RESEARCH & DEVELOPMENT

Cost Reduction of Worker Compensation Claims Resulting from Driver License Road Test Related Injuries

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16. Abstract

Driver license examiners serve as the first line of defense against unsafe drivers and driving practices by issuing driver licenses only to individuals that are able to safely operate motor vehicles. While they play an important role in preserving traffic safety, they are themselves exposed to high levels of safety risks as they test new drivers with limited driving proficiency and experience. Not surprisingly, this community of workers report a large number of work related incidents that are associated with a significant number of worker compensation claims. The purpose of the reported research was to gain a deeper understanding of the safety challenges and incidents that this community of workers experience to inform the adoption of effective safety practices and identify potential policy changes. The objectives of the study were accomplished in two complementary studies. The first study focused on performing a content analysis of incident reports involving driver license examiners that were maintained by the North Carolina Division of Motor Vehicles (NCDMV) The key findings from the first study include the following: (1) The most common event types that driver license examiners experience are *collision with fixed object*, *overexertion and physical bodily reaction*, and *collision with another vehicle*; (2) The most common contributing factors are f*ailure to maintain control of vehicle* and incidents experienced while *examiners are exiting the vehicle*; (3) Most incidents that result in injury involve injuries to multiple body parts, followed by injuries to the *back*, *leg*, and neck; (4) The most common injury types are strain, sprain, and *bruising and contusion*; (5) The injury outcomes are *medical case*, *permanent disability*, *report only*, and *temporary disability*. The second study involved a complementary effort where interviews were conducted with active driver license examiners to unveil safety challenges that are generally not captured as part of accident investigations. Some of the key challenges that were identified include (1) drivers reporting for testing or retesting without sufficient training, (2) communication challenges with prospective drivers that are not proficient in English, (3) drivers adopting driving customs learned in a another country, and others. The study also identified safety management solutions that driver license examiners adopt and other recommended safety solutions that can be possibly adopted in the future along with related implementation challenges.

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EXECUTIVE SUMMARY

Driver license examiners play a crucial role in accident prevention – by serving as the first line of defense against unsafe drivers and driving practices. These examiners ensure that driver licenses are issued only to individuals that can demonstrate basic competency in safely operating motor vehicles. Nonetheless, these examiners themselves are exposed to high levels of safety risk as they test new drivers – with limited driving proficiency and experience. Not surprisingly, a disproportionate number of work-related incidents have been reported among these examiners. A deeper understanding of the safety challenges and incidents that this community of workers experience will be useful to the adoption of effective safety practices and policy changes.

Towards achieving this goal, the current study focused on two complementary studies. The first study focused on performing a content analyses of the safety incident reports maintained by the North Carolina Division of Motor Vehicles (NCDMV) that involved driver license examiners. Apart from demonstrating that numerous incidents are experienced *during* driving tests, the key findings of the investigation included: (1) The most common event types that driver license examiners experience are *collision with fixed object*, *overexertion and physical bodily reaction*, and *collision with another vehicle*; (2) The most common contributing factors are f*ailure to maintain control of vehicle* and incidents experienced while *examiners are exiting the vehicle*; (3) Most incidents that result in injury involve injuries to multiple body parts, followed by injuries to the *back*, *leg*, and neck; (4) The most common injury types are strain, sprain, and *bruising and contusion*; (5) The injury outcomes are *medical case*, *permanent disability*, *report only*, and *temporary disability*. The results also reveal particular relationships that are overrepresented in the incident reports. For example, collision with fixed object is associated particularly with failure to maintain control of vehicle, abrupt acceleration, backing vehicle from parking space, and speeding.

To complement the findings of the first study, the second study focused on soliciting and cataloguing safety challenges that driver license examiners experience as part of their daily operations using interviews. The purpose of the complementary effort was to capture useful data that is not represented in the incident reports such as driver errors associated with near misses and upstream factors not captured as part of incident investigations. The second study also captured current safety practices that driver license examiners adopt to reduce the risk of safety incidents and others that they believe could possibly be adopted in the future. Some of the challenges reported by the driver examiners include (1) drivers reporting for testing or retesting without sufficient training, (2) communication challenges with prospective drivers that are not proficient in English, (3) drivers adopting driving customs learned in a another country, (4) drivers that demonstrate nervousness and anxiety, (5) threats, verbal abuse, and attacks from discontent customers, and others. Some of the measures that driver license examiners currently adopt to minimize safety risks include (1) the use of translation technology to enhance communication with prospective drivers that are not proficient in the English language or another language known to the examiner, (2) pre-testing driving ability in the parking lot prior to the road test, (3) being prepared to take control over the vehicle, (4) encouraging prospective drivers to hold the permit and gain experience prior to testing or retesting, and others. Some of the recommend future approaches to risk reduction suggested include (1) the early termination of the driving test, (2) enforcing a minimum wait period after the issuance of the learners permit or a failed test, (3) adoption of contactless testing methods where the driver examiner remains outside the vehicle during the testing operations, and others. Apart from being the first research effort that focused on examining incident reports involving driver license examiners, the findings can be leveraged to enhance the safety of driver license examiners and empower them to better serve our communities.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Every year, driver license examiners administer millions of driving tests across nations (Bureau of Infrastructure, Transport, and Regional Economics 2017, Driver and Vehicle Licensing Agency 2020, Federal Highway Administration 2011). The primary purpose of these tests is to ensure that new drivers – who are issued licenses – are able to safely operate motor vehicles to minimize the risk of traffic accidents, crashes, and property damage (e.g., Haire et al. 2011; NCDMV 2020, Zakhareuski 2020). Therefore, driver license examiners play a crucial role in reducing traffic accidents and crash rates; and serve as the first line of defense against unsafe drivers and driving practices (McDavid and Echaore-McDavid 2009; Rosenbloom et al. 2007).

Despite their significant role in preventing accidents and enhancing traffic safety, driver license examiners are themselves exposed to high levels of safety risk as they test new drivers who typically have limited driving experience and proficiency (e.g., North Carolina Office of State Human Resources 2013; Smith 2018). In fact, evidence suggests that a large number of driver license examiners are injured on a regular basis as they administer driving tests (Martz 2011). Some estimates suggest that at least one examiner is injured every three days during driving tests (Driving and Vehicle Standard Agency 2017). Evidence also suggests that driver license examiners experience a disproportionate number of near-misses and unsafe situations every year (Driving and Vehicle Standard Agency 2017; NCDMV 2019).

Apart from the physical pain and distress, such injuries result in substantial costs in terms of medical expenses and worker compensation claims – that exceed hundreds of thousands of dollars (Economic Policy Institute 2013; National Safety Council 2018; North Carolina Department of Transportation 2019). These incidents also result in productivity loss that interferes with the efficient administration of driving tests and the operations of licensing offices. When driver license examiners are injured, their ability to enhance traffic safety proactively, protect the public, and serve the community is impeded. Therefore, research that focuses on reducing work-related injuries among this community of workers is imperative to ensure the safety of driver license examiners, new drivers, and the public.

As a first step towards tackling this problem, understand the safety challenges and risks that driver license examiners face is critical. Such efforts can facilitate the adoption of appropriate policies and interventions that promote safety during the administration of driving tests. Unfortunately, previous research has not focused on addressing the safety challenges experienced by driver license examiners.

To address the safety challenges experienced by this community of workers, two complementary studies were conducted. The first study focused on performing a content analyses of incident reports maintained by the NCDMV to unveil safety challenges captured during follow-up reporting and investigation. The second study focused on soliciting and cataloguing safety challenges that driver license examiners experience as part of their daily operations using interviews. The purpose of the complementary interviews was to capture useful data that is not represented in the incident reports such as driver errors associated with near misses and upstream factors not captured as part of incident investigations. The second study also captured current safety practices that driver

license examiners adopt to reduce the risk of safety incidents and others that they believe could possibly be adopted in the future. These findings of this effort will serve as the foundation for future efforts that seek to identify and test prospective interventions to address the identified safety issues.

BACKGROUND

Reducing Traffic-related Safety Incidents

Globally, more than a million lives are lost every year as a result of traffic safety incidents (World Health Organization 2013). In the United States, traffic accidents account for more than 30,000 deaths and over four million traumatic injuries every year (Association for Safety International Road Travel 2019; National Safety Council 2019). In fact, traffic safety incidents have been identified as one of the leading causes of mortality across nations (World Health Organization 2018). Apart from the pain and suffering, these incidents also result in adverse economic and societal outcomes. For example, estimates suggest that the economic and societal burden of traffic incidents in the United States exceed $870 billion every year (Blincoe et al. 2015).

Given the scale and significance of traffic-related incidents, much research has been devoted to understanding factors that contribute to traffic incidents. For example, a large body of research has examined the role of personal factors such as age and experience of drivers on accident likelihood (e.g., Chang and Yeh 2007; Oltedal and Rundmo 2006). Similarly, others have examined behavioral factors such as speeding and drunken driving (e.g., Møller and Haustein 2014; Ristic et al. 2013 Stanton and Salmon 2009), environmental factors such as weather, rain and snow (e.g., Qui and Nixon 2008; Yan et al. 2014; Yu and Abdel-Aty 2014), and highway characteristics such as the layout and the condition of roads on the risk of traffic incidents (e.g., Hummer et al. 2016; Wang et al. 2013; Weng and Meng 2012).

As our understanding of factors that cause injuries and accidents have increased, strategic initiatives to enhance safety have been adopted. Examples of such initiatives include establishing and enforcing speed limits (Archer et al. 2008), requiring the use of seatbelts (Kidd and Singer 2019), replacing road intersections with roundabouts (Daniels et al. 2008), placement of guardrails alongside roads (Soltani et al. 2013), and illuminating roadways using artificial lighting after sunset (Monsere et al. 2008).

Apart from the above-discussed initiatives, an effective and upstream measure used to reduce traffic incidents is the administration of driving tests by driver license examiners. This measure focuses on assessing the driving skill of prospective drivers prior to the issuance of driver licenses (e.g., Haire et al. 2011; NCDMV 2020, Zakhareuski 2020). Unfortunately, these driver license examiners, as already discussed, are themselves vulnerable to being injured while testing inexperienced drivers (North Carolina Office of State Human Resources 2013; Smith 2018).

Given their important role in promoting traffic and public wellbeing, research that focuses on enhancing the safety and efficiency of driver license examiners is necessary. Such efforts will enable driver license examiners to offer superior services; while also enhancing traffic safety.

Significance of Work-Related Injury Prevention

More than 4000 work-related fatal incidents and more than three million non-fatal incidents are reported in the United States every year (U.S. Bureau of Labor Statistics 2018). These injuries and incidents result in undesirable outcomes that impact workers, their employers, and the broader society. For example, injured workers may experience disabilities, may not be able to return to work, and may be unable to provide for their loved ones (Occupational Safety and Health Administration 2015). On the other hand, employers may need to bear additional costs associated with medical expenses, worker compensation claims, litigations, and property damages (Liberty Mutual 2020; National Safety Council 2019). In the same manner, the broader community that depends on the injured workers for services – may experience service interruptions and delays (National Safety Council 2019). For example, when a driver license examiner is injured, scheduled driving tests may need to be canceled or delayed. Such delays in the issuance of licenses can impede customers from achieving their own goals of contributing to their families and the wider society; and lead to customer dissatisfaction. Not surprisingly, estimates suggest that workplace injuries in the United States result in a collective loss that exceeds $170 billion and 100 million workdays every year (National Safety Council 2019; U.S. Department of Labor 2015).

To prevent these work-related incidents, strategic initiatives have been undertaken to understand injury causes and identify appropriate injury prevention methods. For example, in the healthcare setting, early investigations unveiled that workers tasked with lifting and transferring patients experienced a disproportionate number of lower-back injuries (Edlich et al. 2005). This finding prompted the development and adoption of mechanically-powered patient-lifting equipment which yielded a 35% reduction in lower-back injuries among healthcare workers in the United States (Bell et al. 2008). In the same manner, interventions have been adopted for a variety of applications including reducing falls in construction workplaces (Zuluaga and Albert 2018), addressing tractor-related incidents among agriculture workers (Franceschetti et al. 2019), and prevention of explosions in the oil and gas industry (Dennis 2014).

Like these efforts, an understanding of the safety challenges associated with the administration of driving tests can facilitate the development and implementation of new interventions to protect driver license examiners. Unfortunately, as already discussed, the safety of this community of workers has not been targeted in previous studies. Efforts in this area will be beneficial not only for driver license examiners, but will also result in lower costs to transportation agencies and superior service to the broader community.

RESEARCH OBJECTIVES

To gain a deeper understanding of the safety challenges and incidents that that driver license examiners two complementary studies were undertaken. The first study focused on conducting content analyses of incident deports maintained by NCDMV. The second study focused on interviewing driver license examiners to capture additional safety challenges that are usually not captured as part of incident reporting and investigations. In addition, as part of the second study, current practices that the driver license examiners adopt to reduce the risk of safety incidents and those that they recommend be evaluated for future adoption were captured.

STUDY 1: SAFETY CHALLENGES IDENTIFIED THROUGH CONTENT ANALYSES OF SAFETY INCIDENT REPORTS

Research Methods and Formulation of Research Questions

Stage I: Identification and Extraction of Key Incident Attributes

To gain an understanding of the safety incidents that driver license examiners experience, incident reports maintained by the NCDMV was obtained and examined. The database includes incidents that were reported by driver license examiners and other NCDMV affiliates as part of incident investigations – for the purpose of recording, reporting, and initiating worker compensation claims. The database includes incidents experienced by examiners while administering driving tests for commercial and non-commercial driving licenses.

In total, between 2000 and May 2018, when the currently reported investigation was initiated, 400 driving test related incidents were recorded. These reports include incidents that occurred from the time a driver license examiner exited the licensing office to administer a driving test until the examiner reentered the licensing office at the conclusion of the test. Accordingly, the database does not include incidents that occurred when a licensing examiner was inside the physical licensing office; such incidents may include tripping over a power cord or experiencing a puncture from a sharp object (such as a stapler) while within the premises of the physical office. However, the incident reports include incidents that occurred after the examiner exited the office and moved toward the driver's vehicle to initiate the test and prior to reentry into the office – such as trips and falls in the parking lot.

In the first stage of the qualitative content analyses effort, four members of the research team collaboratively examined each of the incident reports to determine and extract key incident attributes (Elo and Kyngäs 2008; Saldaña 2015). Given that it was unclear as to what would constitute key attributes at this initial stage of the effort, relevant attributes were iteratively identified as the injury reports were reviewed – one at a time.

At the end of the first stage of the review, the key attributes of interest that were determined to be the focus of the study were identified. The first of these identified attributes of interest is the *driving test stage*, which is captured in three categories: before test initiation, during the driving test, and after test completion, and designated respectively as *before*, *during*, and *after*. The *before* category includes incidents that occurred between the time the driver license examiner exited the licensing office and when the examiner entered the driver's vehicle to begin the test. Examples of such reported incidents include tripping over parking curbs, injuries sustained during pre-inspection of the vehicle, and incidents that occurred while entering the vehicle. The *during* category captures incidents that occurred after the driver license examiner entered the vehicle to administer the test until the driving test was completed and the examiner was ready to exit the vehicle. Finally, the *after* category captures incidents that occurred while the driver license examiner was exiting the vehicle until the examiner re-entered the licensing office at the conclusion of the driving test.

Apart from (1) driving test stage other attributes of interest included the (2) event type – such as collision with fixed object, collision with another vehicle, and fall to lower level; (3) contributing factor – such as failure to maintain control of vehicle, speeding, and abrupt acceleration; (4) injured

body part – such as back, leg, and neck; (5) injury type – such as strain, bruising or contusion, inflammation, and fracture; and (6) injury outcome – such as permanent disability, temporary disability, and medical case (i.e., incidents where the examiner was able to return to work immediately after receiving medical attention). Table 1 presents the complete list of attributes and the corresponding attribute categories in the left two columns.

After the attributes were identified using an iterative approach, five members of the research team reviewed each of the incident reports – once-again one at a time – and collaboratively identified and extracted the attributes present in each of the incident reports. For illustrative purposes, Fig. 1 presents an excerpt from an example incident report along with the associated attributes and the attribute categories that the research team extracted.

Of the initial 400 incident reports, four were excluded from subsequent analyses because they did not sufficiently capture the targeted key attributes or provide a clear description of the incident. Accordingly, the remaining 396 incident reports served as the database for this study.

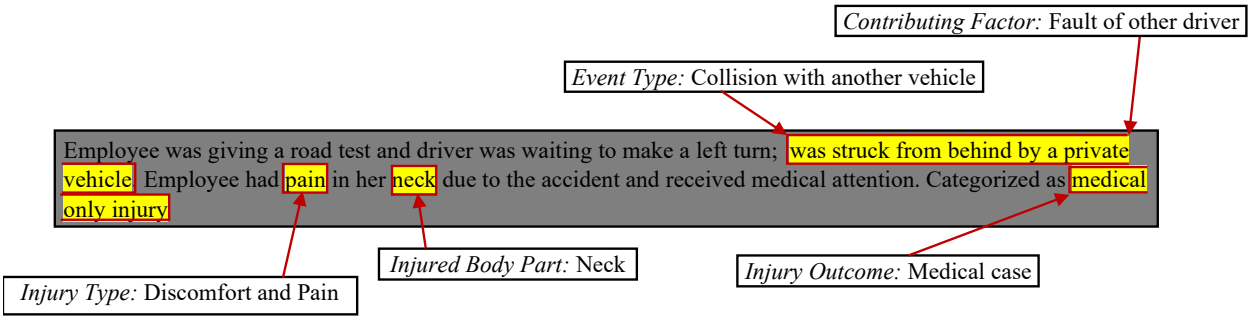

Figure 1. Example of incident report excerpt and attribute extraction attribute extraction

Stage II: Formulation of Targeted Research Questions

After extracting the attributes from each of the 396 incident reports , the research team formulated research questions to gain a better understanding of the safety-related challenges faced by driver license examiners. The first set of research questions focused on examining if particular attribute categories are overrepresented or particularly prominent in the database. For example, based on the attribute categories presented in Table 1, one of the questions targeted whether driver license examiners are more likely to experience incidents at particular stages of the driving test (i.e., before, during, or after). Such information can offer important insights and reveal problem areas that must be prioritized to reduce injury rates among driver license examiners. The complete first set of targeted research questions is as follows:

- Are driver license examiners especially vulnerable to injury / incident at particular *driving test stages*?
- Are driver license examiners especially vulnerable to experiencing particular *event types?*
- Are driver license examiners especially vulnerable to injury / illness as a result of particular *contributing factors*?

