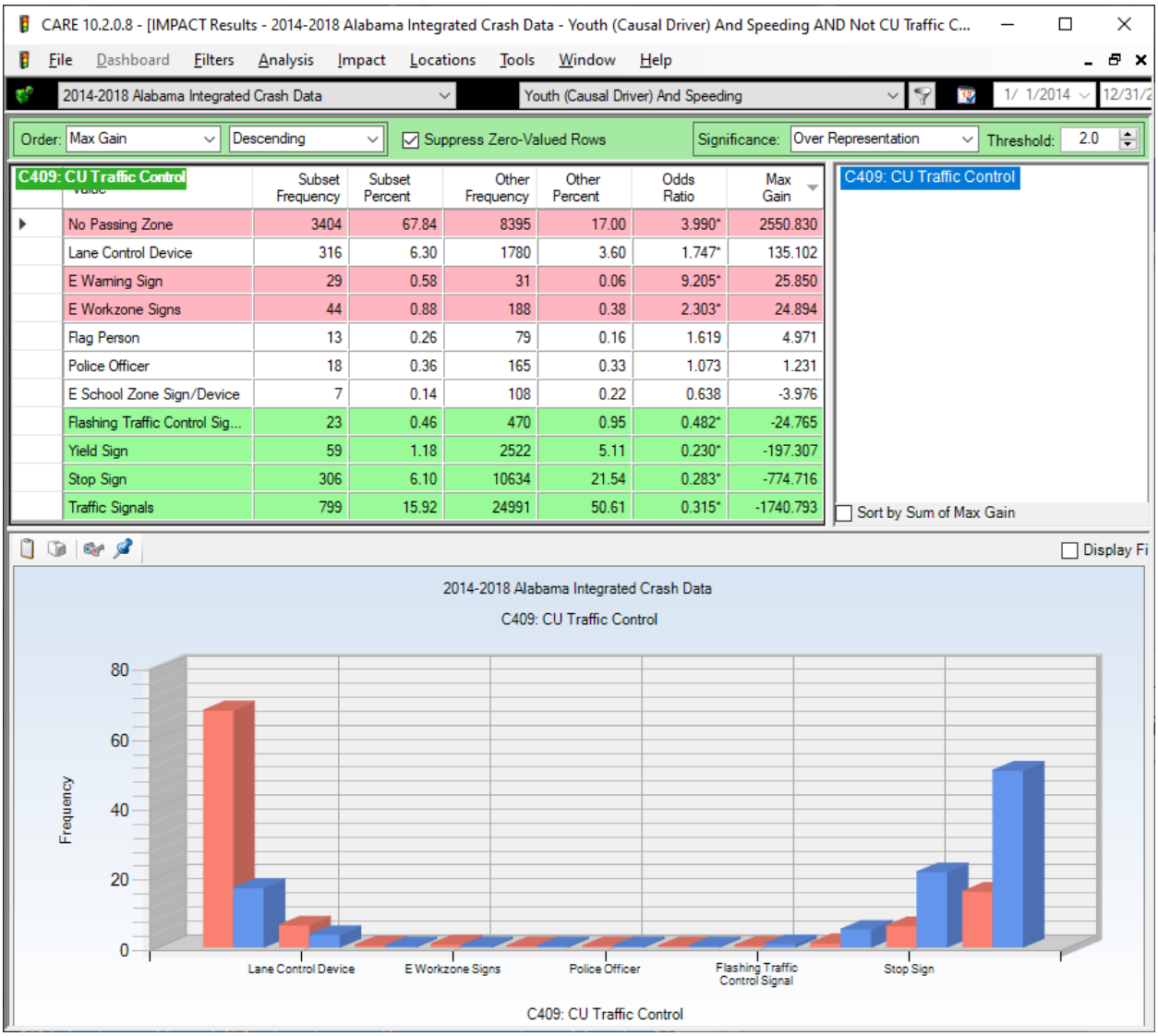
This corresponds heavily to the general severity findings in C025.

C409 CU Traffic Control



The high (close to 40%) relative occurrences of crashes in No Passing Zones is an indicator of risky behavior. They do not seem to have as much of a problem with Yield Signs and Traffic Signals as they do with Stop Signs.

C409 CU Traffic Control for *Speed Related Crashes*



C409: CU Traffic Control	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
No Passing Zone	3404	67.84	8395	17.00	3.990*	2550.830
Lane Control Device	316	6.30	1780	3.60	1.747*	135.102
E Warning Sign	29	0.58	31	0.06	9.205*	25.850
E Workzone Signs	44	0.88	188	0.38	2.303*	24.894
Flag Person	13	0.26	79	0.16	1.619	4.971
Police Officer	18	0.36	165	0.33	1.073	1.231
E School Zone Sign/Device	7	0.14	108	0.22	0.638	-3.976
Flashing Traffic Control Sig...	23	0.46	470	0.95	0.482*	-24.765
Yield Sign	59	1.18	2522	5.11	0.230*	-197.307
Stop Sign	306	6.10	10634	21.54	0.283*	-774.716
Traffic Signals	799	15.92	24991	50.61	0.315*	-1740.793

The no passing zone proportion increases from 21.76% to 67.84% in the test group where the vehicle driven by the younger driver was speeding. The control percentages are about the same at 15.64% and 17.00%.