- Are driver license examiners especially vulnerable to injuring particular *body parts*?
- Are driver license examiners especially vulnerable to experiencing particular *injury types*?
- Are driver license examiners especially vulnerable to experiencing particular *injury outcome*s?

After the first set of questions were identified, the second set of formulated questions focused on obtaining a more nuanced understanding of the safety incidents. These questions targeted the examination of relationships between the attributes. For example, one of the research questions was designed to examine whether or not there exists a relationship between the *driving test stage* and the resulting *event type*. More specifically, this question sought to examine if particular *event types* are more likely than expected at different times of the driving tests. The complete second set of targeted research questions is as follows:

- Does the driving test stage correlate with the (1) event type, (2) contributing factor, (3) injured body part, (4) injury type, and (5) injury outcome?
- Does the contributing factor correlate with the (1) event type, (2) injured body part, (3) injury type, and (4) injury outcome?
- Does the event type correlate with the (1) injured body part, (2) injury type, and (3) injury outcome?
- Does the injured body part correlate with the (1) injury outcome?
- Does injury type correlate with the (1) injury outcome?

Data Analysis and Results

Examining Attribute Categories that are more Prominent

As discussed above, the first set of research questions focused on whether particular attribute categories were more prominent or more likely to be associated with work-related incidents. To investigate this set of questions, the *chi-square goodness-of-fit test* was adopted (Agresti 2018). This was accomplished by first computing the *chi-square test statistic*, presented in Equation 1, and comparing it to the *chi-square distribution* – to assess if there are significant disparities between the number of safety incidents observed (O_i) and the number of incidents expected (E_i). While the observed count refers to the number of incidents where a particular attribute category is relevant in the dataset, the expected count refers to the number of incidents expected in the hypothetical case where none of the attribute categories are more prominent than another. Accordingly, the expected count can be calculated simply by distributing the total number of incidents (i.e., 396 in the current study) equally across the relevant attribute categories as shown in Equation 2. For example, for the *driving test stage* attribute, the expected count can be calculated by distributing the total number of incidents (i.e., 396) across the three attribute categories (i.e., *during*, *before*, and *after* – 396/3). Likewise, for the *event type* attribute, the incidents are equally distributed across the eight attribute categories (i.e., 396/8). Table 1 shows the total number of attribute categories that is relevant to each of the attributes.

Table 1. Attributes, attribute categories, and chi-square goodness-of-fit test results

Attribute	Attribute Categories	#	ε_i	Chi-Square Test Statistic	*p*-value
Driving Test Stage (Total #: 396)	During	250	+10.27	158.77	<0.001
	Before	79	-4.61		
	After	67	-5.65		
Event Type (Total #: 396)	Collision with fixed object	125	+10.73	266.67	<0.001
	Overexertion and physical bodily reaction	89	+5.61		
	Collision with another vehicle	76	+3.77		
	Fall on the same level	50	+0.07		
	Fall to lower level	25	-3.48		
	Struck by or against	15	-4.90		
	Exposure to harmful substances, surfaces, or environments	7	-6.04		
	Others / Unknown / Unreported	9	-5.76		
Contributing Factor (Total #: 396)	Failure to maintain control of vehicle	81	+11.96	290.27	<0.001
	Exiting the vehicle	48	+5.12		
	Uneven surface / Object on ground / Loss of balance	47	+4.91		
	Fault of other driver	38	+3.05		
	Abrupt acceleration	32	+1.80		
	Entering the vehicle	25	+0.35		
	Abrupt braking	23	-0.06		
	Backing vehicle from parking space	22	-0.27		
	Failure to yield right of way	17	-1.30		
	Speeding	10	-2.75		
	Manual handling / Lifting	10	-2.75		
	Abrupt postural change / Poor posture	9	-2.96		
	Unsafe lane change / Oversteering / Overcorrecting	8	-3.17		
	Weather conditions	7	-3.38		
	Failure to stop at stop sign or red light	7	-3.38		
	Animal / Insect	5	-3.79		
	Others / Unknown / Unreported	7	-3.38		
Injured Body Part (Total #: 396)	Multiple body parts	109	+12.17	342.33	<0.001
	Back	96	+10.00		
	Leg	40	+0.67		
	Neck	37	+0.17		
	Arm and shoulder	34	-0.33		
	Knee	24	-2.00		
	Hand	21	-2.50		
	Head	10	-4.33		
	Abdomen and hip	6	-5.00		
	Chest	6	-5.00		
	None	13	-3.83		
Injury Type (Total #: 396)	Strain	208	+28.67	1023.44	<0.001
	Sprain	64	+4.67		
	Bruising or contusion	49	+2.17		
	Multiple types	30	-1.00		
	Discomfort and pain	13	-3.83		
	Laceration	7	-4.83		
	Inflammation	5	-5.17		
	Fracture	5	-5.17		
	Burn	1	-5.83		
	Heatstroke	1	-5.83		
	None	13	-3.83		
Injury Outcome (Total #: 396)	Medical case	278	+17.99	435.78	<0.001
	Permanent disability	54	-4.52		
	Report only	39	-6.03		
	Temporary disability	25	-7.44		

Note: # represents count or frequency; ε_i represents standardized residual

$$\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i} \quad (1)$$

where, χ^2 is the *chi-square test statistic*; O_i is the observed count or frequency that represents the number of incidents that corresponds to a particular attribute category *i*; E_i is the expected count or frequency for the attribute category *i* in the hypothetical case that none of the attribute categories is more prominent than another attribute category; and *k* is the total number of attribute categories that are relevant to the research question of interest.

$$E_i = \frac{N}{k} \quad (2)$$

where, E_i is the expected count or frequency for a particular attribute category *i* in the hypothetical case that none of the attribute categories is more prominent than another attribute category; N is the total number of incidents (i.e., 396) in the database; and k is the total number of attribute categories that are relevant to the research question of interest.

The results of the tests are also presented in Table 1. As shown, for the *driving test stage* attribute, of the 396 total work-related incidents, 250 occurred *during* the driving test, 79 occurred *before* the driving test, and 67 occurred *after* the driving test. The computation of the *chi-square test statistic* using these observed counts and the expected count of 132 (396 total incidents distributed equally across the three attribute categories – i.e., 396/3) yielded a *chi-square value* of 158.77. A comparison of the test statistic with the *chi-square- distribution* yielded a *p*-value that was less than 0.05 – which suggests that the three different times are not represented equally or that incidents are more likely to occur at certain times.

In the same manner, the findings suggest that particular *event types* [F(7) = 266.67], *contributing factors* [F(16) = 290.97], and *injured body parts* are more likely than others. [F(10) = 342.33]. Likewise, driver license examiners are more likely to experience certain *injury types* [F(10) = 266.67] and *injury outcomes* [F(3) = 437.78] than others. Therefore, in summary, the results for the first set of research questions indicate that driver license examiners are more likely to (1) experience injury in certain *driving test stages*, (2) experience certain *event types* , (3) be impacted by certain *contributing factors* , (4) encounter incidents that result in certain *injured body parts* , (5) experience certain *injury types*, and (6) experience certain *injury outcomes* compared to other respective attribute categories.

Apart from examining the count data that correspond to each of the attribute categories, to more specifically identify the attribute categories that are more likely to be associated with incidents, the standardized residuals as presented in Equation 3 was computed for each of the attributes. In the equation, the numerator represents the residual – which is the difference between the observed and expected count for each of the attribute categories. The denominator is the square root of the expected count – which is an estimate of the standard deviation of the residuals that standardizes

the residual for easier interpretation. A positive standardized residual indicates that an attribute category is more prominent or more likely to occur relative to the other attribute categories (Kateri 2014). In contrast, a negative residual indicates that the corresponding attribute category is relatively less represented in the data. A standardized residual of zero indicates that the observed count and the expected count are equal – suggesting that the corresponding attribute category is neither overrepresented nor underrepresented in the dataset.

$$\varepsilon_i = \frac{O_i - E_i}{\sqrt{E_i}} \tag{3}$$

where, ε_i is the standardized residual from the *chi-square goodness-of-fit* test; O_i is the observed count or frequency that represent the number of incidents that correspond to the attribute category *i*; and E_i is the expected count or frequency for the attribute category *i* in the hypothetical case that none of the attribute categories were more prominent than another.

Table 1 also presents the standardized residuals. The positive standardized residuals suggest that incidents are more likely to be experienced by driver license examiners *during* the driving test compared to *before* and *after* the driving test. The *event types* that driver license examiners are more likely to experience include (1) *collision with fixed object*, (2) *overexertion and bodily reaction*, (3) *collision with another vehicle*, and (4) *fall on the same level*. The *contributing factors* that are more likely to be associated with incidents include (1) *failure to maintain control of vehicle*, (2) *exiting the vehicle*, (3) *uneven surface / object on the ground / loss of balance*, (4) *fault of other driver*, (5) *abrupt acceleration*, and (6) *entering the vehicle.*

Most incidents result in injuries to *multiple body parts* among driver license examiners. In addition, driver license examiners are particularly likely to experience injury to their (1) *back*, (2) *leg*, and (3) *neck*. When considering injury type, driver license examiners most commonly experience (1) *strain*, (2) *sprain*, and (3) *bruising or contusion*. Finally, for the *injury outcome* attribute category, *medical case*, which involves the transportation of the driver license examiner to a healthcare facility following an incident and before the examiner is able to return to work the next day, is more likely than the other *injury outcome* categories.

Examining Relationships between Attributes

Having addressed the first set of questions, the second set of research questions were pursued. As mentioned earlier, the second set of research questions focused on examining if there are relationships between the different attributes or if the attributes are independent (e.g., *driving test stage* and *injury type*). To examine these questions, the *chi-square test of independence* was adopted.

For the *chi-square test of independence*, the *chi-square test statistic* is computed using a slight variation of Equation 1 – as presented in Equation 4 – to account for the two attributes that are relevant to each of the research questions. Given that the data for the *chi-square test of independence* are generally presented in the form of a contingency table where the rows correspond to one of the attributes and the columns correspond to the other attribute of interest (Kateri 2014),

the expected value is calculated using the marginal frequencies of the rows and columns as presented in Equation 5. The obtained *chi-square test statistic* is compared against the *chi-square distribution* using the robust generalized *Fisher's exact test* to obtain the *p*-value to account for any contingency table cells with an expected count of less than 5 (Mehta and Patel 2011).

$$\chi^2 = \sum_{i=1}^{c} \sum_{j=1}^{r} \frac{(O_{ij} - E_{ij})^2}{E_{ij}} \qquad (4)$$

where, χ^2 is the chi-square test statistic; O_{ij} is the observed count or frequency representing the number of incidents that correspond to a particular attribute category combination *ij*; E_{ij} is the expected count or frequency for a particular attribute category combination *ij* in the hypothetical case that none of the combinations of the attribute categories is more prominent than another; *c* represents the total number of attribute categories that is represented as columns in the contingency table; and *r* represents the total number of attribute categories that is represented as rows in the contingency table.

$$E_{ij} = \frac{N_i \times N_j}{N} \qquad (5)$$

where, E_{ij} is the expected count or frequency for a particular attribute category combination *ij* in the hypothetical case that none of the combinations of the attribute categories is more prominent than another; N_i is the marginal frequency or count for each of the columns in the contingency table; N_j is the marginal frequency or count for each of the rows in the contingency table; and N is the total number of incidents in the database (i.e., 396).

While the *chi-square test of independence* is sufficient to show whether a relationship exists between two attributes of interest, it does not provide a measure of the strength of the relationship. Therefore, *Cramer's V,* which is widely used alongside the chi-square test of independence, was computed using Equation 6 (Cramer and Howitt 2004). *Cramer's V* ranges between 0 where there is no association between the variables and 1 where a complete association is present. Using the obtained *Cramer's V*, the magnitude of the relationship is interpreted using the criteria suggested by Cohen (1992) – A *Cramer's V* between 0.1 and 0.3 (~ i.e., explains between 1% and 9% of total variance) is considered small, between 0.3 and 0.5 (~ i.e., explains between 9% and 25% of total variance) is considered moderate, and over 0.5 (~ i.e., explains over 25% of total variance) is considered large.

$$V = \frac{\chi^2 / N}{\min(c-1, r-1)} \qquad (6)$$

where, χ^2 is the chi-square test statistic computed using Equation 4; N is the total number of incidents in the database (i.e., 396); *c* is the total number of attribute categories that are represented as columns in the contingency table; and *r* is the total number of attribute categories that are represented as rows in the contingency table.

The results of the analysis examining the relationship between the *driving test stage* and the other relevant attributes are presented in Table 2. As shown, there was a statistically significant relationship (i.e., $p < 0.05$) between the *driving test stage* and the *event type*. In other words, certain event types are more likely to occur at different stages of the driving test. Moreover, the associated *Cramer's V* (i.e., 0.656) suggests that the magnitude of this relationship is large.

In the same manner, a statistically significant relationship (i.e., $p < 0.05$) is evident between the *driving test stage* and (1) c*ontributing factor*, (2) *injured body part*, and (3) *injury type*. However, a statistically significant relationship is not evident between *driving test stage* and *injury outcomes*. In other words, the likelihood of each *injury outcome* is statistically the same across each of the three attribute categories (*before*, *during*, and *after*) of the *driving test stage*. The magnitude of the relationship between *driving test stage* and *contributing factor* is large (*Cramer's V* = 0.877). In contrast, the relationships between *driving test stage* and *injured body part* (*Cramer's V* = 0.42) and *injury type* (*Cramer's V* = 0.316) are of moderate magnitude.

While the above-discussed results provide information on whether a relationship exists between the examined attributes , the analysis does not offer insights into the specific attribute category combinations that are more likely than expected to occur in the context of incidents. In other words, although the results offer evidence that certain attribute category combinations are relatively more likely than expected to be associated with incidents, the findings do not pinpoint particular attribute category combinations that are more likely to occur (i.e., overrepresented) than expected. To identify these attribute category combinations that contribute significantly to a higher *chi-square test statistic* – thereby offering evidence that a relationship exists between the attributes – the standardized residuals are computed as shown in Equation 7 (Kateri 2014). As shown, the standardized residuals capture the difference between the observed counts and the expected counts and also account for the differences in the marginal counts across the rows and columns of the contingency table.

$$\varepsilon_{ij} = \frac{O_{ij} - E_{ij}}{\sqrt{E_{ij} \times (1 - N_i/N) \times (1 - N_j/N)}} \qquad (7)$$

where, ε_{ij} is the standardized residual from the chi-square test of independence; O_{ij} is the observed count or frequency that represent the number of incidents that correspond to a specific combination of attribute categories *ij,*; E_{ij} is the expected count or frequency for a specific combination of attribute categories *ij* in the hypothetical case that none of the combinations is more prominent than another; N_i is the marginal frequency or count for each of the columns in the contingency table; $N_j$is the marginal frequency or count for each of the rows in the contingency table; and N is the total number of incidents in the database (i.e., 396)

Table 2. Relationship between driving test stage and the other five attributes

Attribute	Attribute Categories	Driving Test Stage						Chi-Square Test Statistic	*p*-value	Cramer's V
		During		Before		After				
		#	ε_{ij}	#	ε_{ij}	#	ε_{ij}			
Event Type (Total #: 396)	Collision with fixed object	125	+10.3	0	-6.8	0	-6.0	340.99	<0.001	0.656
	Overexertion and physical bodily reaction	37	-4.8	30	+3.6	22	+2.3			
	Collision with another vehicle	76	+7.4	0	-4.9	0	-4.3			
	Fall on the same level	2	-9.3	33	+8.6	15	+2.7			
	Fall to lower level	0	-6.8	3	-1.1	22	+9.9			
	Struck by or against	2	-4.1	9	+3.9	4	+1.1			
	Exposure to harmful substances, surfaces, or environments	1	-2.7	3	+1.5	3	+1.9			
	Others / Unknown / Unreported	7	+0.9	2	+0.2	0	-1.4			
Contributing Factor (Total #: 396)	Failure to maintain control of vehicle	81	+7.7	0	-5.0	0	-4.6	609.683	<0.001	0.877
	Exiting the vehicle	0	-9.7	0	-3.7	48	+16.4			
	Uneven surface / Object on ground / Loss of balance	2	-8.9	33	+9.2	12	+1.7			
	Fault of other driver	36	+4.2	2	-2.4	0	-2.9			
	Abrupt acceleration	32	+4.5	0	-2.9	0	-2.7			
	Entering the vehicle	0	-6.8	25	+10.3	0	-2.3			
	Abrupt braking	23	+3.8	0	-2.5	0	-2.2			
	Backing vehicle from parking space	22	+3.7	0	-2.4	0	-2.2			
	Failure to yield right of way	17	+3.2	0	-2.1	0	-1.9			
	Speeding	10	+2.4	0	-1.6	0	-1.4			
	Manual handling / Lifting	1	-3.5	9	+5.6	0	-1.4			
	Abrupt postural change / Poor posture	4	-1.2	4	+1.9	1	-0.5			
	Unsafe lane change / Oversteering / Overcorrecting	8	+2.2	0	-1.4	0	-1.3			
	Weather conditions	1	-2.7	3	+1.5	3	+1.8			
	Failure to stop at stop sign or red light	7	+2.0	0	-1.3	0	-1.2			
	Animal / Insect	0	-2.9	2	+1.1	3	+2.6			
	Others / Unknown / Unreported	6	+1.2	1	-0.4	0	-1.2			
Injured Body Part (Total #: 396)	Multiple body parts	80	+2.6	15	-2.0	14	-1.3	139.637	<0.001	0.42
	Back	71	+2.5	15	-1.3	10	-1.9			
	Leg	4	-7.3	22	+5.8	14	+3.3			
	Neck	37	+4.9	0	-3.2	0	-2.9			
	Arm and shoulder	19	-0.9	10	+1.4	5	-0.3			
	Knee	4	-4.9	6	+0.6	14	+5.7			
	Hand	8	-2.4	7	+1.5	6	+1.5			
	Head	7	+0.5	2	0.0	1	-0.6			
	Abdomen and hip	1	-2.4	3	+1.8	2	+1.1			
	Chest	6	+1.9	0	-1.2	0	-1.1			
	None	13	+2.8	0	-1.8	0	-1.6			
Injury Type (Total #: 396)	Strain	155	+4.9	33	-2.3	20	-4.0	78.97	<0.001	0.316
	Sprain	22	-5.2	19	+2.1	23	+4.5			
	Bruise or contusions	22	-2.8	18	+3.1	9	+0.3			
	Multiple types	21	+0.8	2	-1.9	7	+1.0			
	Discomfort and pain	10	+1.0	2	-0.4	1	-0.9			
	Laceration	2	-1.9	3	+1.5	2	+0.9			
	Inflammation	0	-2.9	2	+1.1	3	+2.6			
	Fracture	4	+0.8	0	-1.1	1	+0.2			
	Burn	0	-1.3	1	+2.0	0	-0.4			
	Heatstroke	1	+0.8	0	-0.5	0	-0.4			
	None	13	+2.8	0	-1.8	0	-1.6			
Injury Outcome (Total #: 396)	Medical case	179	+0.8	57	+0.2	42	-1.3	7.919	0.244	0.141
	Permanent disability	30	-1.2	12	+0.4	12	+1.2			
	Report only	21	-1.3	10	+0.9	8	+0.7			
	Temporary disability	20	+1.8	1	-2.1	4	-0.1			

Note: # represents Count or Frequency; ε_{ij} represents Standardized Residual

Table 2 presents the computed standardized residuals. When the standardized residual associated with a particular attribute category combination is positive, that attribute category combination is relatively more likely to occur than expected (Kateri 2014). Moreover, since standardized residuals are analogous to *z*-scores, a standardized residual that is greater than '2' or '3' suggests that the relationship is associated with a significance level or *p-value* less than 0.05 or 0.002 respectively (Agresti 2018). For the sake of brevity, the paragraphs below discuss only selected standardized residuals that are larger than 3 because they (1) offer substantial evidence that the particular attribute combination is more likely to occur than expected and (2) contribute heavily to a significant chi-square test statistic. Also, the discussion ignores cases where a significant relationship is not evident between two attribute of interest (e.g., *driving test stage* and *injury outcome*) based on the *chi-square test of independence* discussed earlier.

With regard to the relationship between *driving test stage* and *event type*, *collision with fixed object* (ε_{ij} = 10.3) (e.g., utility poles, roadway signage, etc.) and *collision with another vehicle* (ε_{ij} = 7.4) are more likely than expected to occur *during* driving tests. However, *before* the driving test, driver license examiners are more likely to experience *fall on the same level* (ε_{ij} = 8.6) (e.g., trips over curbs or falls during vehicle entry), s*truck by or against incidents* (ε_{ij} = 3.9) (e.g., striking hand on vehicle door during entry), and *overexertion and physical bodily reaction* (ε_{ij} = 3.6) (e.g., strain while entering vehicle). After the driving test, driver license examiners may experience *fall to lower level* (ε_{ij} = 9.9) incidents, particularly when exiting the vehicle.

With regard to contributing factor, failure to maintain control of vehicle (ε_{ij} = 7.7), abrupt acceleration (ε_{ij} = 4.5), fault of other driver (ε_{ij} = 4.2), abrupt braking (ε_{ij} = 3.8), backing vehicle from parking space (ε_{ij} = 3.7) (e.g., backing into another car), and failure to yield right of way (ε_{ij} = 3.2) are particularly common during driving tests. Before the driving test, a disproportionate number of incidents is associated with entering the vehicle (ε_{ij} = 10.3) (e.g., strain during entry), uneven surface / object on ground / loss of balance (ε_{ij} = 9.2), and manual handling / lifting (ε_{ij} = 5.6) (e.g., moving traffic cones). Finally, after driving tests, incidents are particularly more likely to occur than expected when driver license examiners are exiting the vehicle (ε_{ij} = 16.4) (e.g., fall from the vehicle).

With regard to *injured body part*, *during* the driving test, driver license examiners are susceptible to injuries to the *neck* (ε_{ij} = 4.9) (e.g., from the jerking action caused by abrupt acceleration) more than expected. *Before* the driving test, injuries to *leg* (ε_{ij} = 5.8) (e.g., from falls in the parking lot) are overrepresented; whereas injuries to *knee* (ε_{ij} = 5.7) and *leg* (ε_{ij} = 3.3) are more common than expected *after* driving tests (e.g., from a fall from the vehicle).

With regard to *injury type*, *strain* (ε_{ij} = 4.9) (e.g., back strain after a collision) is likely to occur *during* the driving test; *bruising or contusion* is more likely than expected to occur *before* the driving test (ε_{ij} = 3.1) (i.e., injury after a trip or fall); and *sprain* (ε_{ij} = 4.5) is significantly more likely than expected after the driving test (e.g., ankle sprain on exiting the vehicle).

The remaining research questions that were part of the second set of research questions were also examined using the same approach discussed above. Table 3 presents the analysis results that examine the relationship between *contributing factor* and the other attributes. As can be seen, a

statistically significant relationship is evident between *contributing factor* and (1) *event type,* (2) *injured body part,* and (3) *injury type* (i.e., $p < 0.05$). The relationship between *contributing factors* and *event type* is strong (i.e., Cramer's $V = 0.707$). On the other hand, the relationships between the *contributing factor and injured body part* and *injury type* are small (i.e., Cramer's $V = 0.295$) and moderate (i.e., Cramer's $V = 0.366$), respectively.

The standardized residuals in Table 3 indicate that collision with fixed object (e.g., curb, guardrail, etc.) is strongly linked with failure to maintain control of vehicle ($\varepsilon_{ij} = 11.9$), abrupt acceleration ($\varepsilon_{ij} = 7.1$), backing vehicle from parking space ($\varepsilon_{ij} = 4.3$), and speeding ($\varepsilon_{ij} = 4.0$). Overexertion and physical bodily reaction incidents are commonly linked with exiting the vehicle ($\varepsilon_{ij} = 3.4$), entering the vehicle ($\varepsilon_{ij} = 5.1$), abrupt braking ($\varepsilon_{ij} = 8.7$) (e.g., strain as a result of jerking), manual handling / lifting ($\varepsilon_{ij} = 3.6$), and abrupt postural change / poor posture ($\varepsilon_{ij} = 4.8$). Collision with another vehicle was largely linked with fault of other driver ($\varepsilon_{ij} = 12.4$), failure to yield right of way ($\varepsilon_{ij} = 8.6$), unsafe lane changing / oversteering / overcorrecting ($\varepsilon_{ij} = 3.1$), and failure to stop at stop sign or red light ($\varepsilon_{ij} = 3.5$). Falls on the same level is associated particularly with uneven surface / object on ground / loss of balance ($\varepsilon_{ij} = 16.4$) and weather conditions ($\varepsilon_{ij} = 3.6$); whereas fall to lower level is much more likely when exiting the vehicle ($\varepsilon_{ij} = 12$). Struck by or against incidents are associated with entering the vehicle ($\varepsilon_{ij} = 4.4$) (e.g., striking hand on vehicle during entry) and weather conditions ($\varepsilon_{ij} = 3.5$) (e.g., windy conditions cause vehicle door to slam on hand). Finally, exposure to harmful substances, surfaces, or environments was particularly associated with animal / insect.

With regard to *injured body part*, injuries that involve *multiple body parts* were associated with the *fault of other drivers* ($\varepsilon_{ij} = 3.3$) and *weather conditions* ($\varepsilon_{ij} = 3.5$) (e.g., slipping on ice or snow); injury to the *leg* is associated with *exiting the vehicle* ($\varepsilon_{ij} = 3.1$) and *uneven surface / object on ground / loss of balance* ($\varepsilon_{ij} = 7.3$); *neck* injuries were largely associated with *abrupt braking* ($\varepsilon_{ij} = 3.6$); *knee* injuries occur particularly when exiting the vehicle ($\varepsilon_{ij} = 5.9$); and *abdomen and, hip* ($\varepsilon_{ij} = 4.1$), and *chest* injuries ($\varepsilon_{ij} = 3.5$) are largely associated with *failure to yield right of way*.

With regard to injury type, sprain is disproportionately linked with exiting the vehicle ($\varepsilon_{ij} = 3.9$) and uneven surface / object on ground / loss of balance ($\varepsilon_{ij} = 5.2$) (e.g. leg sprain); bruising and contusion is linked with uneven surface / object on the ground / loss of balance ($\varepsilon_{ij} = 3.9$); laceration is associated with manual lifting / handling ($\varepsilon_{ij} = 4.4$); inflammation is associated with animals / insect ($\varepsilon_{ij} = 15.9$); fracture is associated with failure to yield right of way ($\varepsilon_{ij} = 4$) and weather conditions ($\varepsilon_{ij} = 3.1$); and heatstroke is associated with weather conditions ($\varepsilon_{ij} = 7.5$).

Table 4 presents the results of the relationship between *event type* and the remaining attributes. A statistically significant relationship is evident between *event type* and *injured body part* (i.e., $p < 0.05$). The strength of the relationship is small (i.e., Cramer's $V = 0.276$). Similarly, a statistically significant relationship is evident between *event type* and *injury type* (i.e., $p < 0.05$), and the strength is *moderate* (i.e., Cramer's $V = 0.422$).

Table 3. Relationship between contributory factor and four other attributes

Attribute	Attribute Categories	Contributing Factor																																						Chi-Square Test Statistic	*p* -value	Cramer's V
		Failure to maintain control of vehicle		Exiting the vehicle		Uneven surface / Object on ground / Loss of balance		Fault of other driver		Abrupt accelerati-on		Entering the vehicle		Abrupt braking		Backing vehicle from parking space		Failure to yield right of way		Speeding		Manual handling /Lifting		Abrupt postural change / Poor posture		Unsafe lane change / Overste-ering / Overcor-recting		Weather conditio-ns		Failure to stop at stop sign or red light		Animal / Insect		Others / Unkno-wn / Unrepor-ted				
		#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}			
Event Type (Total #: 396)	Collision with fixed object	70	+11.9	0	-5.0	0	-5.0	0	-4.4	28	+7.1	0	-3.5	0	-3.4	16	+4.3	0	-2.9	9	+4.0	0	-2.2	1	-1.3	0	-1.9	0	-1.8	0	-1.8	0	-1.5	1	-1.0	1386.25	<0.001	0.707
	Overexertion and physical bodily reaction	2	-4.8	20	+3.4	5	-2.1	0	-3.5	2	-2.3	16	+5.1	22	+8.7	0	-2.6	0	-2.3	1	-1.0	7	+3.6	8	+4.8	3	+1.0	0	-1.4	2	+0.4	0	-1.2	1	-0.5			
	Collision with another vehicle	6	-3.0	0	-3.6	0	-3.6	36	+12.4	1	-2.4	0	-2.5	1	-1.9	5	+0.4	17	+8.6	0	-1.6	0	-1.6	0	-1.5	5	+3.1	0	-1.3	5	+3.5	0	-1.1	0	-1.3			
	Fall on the same level	1	-3.5	3	-1.4	41	+16.4	0	-2.5	0	-2.2	1	-1.3	0	-1.9	0	-1.8	0	-1.6	0	-1.2	0	-1.2	0	-1.2	0	-1.1	4	+3.6	0	-1.0	0	-0.9	0	-1.0			
	Fall to lower level	0	-2.6	22	+12.0	1	-1.3	0	-1.7	0	-1.5	2	+0.4	0	-1.3	0	-1.3	0	-1.1	0	-0.8	0	-0.8	0	-0.8	0	-0.7	0	-0.7	0	-0.7	0	-0.6	0	-0.7			
	Struck by or against	0	-2.0	2	+0.1	0	-1.4	2	+0.5	0	-1.2	5	+4.4	0	-1.0	0	-1.0	0	-0.8	0	-0.6	2	+2.7	0	-0.6	0	-0.6	2	+3.5	0	-0.5	0	-0.4	2	+3.5			
	Exposure to harmful substances, surfaces, or environments	0	-1.4	1	+0.2	0	-1.0	0	-0.9	0	-0.8	0	-0.7	0	-0.7	0	-0.6	0	-0.6	0	-0.4	0	-0.4	0	-0.4	0	-0.4	1	+2.5	0	-0.4	5	+16.8	0	-0.4			
	Others / Unknown / Unreported	2	+0.1	0	-1.1	0	-1.1	0	-1.0	1	+0.3	1	+0.6	0	-0.8	1	+0.7	0	-0.6	0	-0.5	1	+1.7	0	-0.5	0	-0.4	0	-0.4	0	-0.4	0	-0.3	3	+7.3			
Injured Body Part (Total #: 396)	Multiple body parts	23	+0.2	7	-2.1	13	0.0	19	+3.3	9	+0.1	1	-2.7	8	+0.8	8	+1.0	4	-0.4	4	+0.9	2	-0.5	1	-1.1	2	-0.2	6	+3.5	1	-0.8	0	-1.4	1	-0.8	344.236	<0.001	0.295
	Back	27	+2.1	9	-0.9	3	-3.0	9	-0.1	10	+1.0	6	0.0	5	-0.3	8	+1.4	4	-0.1	1	-1.1	2	-0.3	5	+2.2	2	+0.1	0	-1.5	3	+1.2	1	-0.2	1	-0.6			
	Leg	1	-3.0	11	+3.1	19	+7.3	1	-1.6	0	-2.0	4	+1.0	0	-1.7	0	-1.6	1	-0.6	1	0.0	1	0.0	0	-1.0	0	-1.0	0	-0.9	0	-0.9	1	+0.7	0	-0.9			
	Neck	11	+1.5	0	-2.4	0	-2.3	4	+0.3	6	+1.9	0	-1.7	7	+3.6	1	-0.8	2	+0.4	2	+1.2	0	-1.0	0	-1.0	2	+1.5	0	-0.9	1	+0.5	0	-0.7	1	+0.5			
	Arm and shoulder	5	-0.9	4	-0.1	4	0.0	1	-1.4	3	+0.2	4	+1.4	3	+0.8	2	+0.1	1	-0.4	1	+0.2	2	+1.3	0	-0.9	1	+0.4	0	-0.8	1	+0.5	1	+0.9	1	+0.5			
	Knee	3	-1.0	12	+5.9	5	+1.4	1	-0.9	0	-1.5	3	+1.3	0	-1.3	0	-1.2	0	-1.1	0	-0.8	0	-0.8	0	-0.8	0	-0.7	0	-0.7	0	-0.7	0	-0.6	0	-0.7			
	Hand	2	-1.3	4	+1.0	2	-0.3	0	-1.5	0	-1.4	4	+2.5	0	-1.2	0	-1.1	0	-1.0	0	-0.8	2	+2.1	2	+2.3	0	-0.7	1	+1.1	0	-0.6	1	+1.5	3	+4.5			
	Head	1	-0.8	0	-1.2	0	-1.2	1	0.0	1	+0.2	2	+1.8	0	-0.8	0	-0.8	3	+4.1	0	-0.5	0	-0.5	0	-0.5	0	-0.5	0	-0.4	1	+2.0	1	+2.5	0	-0.4			
	Abdomen and hip	1	-0.2	1	+0.3	1	+0.4	0	-0.8	0	-0.7	1	+1.1	0	-0.6	0	-0.6	0	-0.5	0	-0.4	1	+2.2	1	+2.4	0	-0.4	0	-0.3	0	-0.3	0	-0.3	0	-0.3			
	Chest	3	+1.8	0	-0.9	0	-0.9	0	-0.8	0	-0.7	0	-0.6	0	-0.6	0	-0.6	2	+3.5	1	+2.2	0	-0.4	0	-0.4	0	-0.4	0	-0.3	0	-0.3	0	-0.3	0	-0.3			
	None	4	+0.9	0	-1.4	0	-1.3	2	+0.7	3	+2.0	0	-1.0	0	-0.9	3	+2.8	0	-0.8	0	-0.6	0	-0.6	0	-0.6	1	+1.5	0	-0.5	0	-0.5	0	-0.4	0	-0.5			
Injury Type (Total #: 396)	Strain	52	+2.4	16	-2.8	9	-4.9	21	+0.4	22	+1.9	15	+0.8	15	+1.3	13	+0.6	8	-0.5	7	+1.1	6	+0.5	7	+1.5	6	+1.3	1	-2.0	6	+1.8	0	-2.4	4	+0.2	529.552	<0.001	0.366
	Sprain	7	-2.1	17	+3.9	20	+5.2	4	-1.0	2	-1.6	5	+0.5	3	-0.4	1	-1.5	0	-1.9	0	-1.4	0	-1.4	2	+0.5	1	-0.3	1	-0.1	0	-1.2	0	-1.0	1	-0.1			
	Bruise or contusions	10	0.0	5	-0.4	14	+3.9	3	-0.9	1	-1.7	3	-0.1	0	-1.9	2	-0.5	4	+1.4	2	+0.7	1	-0.2	0	-1.1	0	-1.1	3	+2.5	0	-1.0	0	-0.8	1	+0.2			
	Multiple types	5	-0.5	6	+1.4	3	-0.3	5	+1.4	2	-0.3	0	-1.5	3	+1.0	3	+1.1	2	+0.7	1	+0.3	0	-0.9	0	-0.9	0	-0.8	0	-0.8	0	-0.8	0	-0.6	0	-0.8			
	Discomfort and pain	1	-1.2	0	-1.4	0	-1.3	3	+1.7	2	+1.0	1	+0.2	2	+1.5	0	-0.9	1	+0.6	0	-0.6	1	+1.2	0	-0.6	0	-0.5	0	-0.5	1	+1.6	1	+2.1	0	-0.5			
	Laceration	0	-1.4	2	+1.3	1	+0.2	0	-0.9	0	-0.8	1	+0.9	0	-0.7	0	-0.6	0	-0.6	0	-0.4	2	+4.4	0	-0.4	0	-0.4	0	-0.4	0	-0.4	0	-0.3	1	+2.5			
	Inflammation	0	-1.1	1	+0.5	0	-0.8	0	-0.7	0	-0.7	0	-0.6	0	-0.6	0	-0.5	0	-0.5	0	-0.4	0	-0.4	0	-0.3	0	-0.3	0	-0.3	4	+15.9	0	-0.3					
	Fracture	2	+1.1	0	-0.8	0	-0.8	0	-0.7	0	-0.7	0	-0.6	0	-0.6	0	-0.5	2	+4.0	0	-0.4	0	-0.4	0	-0.3	0	-0.3	1	+3.1	0	-0.3	0	-0.3	0	-0.3			
	Burn	0	-0.5	1	+2.7	0	-0.4	0	-0.3	0	-0.3	0	-0.3	0	-0.2	0	-0.2	0	-0.2	0	-0.2	0	-0.2	0	-0.2	0	-0.1	0	-0.1	0	-0.1	0	-0.1	0	-0.1			
	Heatstroke	0	-0.5	0	-0.4	0	-0.4	0	-0.3	0	-0.3	0	-0.3	0	-0.2	0	-0.2	0	-0.2	0	-0.2	0	-0.2	0	-0.2	0	-0.1	1	+7.5	0	-0.1	0	-0.1	0	-0.1			
	No Injury	4	+0.9	0	-1.4	0	-1.3	2	+0.7	3	+2.0	0	-1.0	0	-0.9	3	+2.8	0	-0.8	0	-0.6	0	-0.6	0	-0.6	1	+1.5	0	-0.5	0	-0.5	0	-0.4	0	-0.5			
InjuryOutcome (Total #: 396)	Medical case	54	-0.8	28	-1.9	34	+0.3	26	-0.3	29	+2.6	19	+0.7	19	+1.3	13	-1.2	12	0.0	8	+0.7	7	0.0	5	-1.0	5	-0.5	4	-0.8	6	+0.9	5	+1.5	4	-0.8	50.129	0.389	0.205
	Permanent disability	13	+0.7	11	+2.0	4	-1.1	5	-0.1	1	-1.8	3	-0.2	2	-0.7	2	-0.6	3	+0.5	1	-0.3	2	+0.6	3	+1.7	0	-1.1	1	+0.1	1	+0.1	0	-0.9	2	+1.2			
	Report only	7	-0.4	5	+0.1	8	+1.8	1	-1.6	2	-0.7	2	-0.3	1	-0.9	5	+2.1	1	-0.6	1	0.0	1	0.0	1	+0.1	2	+1.5	2	+1.7	0	-0.9	0	-0.7	0	-0.9			
	Temporary disability	7	+1.0	4	+0.6	1	-1.3	6	+2.5	0	-1.5	1	-0.5	1	-0.4	2	+0.6	1	-0.1	0	-0.8	0	-0.8	0	-0.8	1	+0.7	0	-0.7	0	-0.7	0	-0.6	1	+0.9			

Note: # represents Count or Frequency; ε_{ij} represents Standardized Residual

As per the standardized residuals, with regard to *injured body part*, (1) *leg* injuries are more likely when *fall to the same level incidents* occur (ε_{ij} = 6.0); (2) *knee* injuries are more likely when *fall to lower level* incidents were occur (ε_{ij} = 3.9), (3) hand injuries are more likely when *struck by or against incidents* occur (ε_{ij} = 4.9), and (4) *abdomen and hip* injuries are commonly experienced as a result of *overexertion and physical bodily reaction* (ε_{ij} = 3.6).

With regard to injury type, strain is particularly likely as a result of collision with fixed object (ε_{ij} = 3.8) and overexertion and physical bodily reaction (ε_{ij} = 3.4). Sprain is common with fall on the same level (ε_{ij} = 5.3) and bruising and contusion is linked with both fall on the same level (ε_{ij} = 4.0) and struck by or against incidents (ε_{ij} = 3.3). Laceration is linked particularly with struck by or against incidents (ε_{ij} = 7.5). Inflammation (ε_{ij} = 13.4), fracture (ε_{ij} =7.5), and heatstroke (ε_{ij} = 7.5) are largely associated with exposure to harmful substances, surfaces, or environments.

Table 5 presents the relationship between *injured body part* and *injury outcome* and Table 6 presents the relationship between *injury type* and *injury outcome.* Both relationships are statistically significant (i.e., $p < 0.05$). The strength of the relationship is weak between *injured body part* and *injury outcome* (Cramer's V = 0.295) and is moderate between *injury type* and *injury outcome* (Cramer's V = 0.323).

As per the standardized residuals presented in Table 5, *report only* incidents are linked particularly to cases where no body part (*none*) sustained injury (ε_{ij} = 9.2). Table 6 indicates that *report only* incidents correlate with no injuries (*none*) (ε_{ij} = 9.2) (e.g., a vehicle accident that results in no injuries) and in several instances involve *bruising and contusion* (ε_{ij} = 3.2)

Study 1 Contributions and Recommendations

This research effort represents the first formal investigation of incident reports that involve driver license examiners. The findings offer important insights into incidents that driver license examiners experience and reveal that particular attributes and attribute categories are associated with those work-related incidents.

The study findings offer insights that can be leveraged strategically to enhance the safety of driver license examiners and new drivers who are undertaking their driving tests. As a starting point, efforts should be devoted to tackling high-priority problem areas that are indicated by the attribute categories that are overrepresented in the incidents experienced by driver license examiners. Specifically, based on the findings reported in Table 1, priority should be given to preventing incidents that occur *during* driving tests, which account for more than 63% of all reported incidents. Efforts also should be prioritized to address overrepresented *event types* that comprise over 85% of the incidents and include *collision with fixed object*, *overexertion and physical bodily reaction*, *collision with another vehicle*, and *fall on the same level*. Similar efforts can be undertaken to tackle the overrepresented attribute categories in the context of *contributing factor*, *injured body part*, *injury type*, and *injury outcom*e that represent more than 68%, 71%, 81%, and 70% of the incidents, respectively.

Table 4. Relationship between event type and three other attributes

Attribute	Attribute Categories	Event Type														Chi-Square Test Statistic	*p* -value	Cramer's V
		Collision with fixed object		Overexertion and physical bodily reaction		Collision with another vehicle		Fall on the same level		Fall to lower level		Struck by or against		Exposure to harmful substances, surfaces, or environments		Others / Unknown / Unreported				
		#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}			
Injured Body Part (Total #: 396)	Multiple body parts	36	+0.4	18	-1.8	27	+1.7	16	+0.8	5	-0.9	4	-0.1	1	-0.8	2	-0.4	210.776	<0.001	0.276
	Back	42	+3.0	25	+1.0	18	-0.1	4	-2.9	3	-1.5	1	-1.6	1	-0.6	2	-0.1			
	Leg	2	-3.8	11	+0.8	1	-2.8	17	+6.0	6	+2.4	2	+0.4	1	+0.4	0	-1.0			
	Neck	18	+2.3	8	-0.1	9	+0.8	0	-2.4	0	-1.7	0	-1.3	0	-0.9	2	+1.3			
	Arm and shoulder	8	-1.1	10	+1.0	6	-0.2	4	-0.2	3	+0.6	1	-0.3	2	+1.9	0	-0.9			
	Knee	3	-2.1	8	+1.3	1	-1.9	6	+1.9	6	+3.9	0	-1.0	0	-0.7	0	-0.8			
	Hand	3	-1.8	4	-0.4	0	-2.3	3	+0.2	2	+0.6	5	+4.9	1	+1.1	3	+3.8			
	Head	2	-0.8	0	-1.7	5	+2.5	0	-1.2	0	-0.8	2	+2.7	1	+2.0	0	-0.5			
	Abdomen and hip	1	-0.8	5	+3.6	0	-1.2	0	-0.9	0	-0.6	0	-0.5	0	-0.3	0	-0.4			
	Chest	3	+1.0	0	-1.3	3	+1.9	0	-0.9	0	-0.6	0	-0.5	0	-0.3	0	-0.4			
	None	7	+1.8	0	-2.0	6	+2.5	0	-1.4	0	-1.0	0	-0.7	0	-0.5	0	-0.6			
Injury Type (Total #: 396)	Strain	83	+3.8	61	+3.4	42	+0.5	8	-5.5	6	-3.0	3	-2.6	0	-2.8	5	+0.2	492.675	<0.001	0.422
	Sprain	8	-3.6	19	+1.5	5	-2.5	21	+5.3	9	+2.8	0	-1.7	0	-1.2	2	+0.5			
	Bruise or contusions	13	-0.8	0	-4.0	8	-0.5	15	+4.0	6	+1.8	6	+3.3	0	-1.0	1	-0.1			
	Multiple types	9	-0.2	5	-0.8	8	+1.1	4	+0.1	3	+0.9	1	-0.1	0	-0.8	0	-0.9			
	Discomfort and Pain	3	-0.7	3	+0.1	5	+1.8	0	-1.4	0	-1.0	1	+0.7	1	+1.6	0	-0.6			
	Laceration	0	-1.8	0	-1.4	0	-1.3	1	+0.1	1	+0.9	4	+7.5	0	-0.4	1	+2.2			
	Inflammation	0	-1.5	1	-0.1	0	-1.1	0	-0.9	0	-0.6	0	-0.4	4	+13.4	0	-0.3			
	Fracture	2	+0.4	0	-1.2	2	+1.2	1	+0.5	0	-0.6	0	-0.4	0	-0.3	0	-0.3			
	Burn	0	-0.7	0	-0.5	0	-0.5	0	-0.4	0	-0.3	0	-0.2	1	+7.5	0	-0.2			
	Heatstroke	0	-0.7	0	-0.5	0	-0.5	0	-0.4	0	-0.3	0	-0.2	1	+7.5	0	-0.2			
	None	7	+1.8	0	-2.0	6	+2.5	0	-1.4	0	-1.0	0	-0.7	0	-0.5	0	-0.6			
Injury Outcome (Total #: 396)	Medical case	91	+0.8	64	+0.4	50	-0.9	33	-0.7	15	-1.2	12	+0.8	6	+0.9	7	+0.5	14.692	0.838	0.111
	Permanent disability	15	-0.6	13	+0.3	11	+0.2	6	-0.4	6	+1.6	1	-0.8	1	+0.1	1	-0.2			
	Report only	11	-0.5	8	-0.3	7	-0.2	9	+2.1	2	-0.3	2	+0.5	0	-0.9	0	-1.0			
	Temporary disability	8	0.0	4	-0.8	8	+1.7	2	-0.7	2	+0.4	0	-1.0	0	-0.7	1	+0.6			

Note: # represents Count or Frequency; ε_{ij} represents Standardized Residual

Table 5. Relationship between injured body part and injury outcome

Attribute	Attribute Categories	Injured Body Part																				Chi-Square Test Statistic	*p*-value	Cramer's V
		Multiple body parts		Back		Leg		Neck		Arm and shoulder		Knee		Hand		Head		Abdomen and hip		Chest		None				
		#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}			
Injury Outcome (Total #: 396)	Medical case	71	-1.4	71	+0.9	29	+0.3	28	+0.8	26	+0.8	17	+0.1	17	+1.1	8	+0.7	4	-0.2	5	+0.7	2	-4.4	103.152	<0.001	0.295
	Permanent disability	16	+0.4	12	-0.4	6	+0.3	7	+1.0	2	-1.4	5	+1.1	3	+0.1	1	-0.3	1	+0.2	1	+0.2	0	-1.5			
	Report only	14	+1.2	4	-2.1	3	-0.5	1	-1.5	2	-0.8	1	-1.0	1	-0.8	1	0.0	1	+0.6	0	-0.8	11	+9.2			
	Temporary disability	8	+0.5	9	+1.4	2	-0.4	1	-0.9	4	+1.4	1	-0.4	0	-1.2	0	-0.8	0	-0.6	0	-0.6	0	-1.0			

Note: # represents Count or Frequency; ε_{ij} represents Standardized Residual

Table 6. Relationship between injury type and injury outcome

Attribute	Attribute Categories	Injury Type																				Chi-Square Test Statistic	*p*-value	Cramer's V
		Strain		Sprain		Bruising and contusion		Multiple types		Discomfort and pain		Laceration		Inflammation		Fracture		Burn		Heatstroke		None				
		#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}	#	ε_{ij}			
Injury Outcome (Total #: 396)	Medical case	154	+1.8	50	+1.5	30	-1.5	17	-1.7	11	+1.2	5	+0.1	5	+1.5	3	-0.5	0	-1.5	1	+0.7	2	-4.4	124.295	<0.001	0.323
	Permanent disability	31	+0.8	10	+0.5	4	-1.2	6	+1.1	1	-0.6	0	-1.1	0	-0.9	1	+0.4	1	+2.5	0	-0.4	0	-1.5			
	Report only	8	-4.2	2	-2.0	11	+3.2	4	+0.7	1	-0.3	2	+1.7	0	-0.7	0	-0.7	0	-0.3	0	-0.3	11	+9.2			
	Temporary disability	15	+0.8	2	-1.1	4	+0.6	3	+0.9	0	-1.0	0	-0.7	0	-0.6	1	+1.3	0	-0.3	0	-0.3	0	-1.0			

Note: # represents Count or Frequency; ε_{ij} represents Standardized Residual

The findings can also offer guidance regarding possible approaches to address some of these high-priority problem areas. For example, for the high-priority *event type*, *collision with fixed object*, the relevant *contributing factor* was found to be *backing vehicle from parking space*. Armed with this knowledge, driver license agencies, driver license examiners, and new drivers can play a role in preventing such incidents through heightened awareness of the likelihood that a collision could occur while reversing from a parking space. For example, driver license examiners could scan the environment to complement and reinforce the scanning efforts of drivers as they back out of the parking space and offer timely warning to stop the vehicle if a collision is imminent. To ensure that this suggestion (and other similar ones) becomes standard practice for driver license examiners, driver license agencies and Division of Motor Vehicles (DMVs) may need to implement and offer relevant training. Driver license agencies and DMVs also need to focus on educating new drivers about these common causes of incidents along with providing guidelines for preventing such incidents as part of driver training programs. For example, new drivers who are informed of the likelihood of a *collision with fixed object* while exiting the parking lot may be more cautious about preventing such incidents if they know the possibility is common in particular contexts. In addition, when possible, new drivers should be encouraged to use vehicles with collision avoidance technologies, such as backing cameras, park-assist systems, and blind-spot warnings for their driving test, after sufficient practice (Noy et al. 2018). Vehicle manufacturers can also play a vital role in preventing incidents by incorporating these features in their vehicles and investing in research that focuses on improving the efficiency and reliability of such safety technologies.

Another high-priority *event type* is *overexertion and physical bodily reaction*. Given that a vast majority of these incidents can be attributed to instances when driver license examiners are *exiting the vehicle*, *entering the vehicle*, *manual handling / lifting*, and engaging in *abrupt postural change / poor posture*, relevant ergonomics training would be useful. Such efforts to reduce *overexertion and physical bodily reaction* can cascade into additional benefits. For example, if the number of *overexertion and physical bodily reaction* instances can be reduced successfully using interventions such as ergonomic training and other such efforts, a statistically significant reduction in the number of *strain* injuries and injuries to the *abdomen and hip* is likely to follow, as per the results shown in Table 4.

In short, possible interventions can be identified to tackle each of the high-priority attribute categories. Once these interventions are adopted, and successful reduction in the incidents associated with the high-priority attribute categories is observed, future efforts may focus on targeting the remaining attribute categories. Such an approach can potentially reduce injury rates and empower driver license examiners to better serve their communities and maintain their own safety and the safety of others. These efforts also can reduce worker compensation claims and enable these DMV workers to return safely to their families at the end of each work-day.

STUDY 2: SAFETY CHALLENGES AND SAFETY MEASURES IDENTIFIED THROUGH INTERVIEWS WITH DRIVER LICENSE EXAMINERS

Research Methods and Data Collection Approach

To gain an understanding of the safety challenges that driver license examiners professionally experience, interviews were planned with driver license examiners. The interviews were guided by an interview protocol that was developed in collaboration with the North Carolina Department of Motor Vehicles. The interview protocol focused on first gathering some background information regarding the number of years the interviewees practiced as driver license examiners, the number of driving tests the interviewees administer on a daily basis, and details on the types of driving tests the interviewees regularly administer (i.e., commercial vs. non-commercial driving tests)

Next, the interview protocol focused on gathering information on the safety challenges the driver license examiners commonly experience along with relevant examples. The scope of the effort was clarified to include any safety challenges, incidents, and near-misses they commonly experience as they administer driving tests and as they worked alongside new and prospective drivers. In addition, safety measures that the driver license examiners adopt currently on a regular basis, and those that they recommend be considered for possible future adoption – along with relevant implementation challenges were captured. Finally, to capture multiple perspectives regarding the safety measures that were suggested for possible future consideration, the list of suggested measures as they emerged from the content analyses, as is discussed below, were shared in subsequent interviews with driver license examiners to obtain additional input. The purpose of capturing this additional information was to inform NCDMV of any opposing or complementary views of the suggested safety measures.

After the development of the interview protocol, a database of the driver license examiners was obtained from the NCDMV and solicitation emails were sent to a random subset of potential interviewees. Those that expressed their willingness to participate in the effort served as the interviewees for the study.

As part of each interview, the interview responses were transcribed manually and the responses were immediately imported into the QSR NVIVO software package for content analysis and coding after each interview. The coding effort focused on reviewing the interview responses, sentence by sentence, and tagging particular safety challenges and safety measures that the driver license examiners expressed during the interviews (Guest et al. 2011). As additional interviews were conducted, the transcriptions were immediately examined and iteratively coded by comparing against existing codes and creating new codes as needed. Older codes were renamed or altered whenever necessary in an iterative and evolving manner at the conclusion of each of the interviews (Zhang and Wildemuth 2009).

Additional interviews were conducted until two conditions were met: (1) theoretical saturation where no new safety challenges or safety measures were being identified in subsequent interviews and (2) repeated evidence of the safety challenges and safety measures were obtained – where at least two interviewees confirmed each of the codes that were adopted in the study as being relevant

and useful to their professional role (Bloor and Wood 2006). In total, this yielded 41 interviews which included 23 female and 18 male driver license examiners. The participating interviewees had an accumulated experience of over 190 years as driver license examiners. More than 80% of the participating driver license examiners administered both commercial and non-commercial driving tests. Overall, on average, the participating driver license examiners administered more than 4 driving tests on a daily basis.

Results and Findings

As mentioned above, the driver license examiners were requested to provide information under three categories. These included safety challenges that they experience during their daily operations, safety management efforts that they adopt on a regular basis, and new safety management strategies and policy changes that should be considered for possible future adoption. Corresponding to each of these three categories, the content analysis effort yielded several themes as reported by the driver license examiners which are presented below. It should be noted that there may be overlaps in the themes as captured and presented below. The purpose of presenting the results in the form of distinct themes is only to ensure that the findings are presented in a logical and digestible manner for readers.

Safety Challenges Related to the Interaction with Prospective Drivers

Drivers that report for testing without sufficient training: The driver license examiners reported that prospective drivers often take the driving test without sufficient training or practice. In some cases, as per the driver license examiners, prospective drivers report to testing immediately after they have completed the written exam and the provisional learners permit is issued.

In the same manner, the examiners reported that several drivers return for retesting without any additional training after having failed the driving test previously. This safety concern was expressed by more than 95% of the participating driver license examiners. A few examiners expressed their concern that certain drivers appear to use the driving test as an avenue for learning to drive instead of adopting other means of training and practice. In many cases, the driver license examiners reported that the drivers return soon after the conclusion of the seven-day required wait period when they become eligible for retesting even if they have not received any training. The examiners were particularly concerned for their safety given that they may have to enter a vehicle driven by a driver that may not be sufficiently trained to safely operate a vehicle.

Presence of communication barriers and language proficiency concerns: Another significant challenge that was reported by the driver license examiners included challenges associated with communicating with prospective drivers that were not familiar with English or another language known to the driver license examiners. According to the driver license examiners, these issues were largely experienced when testing a subset of international students, their family members, and other foreign nationals or visitors that may not be proficient with the English language. Several driver license examiners also shared near-miss incidents that were experienced because of these communication and language barriers. Others mentioned that many prospective drivers may not

sufficiently understand the driver's manual, which is a required reading resource that offers useful safety information – when there are language proficiency issues.

Prospective drivers adopting driving customs learned in a different country: A significant number of driver license examiners shared their experience of testing drivers that had learned to drive in a different country. These drivers that were accustomed to different driving customs often unconsciously adopt these previously learned driving practices while testing in the United States. Examples of such issues included the tendency of driving on the wrong side of the road, not yielding when taking a left turn at a busy intersection, frequent lane changes, and driving slower than the posted speed limit mistaking it to be based on the metric system (i.e., kilometer per hour instead of miles per hour). In some other cases, the driver license examiners mentioned that drivers were just not familiar with the driving customs in the United States due to their lack of experience driving in the country.

Nervousness and anxiety among prospective drivers: Over 75% of the driver examiners mentioned that driver nervousness is a frequent safety challenge that they experience. For example, several driver license examiners mentioned that it is not uncommon for them to notice potential drivers sweating, trembling, and even stammering prior to the driving test due to heightened nervousness and anxiety. In some cases, driver license examiners mentioned that such nervousness and anxiety can result in driver errors such as the inability to maintain control of the vehicle, abrupt braking, and unexpected acceleration that can result in catastrophic accidents. When such errors are made by the drivers, their levels of nervousness and anxiety are further exacerbated which significantly increases the likelihood of accidents. Some of the driver license examiners mentioned that in many cases, this nervousness and anxiety may not be due to the driver's inability to drive, but rather because of the phenomenon known as test-anxiety – where they experience fear because of the knowledge that they are being tested or evaluated. However, the driver license examiners also mentioned that drivers that have not had sufficient driving practice also exhibit nervousness and anxiety due to the lack of confidence in their own driving ability.

Threats, verbal abuse, attacks, and discontent customers: One of the more direct safety concerns expressed by the driver license examiners included threats, verbal abuses, and attacks perpetrated by customers and prospective drivers. Such instances were particularly experienced when prospective drivers did not satisfy the testing requirements for the issuance of driving licenses. In other cases, the driver license examiners also reported experiencing customers who demonstrated frustration and discontent related to wait times and the license issuance and testing process. For example, four of the driver license examiners mentioned that customers often express discontent when they realize that they did not bring specific documents that are necessary prior to the issuance of driving licenses.

Distractions during driving tests: Several of the driver license examiners mentioned that distractions are sometimes experienced during driving tests. The most common source of distractions mentioned was ringing or vibrating phones. In many cases, the drivers are startled when the phone unexpectedly rings or vibrates during the driving test. In addition, drivers

sometimes panic in these unexpected circumstances, and driver errors become more likely. One of the driver license examiners also mentioned experiencing drivers that are distracted by roadside signs and advertisements and flashing lights from utility vehicles.

Prospective drivers that do not follow examiner instructions: In many cases, the driver license examiners mentioned that drivers sometimes fail to follow the instructions that are offered by the examiners. The driver license examiners mentioned that some of these instances can be attributed to the cognitive demand associated with driving for new drivers. For example, one of the driver license examiners mentioned that new drivers often struggle with the cognitive demand of driving which requires drivers to pay attention to a number of factors that include the road geometry, lane layout, their control over the vehicle, and other vehicles on the road. Given that the attentional resource of the drivers is limited, there is only a finite number of elements to which a driver can devote their attention during the driving test. Others mentioned that communication challenges and language barriers can result in drivers not following the instructions of the examiners. For example, several of the driver license examiners referred to instances when they asked the prospective drivers to only start the vehicle but not drive during the pre-inspections; however, the drivers in a number of cases began moving the vehicle during the pre-inspection phase. Some driver license examiners also mentioned that the issue is common among elderly drivers that have trouble with hearing.

Impatience among other drivers on the road: A few of the driver license examiners mentioned that the impatience of other drivers on the road can also impose safety challenges. For example, one of the driver license examiners mentioned that an impatient driver may honk when the prospective driver drives relatively slower than other vehicles. In these cases, the prospective driver may begin panicking; which can lead to driver errors. Others mentioned that when another vehicle is behind the prospective driver's vehicle, particularly on a one-lane road, the driver feels pressurized to drive faster, which can also lead to driver errors.

Unclean and messy vehicles: Close to 20% of the driver license examiners mentioned that they often encounter unclean and messy vehicles as part of administering driving tests. This included vehicles with trash, smoke, unpleasant smells, animal hair, significant amounts of dust, fast food packages, and others. These driver license examiners expressed concern for their wellbeing, safety, and personal hygiene when having to enter these vehicles. These safety concerns were particularly heightened during the COVID-19 pandemic.

Job requirement of entering the vehicle of strangers: While this is an essential part of their job, one driver license examiner mentioned that they were sometimes uncomfortable entering and riding alongside a stranger that they know nothing about. However, other driver license examiner was more worried about riding with a stranger that may not know how to drive. The concerns regarding entering a stranger's vehicle were also heightened in the early months of the COVID-19 pandemic.

Missing handrails and steps in large commercial vehicles: As part of the commercial driver license (CDL) tests, the driver license examiners mentioned that they often encounter large vehicles (e.g., box trucks and semi-trailer trucks) with missing handrails and steps that are necessary to safely enter and exit the vehicle. Administering driving tests that involve these vehicles exposes driver license examiners to a heightened risk of falls and slips. The risk is particularly high when driver license examiners may have to physically jump out of the cab to exit the vehicle at the conclusion of the test given that the handrails or steps are missing.

Administering driving tests in risky routes: A few examiners mentioned that a number of driver license offices are located in proximity to industrial facilities. Therefore, as part of the testing route, drivers frequently may need to drive alongside heavy trucks and large utility vehicles. These driver license examiners believed that the severity of incidents in these driving routes is likely to be higher. Moreover, two of the driver license examiners mentioned that several drivers become anxious when these vehicles follow them or pass beside them; these situations can lead to driver errors that can translate into near misses and safety incidents.

Unfamiliarly with driving rules and norms: Several driver license examiners mentioned that they frequently encounter drivers that are just not familiar with the driving rules and norms. For example, drivers may not know who has the right-of-way at an intersection, that they need to yield before they merge, or that they need to use the turn signals while changing lanes. One of the driver license examiners also mentioned having seen a handful of drivers that do not know that they need to actively look for stop signs at intersections. Such unfamiliarity can substantially increase the risk of incidents during driving tests.

Stop-Start systems feature error: The start-stop system is a feature that is becoming increasingly popular in new vehicles. The system automatically shuts the engine off when the vehicle is idling or at rest (e.g., at a traffic light) to save fuel and reduce emissions (Fonseca et al. 2011). While the system offers benefits, two of the driver license examiners mentioned that these systems sometimes pose dangers. For example, one of the driver license examiners mentioned an incident where a driver finished the driving test and entered a parking spot, and stopped the vehicle (i.e., applied brakes) before exiting the vehicle. However, because the engine automatically shut down after the driver had stopped the vehicle, the driver failed to realize that the gearshift was still in the drive mode and not in the parking mode. Assuming that the vehicle was safely parked, the driver attempted to exit the vehicle. As the driver opened the vehicle door and was beginning to step out by removing the driver's feet from the brake pedal, the engine turned on again and the vehicle collided with the parking curb. Fortunately, the driver realized the error and was able to brake and switch the gearshift to the parking position before exiting the vehicle completely.

Failure to yield the right-of-way: More than 65% of the driver license examiners mentioned cases related to prospective drivers that fail to appropriately yield the right-of-way. For example, driver license examiners mentioned that a number of drivers do not yield when arriving at roundabouts. Others cases include when drivers take a left turn at an intersection without yielding to oncoming traffic, taking a right turn at an intersection without yielding to oncoming traffic, exiting a parking

space without yielding to other vehicles, not yielding the right of way to the driver to the right when multiple vehicles reach an 4-way stop intersection at the same time, and not yielding to pedestrians.

Failure to stop at a red light and stop sign: In several cases, prospective drivers fail to stop at a red light or the stop sign. In these cases, a number of driver license examiners reported experiencing near-miss incidents that could have potentially resulted in collision with other vehicles that had the right-of-way. The driver license examiners mentioned that T-bone collisions are particularly likely in these circumstances and can result in life-altering injuries.

Speeding: In some cases, the driver license examiners mentioned that prospective drivers drive much faster than the posted speed limit. In other cases, the drivers drive faster than they should give the circumstances on the road. For example, prior to a turn, most drivers slow down to safely turn. Accordingly, vehicles that are following a turning vehicle may also need to slow down. However, in many cases, potential drivers are not prepared to sufficiently slowdown in these circumstances which increases the likelihood of a rear-end collision. In other cases, the drivers do not slow down sufficiently at a curve or while taking a turn – which sometimes results in the loss of control of the vehicle; resulting in dangerous situations. Another common situation that was mentioned is that drivers sometimes do not notice the change in the speed limit. In these cases, they may not sufficiently slow down to comply with the speed limit.

Unsafe lane changes: Unsafe lane changes were commonly reported by the driver license examiners. These unsafe lane changes often involved changing lanes without sufficiently checking the rear mirror or the blind spot area using a shoulder check. In some cases, the driver license examiners mentioned that drivers forget to signal a lane change or they change lanes too quickly following the signaling of a lane change. In some other cases, the driver license examiners also mentioned that anxious drivers take too long to change the lane often due to a lack of confidence. These lane change errors can result in cases where the driver changes lanes in front of another vehicle that increases the risk of a rear-end collision. In other cases, these errors increase the risk of sideswipe collisions where the driver attempts to change lanes when another vehicle is already on the lane the driver is intending to enter. Changing lanes when in the intersection was also discussed by the driver license examiners as a behavior that has been experienced which can cause collisions. Some of these changes also occur as a result of driver confusion when drivers mistakenly transition into the wrong lane after passing an intersection. Finally, as discussed earlier, a few prospective drivers that are accustomed to driving in other nations with different driving norms sometimes change lanes too often which can unnecessarily increase safety risk.

Abrupt acceleration or braking: In many cases, the driver license examiners mentioned that prospective drivers abruptly accelerate during the driving test. The most common reason for abrupt acceleration that was mentioned was drivers mistaking the gas pedal for the brake. Abrupt accelerations were also common when drivers place one foot on the accelerator and the other foot over the brakes. Likewise, abrupt accelerations were common when drivers started the driving test and applied more pressure than was needed on the accelerator to begin driving. These abrupt

accelerations, according to the driver license examiners, can result in collisions with other vehicle or other infrastructure elements. In other cases, these abrupt accelerations result in sudden jerking of the body which can also result in strain and sprain-related injuries – particularly to the neck and the back.

Like abrupt acceleration, abrupt braking was also commonly reported by the driver license examiners. For example, in many cases, when drivers hope to slow down, they often brake too hard. In these cases, the vehicle abruptly comes to a halt and can result in rear-end collisions. Prospective drivers also reportedly braked abruptly often when close to a traffic light even if the green signal was on due to confusion, anxiety, and a lack of confidence. In some other cases, a flashing yellow light also resulted in instances where drivers abruptly braked as they contemplated the appropriate action, in what was, in many cases, an unexpected situation for the drivers.

Errors during 3-point turns: Several driver license examiners mentioned that errors during 3-point turns are common during driving tests. The most common errors involved sudden accelerations, either while backing or moving forward, that result in the vehicle striking or going over the curb. Such sudden impacts were linked with sudden jerking of the body that often impacted the neck and the back of driver license examiners. One of the driver license examiners also mentioned experiencing drivers that strike roadside fixtures during a 3-point turn. Other safety issues included cases where the driver initiates a 3-point turn without sufficiently examining the road to ensure that there isn't any traffic either coming from the front or the rear, and drivers steering in the wrong direction particularly when reversing the vehicle.

Overcorrecting / Oversteering: In a number of cases, when drivers change lanes, they do not straighten their steering wheel sufficiently in a timely manner which results in oversteering. In these cases, drivers encroach onto a lane that they did not intend to enter or intrude into the shoulder. In these cases, the risk of a collision with another vehicle or roadside fixtures increases. In some other cases, to correct an oversteering condition, drivers often overcorrect (i.e., turn the steering wheel more than they need to in the opposite direction) which again increases the risk of collisions with other vehicles or roadside fixtures.

Entering and exiting parking space errors: The most common parking-related errors that were experienced involved collision with vehicles that are parked beside the driver's vehicle. These incidents were experienced both while entering and exiting the parking space. They were particularly common when drivers steered the vehicle in the wrong direction while exiting a parking space. Another common error while exiting a parking space is when drivers back out of a parking space without checking for traffic or pedestrians. In addition, collision with vehicles that are parked on parking spaces behind the driver's vehicle when pulling out of the parking space was also commonly reported

In addition, unintended accelerations were also common while entering and exiting the parking space. These unintended accelerations often occurred when drivers apply more pressure than was intended on the accelerator. While these often resulted in collisions with other vehicles as

described above, drivers also often collided or jumped the parking curb. In some cases, these collisions occurred because drivers mistakenly placed the vehicle in the drive mode or gear when they actually intended to reverse out of the parking space.

Driving too slowly or slowing down after a turn: Several driver license examiners mentioned that prospective drivers often drive significantly slower than the posted speed limits. This can increase the risk of an incident as other drivers may not sufficiently be prepared to suddenly slow down when encountering a significantly slower vehicle. In addition, the driver license examiners also mentioned that the other drivers may demonstrate their frustration in a number of ways (e.g., honking) when they encounter a slow driver. These situations can exacerbate the anxiety experienced by the drivers that can further result in additional driver errors. Another related concern that was expressed is that a significant number of potential drivers slow down after a turn. In these cases too, the other drivers may not be sufficiently prepared to slow down abruptly; and this can increase the risk of incidents including being rear-ended by the vehicle behind. Driver license examiners also mentioned that potential drivers often do not increase their speed sufficiently while merging into a highway where the speed limits are higher; which can also result in unsafe situations.

Failure to merge prior to lane ending: During the driving tests, drivers sometimes encounter situations where the traveling lane ends (i.e., rightmost lane in most cases). In several cases, driver license examiners mentioned that prospective drivers often do not merge to the left lane or change lanes in a timely manner. In these cases, the driver gets close to the lane ending and begins to panic. In many cases, these drivers then abruptly switch lanes without examining or considering if it is safe to do so. These situations increase the risk of sideswipe collisions.

Insufficient space management: Three driver license examiners mentioned experiencing a number of near-miss cases when drivers do not maintain sufficient space between their vehicle and the vehicle they are following. These circumstances were most common when the vehicle in front slows down or stops. In such circumstances, a few driver license examiners mentioned having experienced rear-end collisions that damage the vehicle and also result in back and neck injuries to the driver and the driver license examiners.

Collision with other vehicles, median, curb, roadside fixtures, and other elements: Apart from collisions with other vehicles, collisions with the curb and median during the driving tests were common. A disproportionate number of these incidents occurred during turns. For example, when drivers take a left turn at the intersection, they sometimes strike the median prior to transitioning into the intended lane. Other times, drivers may come in contact with or jump the curb while making a right turn. In all these instances, the sudden jerking that results from the impact, in many cases, results in injuries to the neck and the back for both drivers and driver license examiners.

The driver license examiners also mentioned that drivers may sometimes collide with roadside fixtures such as guardrails, poles, or even trees. According to one of the driver license examiners, one of the drivers struck a trashcan that was placed beside the road. In many cases, the potential

drivers often overcorrect after such a collision – which often increases the risk of collisions with other vehicles.

Center left-turn lane head-on collision risk situations: As shown in Figure 1, in some instances, the prospective driver may get into the center left-turn lane prior to taking a left-turn. However, at the same time, another vehicle that intends to access a business entrance may also move into the center left-turn lane with both the vehicles facing each other. Such unexpected circumstances have resulted in much anxiety to the prospective drivers where a few head-on collision near-miss incidents have been experienced.

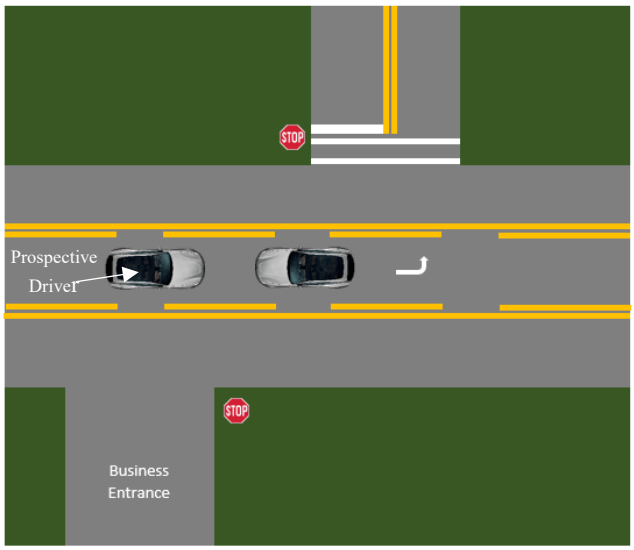

Figure 2. Center left-turn lane head-on collision risk situations

Entry into the wrong side of the road: Three driver license examiners mentioned instances when a driver seeking to take a left turn mistakenly entered the wrong side of the road after attempting the turn. In addition, as also discussed earlier, certain internationally trained drivers were prone to entering the wrong side of the road due to their previous driving experience of keeping to the left side of the road.

Safety Management Solutions Currently Adopted by Driver License Examiners on a Regular Basis

The following sections describe the safety management solutions that driver license examiners mentioned that they adopt on an individual basis regularly. It must be clarified that while a few driver license examiners mentioned adopting these safety management solutions, they were not universally adopted by all driver license examiners.

Adoption of widely understood terms and hand gestures: To counter communication challenges as discussed earlier, a large number of driver license examiners mentioned using terms such as “stop”,

"wait", and "turn right" that is widely understood by prospective drivers during the driving test. The driver license examiners believed that such a strategy is particularly useful when drivers are not proficient in communicating in English, but are familiar with these common terms that are almost universally understood. In many cases, the driver license examiners also tested the driver's understanding of these terms prior to initiating the driving test. The driver license examiners mentioned that they often verified that the driver understood that they need to come to a complete stop when the examiner offered instructions to "stop". In many cases, the driver license examiners ensured that the drivers understood these keywords in the parking lot prior to the test on the road. The use of these widely understood terms was often also supplemented with hand gestures (e.g., signaling to brake or stop) that were practiced in the parking lot prior to testing on the road. However, some driver license examiners mentioned that these hand gestures can be distracting to drivers as they may divert their attention from the road and traffic conditions.

One of the driver license examiner mentioned using interpreters when possible to communicate with prospective drivers that were not proficient in English. In many cases, the interpreter was an accompanying friend or acquaintance of the prospective driver who was able to communicate in English. With the help of the interpreter, the driver license examiner often communicated the meaning of the key terms such as "stop", "wait", and "turn right" and tested the driver's understanding in the parking lot prior to the road test. The interpreters were however not permitted to accompany the prospective driver and the driver license examiner during the driving test due to existing policies to reduce any interference, distractions, and other unexpected situations.

Being prepared to take control over the vehicle: Several driver license examiners mentioned that they always remained prepared to take control over the steering wheel during driving tests. The driver license examiners mentioned that such vigilance is particularly important given that they regularly experienced instances of unsafe driving. Several driver license examiners mentioned instances where they had to grab the steering wheel to avoid imminent collisions on the road and while exiting a parking space (e.g., when driver steers in the wrong direction). There were also accounts of instances where the driver license examiner took control over the steering wheel to avoid collision with the curb, the median, and roadside fixtures. Such interventions were also necessary in a number of cases where the driver had difficulty remaining in their lane or when the driver attempts a lane change without sufficiently scanning for vehicles in the adjacent lane. In addition, in a few cases, driver license examiners mentioned that they are sometimes forced to either pull the emergency brakes or move the gear to the neutral position to stop or slow the vehicle in an emergency situation. These approaches were particularly useful when the drivers fail to follow instructions and a dangerous situation becomes imminent.

Encouraging prospective drivers to hold permit and gain experience: In a number of cases, the driver license examiners mentioned encouraging prospective drivers to gain sufficient practice prior to taking the driving test. These suggestions were often presented immediately following the issuance of the learner's permit to prospective drivers and after a failed attempt at the driving test. In some cases, the driver license examiners were also able to informally ask prospective drivers if they have had any driving experience in the United States prior to attempting the driving test. In

cases where the prospective driver reports not having had sufficient practice, the driver license examiners would recommend that the driver attains sufficient practice prior to testing. According to the driver license examiners, such an intervention was also useful when drivers demonstrated a significant amount of anxiety and nervousness prior to taking the driving test. The driver license examiners believed that with sufficient practice, a subset of drivers are more likely to gain confidence where anxiety and nervousness would no longer be an issue. Such interventions were expected to reduce the likelihood of driving errors and risky situations during a driving test.

Use of translation technology: A number of driver license examiners mentioned using technology that enabled them to communicate with drivers that were not sufficiently conversant in the English language. For example, a few driver license examiners mentioned using google translate, apple translate, and other translation applications on the phone as they tried to communicate in other languages. A few driver license examiners mentioned that they have gained some confidence in communicating keywords in a few languages by using these applications regularly. A few others mentioned that they began learning Spanish as a hobby during their leisure time which became beneficial as they worked with prospective drivers.

Self-assessment of safety risk: A number of driver license examiners mentioned that they self-assess the risk of any maneuver prior to offering instructions to the drivers. For example, the examiners mentioned that they check to ensure that no vehicles or pedestrians are behind the vehicle when they instruct the driver to pull out of a parking space. Likewise, the driver license examiners mentioned that they identify a low traffic area and check for nearby vehicles prior to asking the drivers to demonstrate the 3-point turn.

In many other cases, the driver license examiners mentioned that they stay vigilant and alert prospective drivers of any imminent dangers. For example, if it appears that the driver has not noticed a stop sign (i.e., driver does not appropriately decelerate), the driver license examiners alert drivers of the stop sign. Likewise, if a driver fails to yield appropriately to another vehicle while pulling out at an intersection (i.e., pulling out in front of another vehicle), the driver license examiners immediately instruct the driver to stop.

Managing nervous and anxious customers and ensuring driver comfort: Given the prevalence of testing-related anxiety and nervousness among potential drivers, the driver license examiners mentioned that they often take efforts to be friendly and put the customers at ease. For example, the driver license examiners. often demonstrate empathy and communicate their shared interest in the success of the potential driver at the driving test. They often also clarify that their primary goal is only to ensure that the potential driver is able to safely drive while following traffic rules for the safety of themselves and others. The driver license examiners also mentioned that such efforts can reduce discontentment among prospective drivers and any adversarial behaviors. In many cases, the driver license examiners also mentioned that nervousness and anxiety among prospective drivers can occur due to the lack of practice and confidence in their own driving ability. In these circumstances, a few driver license examiners mentioned that they encourage the prospective driver to postpone the driving test to attain additional practice and training.

Maintaining safe distance and ensuring the engine is off during the Pre-test inspection: Prior to initiating the driver license test, the examiner conducts a pre-test inspection where the vehicle is examined. Apart from examining the condition of the vehicle (e.g., cracked windshield, deflated tires, working horn, working seatbelts), they also ensure the proper functioning of the headlights, braking lights, turn signals, hazard lights, windshield wipers, and others. Given that prospective drivers sometimes move the vehicle unexpectedly during these pre-test inspections, driver license examiners often maintain a safe distance from the vehicle during these inspections. Several of the driver license examiners also particularly mentioned mindfully staying clear from standing in front of or behind the vehicle during these inspections. Several driver license examiners also mentioned that certain parts of the pre-test inspection could be conducted when the engine is shutdown or when the ignition is on without cranking the engine to start the vehicle.

Pre-testing driving ability in the parking lot prior to the road test: Given the heightened risk of safety incidents on the road during driving tests, several of the driver license examiners mentioned that they often test drivers first in the parking lot where safety risk is relatively lower than on the road. More specifically, they ensure that the prospective driver is able to safely operate and maintain control over the vehicle and apply the brakes as necessary. Once the prospective driver is able to demonstrate their driving competency in a parking lot setting, and the driver license examiner is more confident about the abilities of the prospective driver, they then proceed to test the driver on the road. In cases where the prospective driver is clearly unable to safely operate the vehicle, the driver license examiner suggests that the driver voluntarily terminate the test and return for retesting after sufficient practice.

Use of an alternative safer testing route: In some cases, the driver license examiners mentioned using an alternate route than the one traditionally used to reduce the risk of any incidents. For example, when traffic volume was expected to be higher in certain routes due to the time of the day or the occurrence of a special event, the driver license examiners mentioned using an alternate route. An alternate route was also used in circumstances where any infrastructure maintenance operations such as roadwork or utility work was scheduled on the regular testing route. In the same manner, a few driver license examiners mentioned using alternate testing routes when the regular route included industrial areas where large vehicles such as trucks are expected to be encountered.

Considerations when offering negative feedback after failure: A number of driver license examiners mentioned that one of the most difficult aspects of their job is to communicate to prospective drivers that they failed the exam and were unable to successfully demonstrate driving competency. As already discussed earlier, while a necessary part of their jobs, when driver license examiners offer such negative feedback to prospective drivers, it is not uncommon for them to experience verbal abuses, threats, and attacks. To reduce the risk of such incidents, a few driver license examiners mentioned that they take a few precautionary measures to reduce such incidents while offering negative feedback. For example, one of the driver license examiners mentioned that they wait until they can physically exit the vehicle and re-enter the driver license office before providing such feedback. According to the driver license examiner, the prospective driver is less

likely to perpetuate undesirable behaviors in a more public place. Moreover, there are other employees in the driver license office that may be able to intervene as necessary if the situation calls for it. Another driver license examiner mentioned that they first ask the prospective driver what they think about the driving test and how they did prior to offering their own negative feedback. The driver license examiner mentioned that in many cases, the prospective drivers themselves identify some of their own major failures – thus making it easier for the driver license examiners to offer additional constructive feedback along with a failure decision. Other driver license examiners mentioned that demonstrating empathy, encouraging prospective drivers to practice and return for retesting, and offering visual and explicit forms of feedback (e.g., manually drawing maneuver errors at intersections, communicating specific locations where the driver failed to demonstrate competency) over generic and vague approaches (e.g., you were unable to sufficiently control the vehicle) can put the prospective driver at ease while receiving the feedback.

Offering written knowledge test and the driver's manual in different languages: A number of driver license examiners mentioned that the North Carolina DMV has made provisions to address language proficiency issues among prospective drivers. These efforts include offering the written knowledge test in different languages and making the driver's handbook that offers important driving instructions available in both English and Spanish. While the solution partially addresses issues with language proficiencies, the driver license examiners mentioned that the solution was not sufficient to address communication challenges that arise during the driving test.

Suggesting that prospective drivers silence or turn off their phone prior to testing: To counter distractions from ringing and vibrating phones, a few driver license examiners mentioned that they discuss the possibility of such distractions with prospective drivers and suggest that they either silence their phone or turn it off prior to test initiation.

Suggested Future Safety Management Solutions and Implementation Barriers

Early Test Termination: A number of driver license examiners mentioned that when drivers make significant errors at the early stages of the test, it often becomes clear that the driver has not had the necessary training or that they do not possess the necessary competency to be successful in the driving test. Accordingly, the driver license examiners suggested that it will be useful if they can terminate the test as soon as they are able to make such a judgment (e.g., after two significant errors or violations). The driver license examiners believed that such empowerment of driver license examiners will reduce the likelihood of safety incidents and offer better protection for driver license examiners.

The most significant challenge associated with the adoption of such a policy is that prospective drivers may believe that they have not been given a complete and fair chance to demonstrate their driving competency. Many prospective drivers that fail the exam could express dissatisfaction with their testing experience.

The driver license examiners also mentioned that offering feedback is a central part of the driving test. Such feedback offers clarity on problem areas that the driver should address when they return for retesting. If drivers can fail the driving test without experiencing the complete driving test, the feedback offered may be incomplete and may not address all areas of the typical driving test. In such situations, while the driver may address the problem areas previously identified from the partial test during retesting efforts, there may be new areas where the driver fails to demonstrate competency. Unfortunately, in these cases, the driver license examiner will have to fail the driver and recommend retesting. Some driver license examiners believed that offering a complete test during the first attempt may resolve some of the related challenges and can possibly reduce customer frustration.

Another situation that the driver license examiners mentioned that such empowerment to terminate the test would be useful is when they encounter large vehicles (i.e., part of the commercial driver license tests) with missing handrails and steps. The driver license examiners mentioned that the risk for falls and slips while entering and exiting these vehicles can be dramatically reduced if such a policy is universally adopted.

Enforcing a minimum wait time following the issuance of the learners' permit: Given that a significant number of drivers immediately attempt the driving test without sufficient practice or training after receiving the learners permit, the driver license examiners suggested that a policy change that requires a reasonable wait time prior to testing could be useful. One concern that was expressed with the adoption of such a new policy was that drivers that may have sufficient competency from prior driving in other nations with comparable driving customs would need to wait a little longer to obtain driving licenses. However, all the driver license examiners believed that the benefits of such a change far outweighed any other undesirable effects.

Extend minimum wait period after failed test: Given that drivers often returned for retesting after the mandatory seven-day wait period after a failed test, in some cases without receiving any additional training, several driver license examiners were of the opinion that a longer mandated wait period would be useful. The driver license examiners particularly thought that such policies would be useful when drivers fail the driving test multiple times. The driver license examiners believed that such restrictions will encourage more drivers to prepare and practice sufficiently before they return to retesting. The recommend wait period ranged from two weeks to two months; with larger recommended wait periods for drivers that fail driving tests repeatedly with no evidence of any training or practice during the wait period.

Provide evidence of practice and training prior to attempting driving test: As several drivers attempt the driving test without sufficient practice or training, several driver license examiners mentioned that requiring prospective drivers to provide evidence and records of their practice or training will be useful prior to testing. Several driver license examiners also mentioned that it will be useful to outline the recommended amount of practice or training needed prior to attempting the test and providing the information in the form of a booklet while prospective drivers receive their learner's permit. It was believed that requiring prospective drivers to maintain a log of their

driving experience in the provided booklet and presenting the information prior to attempting the driving test would help address this reoccurring challenge.

Establish fee for retesting: To discourage drivers from returning for retesting after a failed test without any additional practice or training, a few driver license examiners recommended that establishing a retesting fee would be useful. Some of the driver license examiners mentioned that such retesting fee may be applied for prospective drivers that fail two or more times; with the ability to take the first retesting session without any additional fee.

Contactless Testing: Given that most of the safety risks that driver license examiners experience during driving tests occur when in the vehicle, contactless testing approaches that became increasingly popular during the COVID-19 pandemic were recommended by several driver license examiners. These tests were largely conducted in a parking lot or in a controlled setting where prospective drivers demonstrated their competency from within the vehicle while driver license examiners offered instructions from outside the vehicle. Many driver license examiners believed that such a testing approach was sufficient to assess driver competency although drivers are tested in a more controlled environment without being tested in actual roadways. Moreover, given that the testing protocol does not include testing on actual roadways, the driver license examiners believed that a permanent policy change involving contactless testing will reduce the likelihood of high-risk incidents that are more likely on the road. However, a handful of examiners believed that the contactless testing efforts, in the current form, may not sufficiently replicate driving conditions in the real world and may not account for many of the common errors drivers make during driving tests. These drivers, were, however, confident and hopeful that the contactless testing approach can be developed further to better replicate real driving conditions while also protecting the driver license examiners.

Additional efforts to address language barriers: Given that a significant number of prospective drivers are more proficient in Spanish than in English, some of the driver license examiners mentioned that they would benefit from opportunities offered to them to learn basic Spanish. Others also mentioned that the recruitment of driver license examiners that are proficient in Spanish or those that are bilingual will be useful to tackling communication barriers. A few driver license examiners mentioned that while translation technology exists, they are not widely adopted. Making driver license examiners aware of these technologies and offering relevant training may be useful. These driver license examiners also mentioned that the translation technology applications will need to be further improved and refined to ensure effective use in practice.

Nonetheless, some driver license examiners also believed that drivers must possess basic competency in communicating in English given that several traffic signage (e.g., do not enter signs, stop signs, roadwork signage, exit signs, location names, direction names, etc.) and LED traffic information displays that are widely adopted use the English language. In fact, a few driver license examiners believed that it would be a disservice to prospective drivers if a basic proficiency in English is not expected given that drivers are expected to follow signage and instructions that are in English in the real-world.

Heads-up display: One of the driver license examiners mentioned that the use of a heads-up display that offers directions to drivers using signs (e.g., presents an arrow directing driver to turn right or left) would alleviate the language barrier challenge that is commonly experienced. Another driver license examiner mentioned that the use of a GPS navigation system with preset directions would be useful. However, several other driver license examiners mentioned that the use of such systems can be a significant distraction to drivers and that prospective drivers may pay attention to these heads-up systems rather than the road. There was also concern that inexperienced drivers may just rely on the directions offered by the heads-up display instead of using their own judgment which can result in undesirable safety incidents.

Use of a virtual environment for pretesting prior to the road test: A handful of driver license examiners mentioned that it may be useful to explore pretesting drivers in a virtual environment prior to the road test. These driver license examiners believed that such testing can help identify high-risk drivers in a no-risk environment without attempting the road test and offer remedial recommendations prior to the road test. However, the majority of driver license examiners were of the opinion that while there are a few virtual environments that they have been exposed to, none of them are sufficiently robust to offer a reliable test to assess the driving skill of prospective drivers. Moreover, several driver license examiners believed that an individual's performance in a virtual environment will not translate to comparable performance in the real world based on the current state of the technology. Moreover, they also believed that the increase in cost associated with transitioning and maintaining such a testing protocol would be cost prohibit in the current setting.

Use of a DMV-provided vehicle equipped with a braking system for the examiner: Two driver license examiners mentioned that the use of DMV-provided vehicles with a braking system the examiners can use if safety incidents and collisions become imminent will be useful. However, most driver license examiners mentioned that it would be more advantageous and useful if drivers are tested in the vehicle they plan to use following the issuance of the driving license. Also, a few driver license examiners believed that it was optimal to require that prospective drivers bring their own vehicle; as maintaining a functional fleet of vehicles, particularly when testing drivers with limited proficiency, would be challenging. There were also discussions suggesting that drivers should have skin-in-the-game and will need to take the liability associated with the driving test as is in the real world when they are licensed drivers.

Magnetic signage to communicate ongoing road test: One of the driver license examiners mentioned that the use of magnetic signage to communicate the ongoing test to other drivers will be useful in reducing safety incidents (e.g., collision with other vehicles). However, several other driver license examiners mentioned that such an intervention will adversely impact the realism of the driving test since other drivers will behave differently when around a vehicle they know is being used for an ongoing driving test. For example, other drivers will drive defensively around the driver which will significantly reduce the demands placed on the prospective drivers as is the case in the real world.

Study 2: Contributions, Discussions, and Future Research Directions

The research effort makes useful contributions as it relates to the safety of driver license examiners. First, the study complements the findings of Study 1 by offering additional insights into the safety challenges that driver license examiners experience. More specifically, unlike the findings of study 1, study 2 offers insights from the perspective of driver license examiners – many of which are not captured as part of accident investigations. These include safety challenges such as prospective drivers reporting to testing and retesting without sufficient practice, the presence of communication and language barriers when prospective drivers are unable to converse in English or another language known to the driver license examiners, and the discomfort of having to enter unclean and messy cars.

Second, the study also offered corroborative evidence of several safety challenges that were identified as part of study 1. Examples of these challenges include prospective drivers that fail to yield the right-of-way, speeding, unsafe lane changes and others. Accordingly, the finding of both study 1 and study 2 offer a more complete picture of the safety challenges that driver license examiners experience as part of the professional roles. Departments of Motor vehicles and transportation agencies may leverage the findings of these two studies to take strategic measure to better protect the driver license examiner workforce.

Third, the study findings summarize safety management solutions that individual driver license examiners reportedly adopt on a regular basis. Departments of Motor vehicles (DMVs) and transportation agencies may evaluate these safety management solutions and disseminate the findings with other driver license examiners that may also benefit from the adoption the reported safety management solutions.

Fourth, the study findings report safety management solutions that are currently not adopted or only adopted on a temporary basis. Departments of Motor vehicles and transportation agencies may evaluate these proposed safety management solutions and introduce appropriate policy changes or new interventions that can protect driver license examiners. As mentioned earlier, such approaches can also empower driver license examiners to more efficiently serve their customers while also protecting themselves.

Based on the findings, a number of tables are included in the next few pages that offer useful insights. As can be seen in these tables, the left most column lists the safety challenges and the right most column lists the safety management solutions that were identified as part of the investigation. In each of the tables, one of the safety challenges is highlighted in red and related safety management solutions are highlighted in either green, yellow, or blue. The safety management solutions that are highlighted in green represent safety management solutions that can potentially and directly reduce the likelihood of the specific safety challenge that is highlighted in red. In contrast, the safety management solutions that are highlighted in yellow represent safety management solutions that can potentially and indirectly reduce the likelihood of the specific safety challenge that is highlighted in red. On the other hand the safety management solutions highlighted in blue may not directly impact the safety challenge, but can possibly reduce consequences of the safety challenge highlighted in red.

For example, as can be seen in the first table, one of the safety management solutions that is useful in directly tackling the safety challenge of drivers reporting to testing without sufficient training is encouraging prospective drivers to hold the permit and gain experience while either issuing the learners permit or following a failed test. On the other hand, the safety management solution where the driver license examiner remains prepared to take control over the vehicle if dangerous situations arise will not directly affect whether drivers report to the test without sufficient training but can address related consequences such as the possibility of a collision in such circumstances. Departments of Motor vehicles and transportation agencies can use these tables as a resource to enable and empower their driver license examiners to adopt appropriate safety management solutions to reduce the risk of injury or safety incidents.

While these tables report a number of safety management solutions that are useful in managing the different safety challenges, it is important to note that the effectiveness of the many safety management solutions are not expected to be equivalent. For example, being prepared to take control over the vehicle if a dangerous situation arises will not offer the same benefits of the adoption of the contactless testing approach across Departments of Motor vehicles. More specifically, while the safety risk of injury to the driver license examiner can be reduced if they are prepared to take control over the vehicle, the adoption of the contactless testing approach may offer superior protection to driver license examiners since the safety solution removes the driver license examiner from the vehicle that can be susceptible to a safety incident when testing inexperienced driver license examiners. Future efforts may focus on assessing the relative effectiveness of the identified safety management solutions . Such efforts can enable department of motor vehicles and transportation agencies develop a more robust plan to protect the safety of the driver license examiners.

Finally, the study also revealed important barriers and challenges associated with the adoption of the recommended safety management solutions that were proposed by the driver license examiners. Future research may be carried out to address some of these barriers. For example, while heads-up displays were suggested by a few driver license examiners to address communication related challenges that are regularly experienced, there was concerns regarding distractions that would introduce other safety challenges. Future research could focus on developing head-up displays from a human factors point of view to reduce distractions while enhancing capabilities of the systems to better communicate driving directions to prospective drivers during driving tests.

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Drivers that report for testing without sufficient training	Currently Adopted	Adoption of widely understood terms and hand gestures
Presence of communication barriers and language proficiency concerns		Being prepared to take control over the vehicle
Prospective drivers adopting driving customs learned in a different country		Encouraging prospective drivers to hold permit and gain experience
Nervousness and anxiety among prospective drivers		Use of translation technology
Threats, verbal abuse, attacks and discontent customers		Self-assessment of safety risk
Distractions during Driving Tests		Managing nervous and anxious customers and ensuring driver comfort
Prospective drivers that do not follow examiner instructions		Maintaining safe distance and ensuring the engine is off during the Pre-test inspection
Impatience among other drivers on the road		
Unclean and messy vehicles		Pre-testing driving ability in the parking lot prior to the road test
Job requirement of entering the car of strangers		
Missing handrails and steps in large commercial vehicles		Use of an alternative safer testing route
Administering driving tests in risky routes		Considerations when offering negative feedback after failure
Unfamiliarly with driving rules and norms		Offering written knowledge test and the driver's manual in different languages
Stop-Start systems feature error		Suggesting that prospective drivers silence or turn off their phone prior to testing
Failure to yield right-of way	Proposed for consideration	Early Test Termination
Failure to stop at red light and stop sign		
Speeding		Enforcing a minimum wait time following the issuance of the learners permit
Unsafe lane changes		Extend minimum wait period after failed test
Abrupt acceleration or braking		Provide evidence of practice and training prior to attempting driving test
Errors during 3-point turns		Establish fee for retesting
Overcorrecting / Oversteering		Contactless Testing
Entering and exiting parking space errors		Additional efforts to address language barriers
Driving too slowly or slowing down after a turn		Heads-up display
Failure to merge prior to lane ending		Use of a virtual environment for pretesting prior to the road test
Insufficient space management		Use of a DMV provided vehicle equipped with a braking system for the examiner
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Impatience among other drivers on the road		
Unclean and messy vehicles		Pre-testing driving ability in the parking lot prior to the road test
Job requirement of entering the car of strangers		
Missing handrails and steps in large commercial vehicles		Use of an alternative safer testing route
Administering driving tests in risky routes		Considerations when offering negative feedback after failure
Unfamiliarly with driving rules and norms		Offering written knowledge test and the driver's manual in different languages
Stop-Start systems feature error		Suggesting that prospective drivers silence or turn off their phone prior to testing
Failure to yield right-of way	Proposed for consideration	Early Test Termination
Failure to stop at red light and stop sign		
Speeding		Enforcing a minimum wait time following the issuance of the learners permit
Unsafe lane changes		Extend minimum wait period after failed test
Abrupt acceleration or braking		Provide evidence of practice and training prior to attempting driving test
Errors during 3-point turns		Establish fee for retesting
Overcorrecting / Oversteering		Contactless Testing
Entering and exiting parking space errors		Additional efforts to address language barriers
Driving too slowly or slowing down after a turn		Heads-up display
Failure to merge prior to lane ending		Use of a virtual environment for pretesting prior to the road test
Insufficient space management		Use of a DMV provided vehicle equipped with a braking system for the examiner
Collision with the median, curb, roadside fixtures, and other elements		
Center left-turn lane head-on collision risk situations		Magnetic signage to communicate ongoing road test
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Drivers that report for testing without sufficient training	Currently Adopted	Adoption of widely understood terms and hand gestures
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Prospective drivers adopting driving customs learned in a different country		Encouraging prospective drivers to hold permit and gain experience
Nervousness and anxiety among prospective drivers		Use of translation technology
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Administering driving tests in risky routes		Considerations when offering negative feedback after failure
Unfamiliarly with driving rules and norms		Offering written knowledge test and the driver's manual in different languages
Stop-Start systems feature error		Suggesting that prospective drivers silence or turn off their phone prior to testing
Failure to yield right-of way	Proposed for consideration	Early Test Termination
Failure to stop at red light and stop sign		
Speeding		Enforcing a minimum wait time following the issuance of the learners permit
Unsafe lane changes		Extend minimum wait period after failed test
Abrupt acceleration or braking		Provide evidence of practice and training prior to attempting driving test
Errors during 3-point turns		Establish fee for retesting
Overcorrecting / Oversteering		Contactless Testing
Entering and exiting parking space errors		Additional efforts to address language barriers
Driving too slowly or slowing down after a turn		Heads-up display
Failure to merge prior to lane ending		Use of a virtual environment for pretesting prior to the road test

Use of a DMV provided vehicle equipped with a braki

Insufficient space management		Use of a DMV provided vehicle equipped with a braking system for the examiner
Collision with the median, curb, roadside fixtures, and other elements		
Center left-turn lane head-on collision risk situations		Magnetic signage to communicate ongoing road test
Entry to the wrong side of the road		

SAFETY CHALLENGES		SAFETY MANAGEMENT SOLUTIONS
Drivers that report for testing without sufficient training	Currently Adopted	Adoption of widely understood terms and hand gestures
Presence of communication barriers and language proficiency concerns		Being prepared to take control over the vehicle
Prospective drivers adopting driving customs learned in a different country		Encouraging prospective drivers to hold permit and gain experience
Nervousness and anxiety among prospective drivers		Use of translation technology
Threats, verbal abuse, attacks and discontent customers		Self-assessment of safety risk
Distractions during Driving Tests		Managing nervous and anxious customers and ensuring driver comfort
Prospective drivers that do not follow examiner instructions		Maintaining safe distance and ensuring the engine is off during the Pre-test inspection
Impatience among other drivers on the road		
Unclean and messy vehicles		Pre-testing driving ability in the parking lot prior to the road test
Job requirement of entering the car of strangers		
Missing handrails and steps in large commercial vehicles		Use of an alternative safer testing route
Administering driving tests in risky routes		Considerations when offering negative feedback after failure
Unfamiliarly with driving rules and norms		Offering written knowledge test and the driver's manual in different languages
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Failure to merge prior to lane ending		Use of a virtual environment for pretesting prior to the road test
Insufficient space management		Use of a DMV provided vehicle equipped with a braking system for the examiner
Collision with the median, curb, roadside fixtures, and other elements		
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CONCLUSION

Driver license examiners ensure that driver licenses are issued only to individuals who are able to operate motor vehicles safely. Accordingly, driver license examiners serve as the first line of defense against unsafe drivers and driving practices. Despite their important role in enhancing traffic safety and serving the public, they are nonetheless exposed to high levels of safety risk. Unfortunately, research that focuses on protecting this community of workers is currently lacking. To address this dearth of research and to gain a better understanding of the safety challenges that driver license examiners face, two complementary studies were conducted.

Study 1 empirically examined NCDMV incident reports that involve driver license examiners. The investigation incorporated content analysis of the incident reports to extract fundamental attributes and attribute categories that are associated with each of the examined incidents. The findings reveal potential high-priority problem areas that driver license agencies and driver license examiners may target to reduce the likelihood of work-related injuries. For example, some of the high-priority incidents that need to be addressed include collision with fixed object, overexertion and physical bodily reaction, collision with another vehicle, and fall on the same level. This study also examined relationships among the attribute categories to achieve a more nuanced understanding of the safety-related challenges experienced by driver license examiners and to identify prospective safety solutions.

To complement the findings of study 1, study 2 was conducted. Study 2 focused on soliciting and cataloguing safety challenges that driver license examiners experience as part of their daily operations using interviews. In addition, study 2 captured current safety practices that driver license examiners adopt to reduce the risk of safety incidents and others that they believe could possibly be adopted universally across their offices in the future. These findings can be strategically leveraged by Departments of Motor vehicles (DMVs) and transportation agencies to address the safety challenges experienced by driver license examiners. The findings also offer insights into safety management solutions that Departments of Motor vehicles (DMVs) and transportation agencies can adopt to achieve these desirable objectives.

Finally, based on the analysis conducted as part of study 1, an incident prediction tool was created for NCDOT. The incident prediction tool can be used to identify safety risks that are relevant to specific attributes and attribute categories that are provided as input. The tool can be used by driver license examiners while preparing for driver license tests and to adopt active safety measures to reduce the risk of injury. The tool may be accessed at: https://afalshar.shinyapps.io/DMV_Tool/. Snapshots of the outputs from the incident prediction tool is presented in the Appendix of the report.

The reported two studies represents one of the first research efforts that focuses on addressing the safety challenges of driver license examiners. The findings can be used not only to protect driver license examiners, but also to empower them to offer superior services to their customers and better serve as the first line of defense against traffic incidents.

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APPENDICES

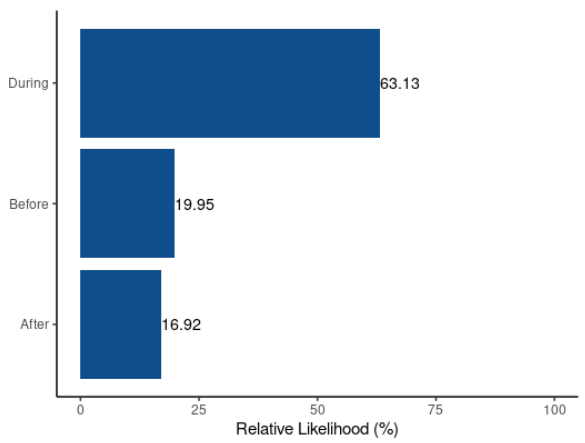
Appendix A – Snapshots of Safety Incident Prediction Tool

Safety Incidents Prediction Tool

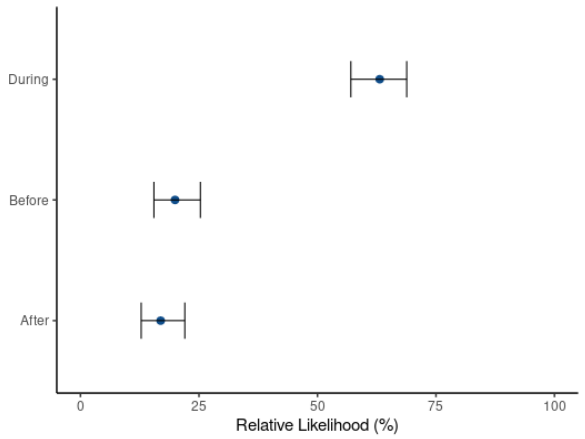
- About
- Overall Probability
- Condit. Prob. (One Variable)

Predicted Variable

Driving Test Stage



Driving Test Stage	Relative Likelihood (%)
During	63.13
Before	19.95
After	16.92



Driving Test Stage	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
During	63.13	57.04	68.83
Before	19.95	15.50	25.30
After	16.92	12.81	22.02

Safety Incidents Prediction Tool

About

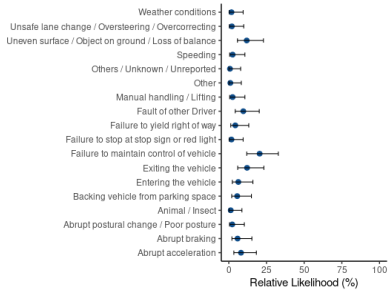
Overall Probability

Condit. Prob. (One Variable)

Predicted Variable

Contributing Factor

Contributing Factor	Relative Likelihood (%)
Failure to maintain control of vehicle	20.45
Exiting the vehicle	12.12
Uneven surface / Object on ground / Loss of balance	11.87
Fault of other Driver	9.60
Abrupt acceleration	8.08
Entering the vehicle	6.31
Abrupt braking	5.81
Backing vehicle from parking space	5.56
Failure to yield right of way	4.29
Speeding	2.53
Manual handling / Lifting	2.53
Abrupt postural change / Poor posture	2.27
Unsafe lane change / Oversteering / Overcorrecting	2.02
Failure to stop at stop sign or red light	1.77
Weather conditions	1.77
Animal / Insect	1.26
Other	1.01
Others / Unknown / Unreported	0.76



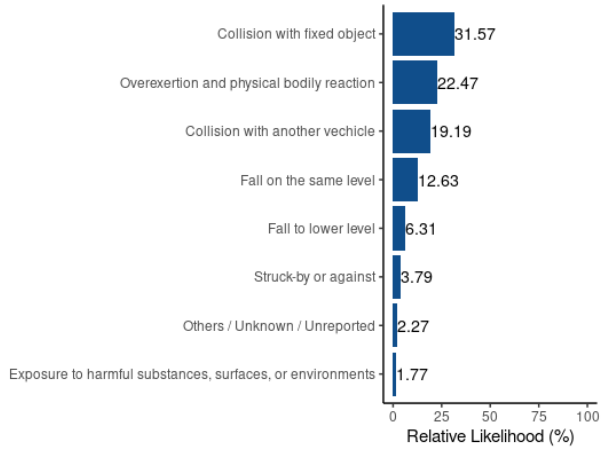
Contributing Factor	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Failure to maintain control of vehicle	20.45	11.91	32.85
Exiting the vehicle	12.12	5.90	23.27
Uneven surface / Object on ground / Loss of balance	11.87	5.73	22.97
Fault of other Driver	9.60	4.26	20.19
Abrupt acceleration	8.08	3.34	18.28
Entering the vehicle	6.31	2.33	15.99
Abrupt braking	5.81	2.06	15.31
Backing vehicle from parking space	5.56	1.93	14.97
Failure to yield right of way	4.29	1.30	13.24
Manual handling / Lifting	2.53	0.56	10.68
Speeding	2.53	0.56	10.68
Abrupt postural change / Poor posture	2.27	0.47	10.29
Unsafe lane change / Oversteering / Overcorrecting	2.02	0.39	9.90
Failure to stop at stop sign or red light	1.77	0.31	9.51
Weather conditions	1.77	0.31	9.51
Animal / Insect	1.26	0.17	8.70
Other	1.01	0.12	8.29
Others / Unknown / Unreported	0.76	0.07	7.86

Safety Incidents Prediction Tool

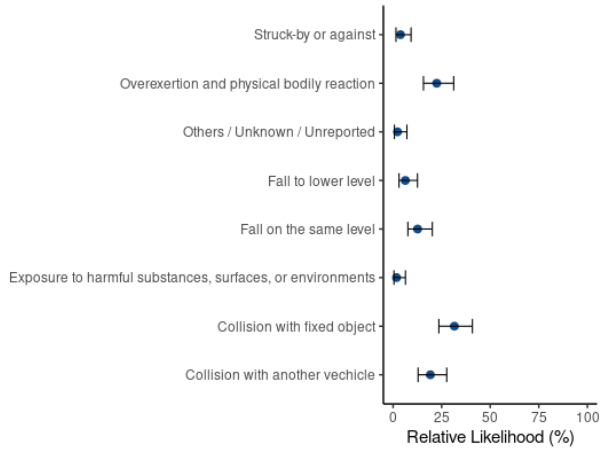
- About
- Overall Probability
- Condit. Prob. (One Variable)

Predicted Variable

Event Type



Event Type	Relative Likelihood (%)
Collision with fixed object	31.57
Overexertion and physical bodily reaction	22.47
Collision with another vechicle	19.19
Fall on the same level	12.63
Fall to lower level	6.31
Struck-by or against	3.79
Others / Unknown / Unreported	2.27
Exposure to harmful substances, surfaces, or environments	1.77



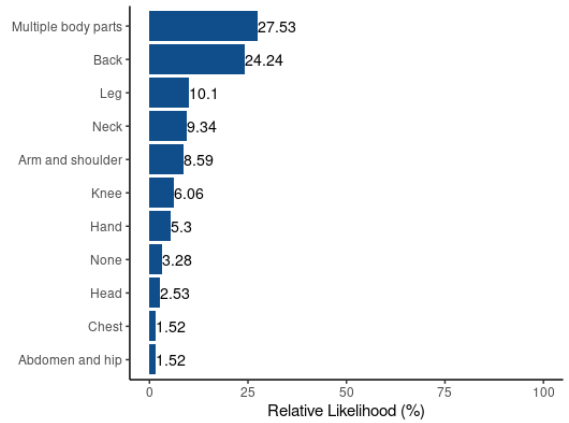
Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	31.57	23.57	40.83
Overexertion and physical bodily reaction	22.47	15.63	31.21
Collision with another vechicle	19.19	12.88	27.62
Fall on the same level	12.63	7.62	20.19
Fall to lower level	6.31	3.06	12.56
Struck-by or against	3.79	1.50	9.25
Others / Unknown / Unreported	2.27	0.70	7.12
Exposure to harmful substances, surfaces, or environments	1.77	0.47	6.37

Safety Incidents Prediction Tool

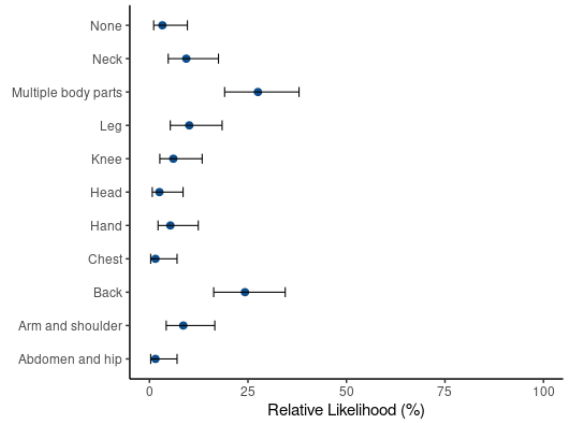
- About
- Overall Probability
- Condit. Prob. (One Variable)

Predicted Variable

Injured Body Part



Injured Body Part	Relative Likelihood (%)
Multiple body parts	27.53
Back	24.24
Leg	10.10
Neck	9.34
Arm and shoulder	8.59
Knee	6.06
Hand	5.30
None	3.28
Head	2.53
Chest	1.52
Abdomen and hip	1.52



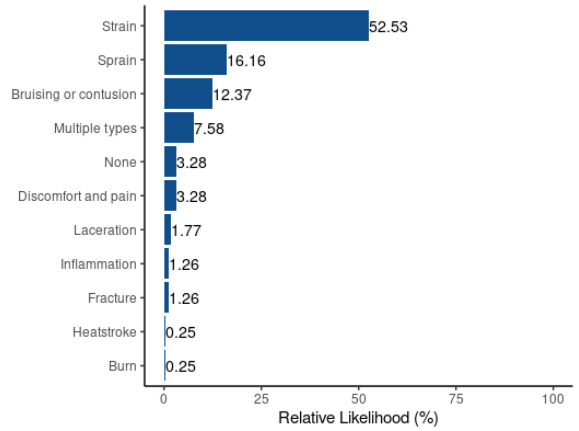
Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	27.53	19.08	37.96
Back	24.24	16.30	34.46
Leg	10.10	5.29	18.44
Neck	9.34	4.76	17.52
Arm and shoulder	8.59	4.25	16.58
Knee	6.06	2.62	13.38
Hand	5.30	2.17	12.39
None	3.28	1.07	9.62
Head	2.53	0.71	8.53
Abdomen and hip	1.52	0.31	7.00
Chest	1.52	0.31	7.00

Safety Incidents Prediction Tool

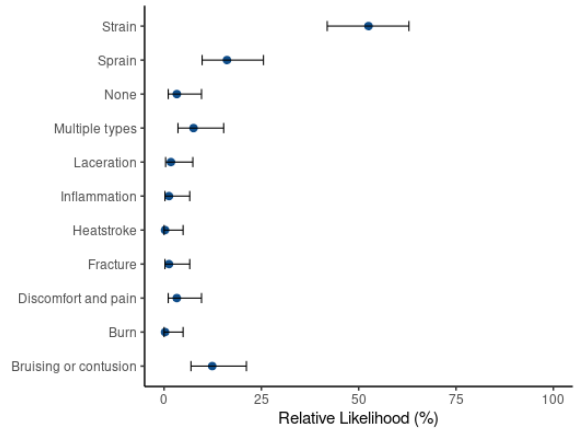
- About
- Overall Probability
- Condit. Prob. (One Variable)

Predicted Variable

Injury Type



Injury Type	Relative Likelihood (%)
Strain	52.53
Sprain	16.16
Bruising or contusion	12.37
Multiple types	7.58
None	3.28
Discomfort and pain	3.28
Laceration	1.77
Fracture	1.26
Inflammation	1.26
Burn	0.25
Heatstroke	0.25



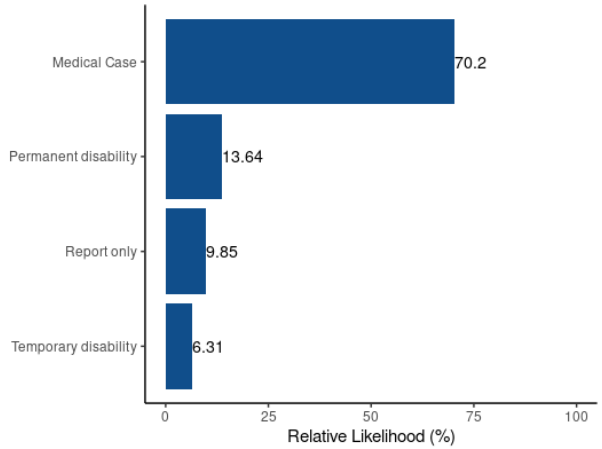
Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	52.53	41.92	62.91
Sprain	16.16	9.78	25.54
Bruising or contusion	12.37	6.92	21.15
Multiple types	7.58	3.58	15.32
Discomfort and pain	3.28	1.07	9.62
None	3.28	1.07	9.62
Laceration	1.77	0.40	7.39
Fracture	1.26	0.23	6.60
Inflammation	1.26	0.23	6.60
Burn	0.25	0.01	4.89
Heatstroke	0.25	0.01	4.89

Safety Incidents Prediction Tool

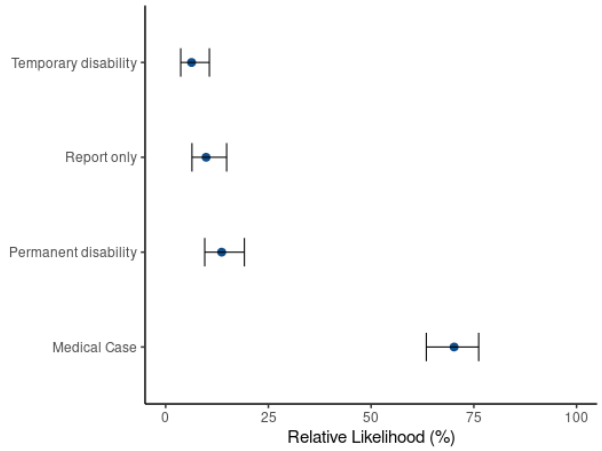
- About
- Overall Probability
- Condit. Prob. (One Variable)

Predicted Variable

Injury Outcome



Injury Outcome	Relative Likelihood (%)
Medical Case	70.20
Permanent disability	13.64
Report only	9.85
Temporary disability	6.31



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	70.20	63.44	76.19
Permanent disability	13.64	9.51	19.17
Report only	9.85	6.41	14.84
Temporary disability	6.31	3.67	10.65

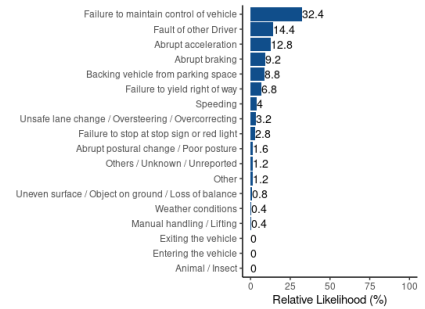
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

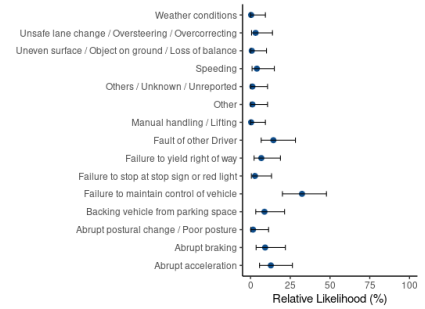
Predicted Variable: Contributing Factor

Given Variable: Driving Test Stage

Attribute for Given Variable: During



Contributing Factor	Relative Likelihood (%)
Failure to maintain control of vehicle	32.40
Fault of other Driver	14.40
Abrupt acceleration	12.80
Abrupt braking	9.20
Backing vehicle from parking space	8.80
Failure to yield right of way	6.80
Speeding	4.00
Unsafe lane change / Oversteering / Overcorrecting	3.20
Failure to stop at stop sign or red light	2.80
Abrupt postural change / Poor posture	1.60
Other	1.20
Others / Unknown / Unreported	1.20
Uneven surface / Object on ground / Loss of balance	0.80
Manual handling / Lifting	0.40
Weather conditions	0.40
Exiting the vehicle	0.00
Entering the vehicle	0.00
Animal / Insect	0.00



Contributing Factor	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Failure to maintain control of vehicle	32.40	20.07	47.77
Fault of other Driver	14.40	6.70	28.26
Abrupt acceleration	12.80	5.68	26.36
Abrupt braking	9.20	3.52	21.94
Backing vehicle from parking space	8.80	3.30	21.43
Failure to yield right of way	6.80	2.24	18.83
Speeding	4.00	0.98	14.99
Unsafe lane change / Oversteering / Overcorrecting	3.20	0.68	13.82
Failure to stop at stop sign or red light	2.80	0.54	13.23
Abrupt postural change / Poor posture	1.60	0.21	11.37
Other	1.20	0.12	10.72
Others / Unknown / Unreported	1.20	0.12	10.72
Uneven surface / Object on ground / Loss of balance	0.80	0.06	10.06
Manual handling / Lifting	0.40	0.02	9.37
Weather conditions	0.40	0.02	9.37

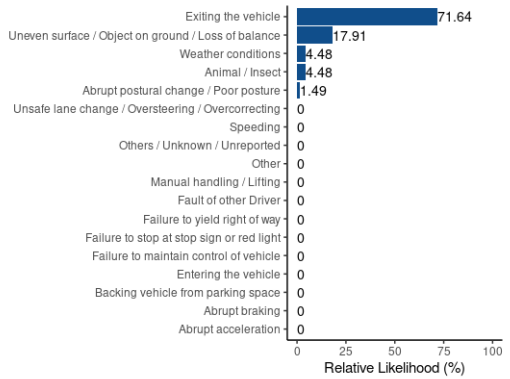
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

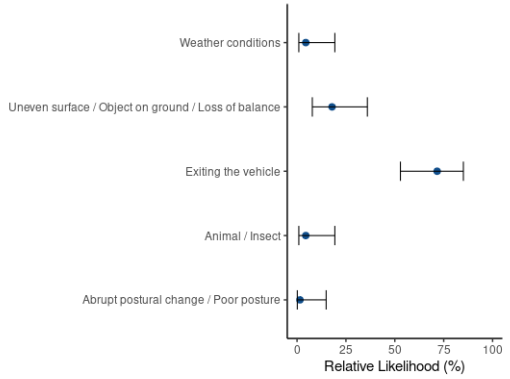
Predicted Variable: Contributing Factor

Given Variable: Driving Test Stage

Attribute for Given Variable: After



Contributing Factor	Relative Likelihood (%)
Exiting the vehicle	71.64
Uneven surface / Object on ground / Loss of balance	17.91
Animal / Insect	4.48
Weather conditions	4.48
Abrupt postural change / Poor posture	1.49
Unsafe lane change / Oversteering / Overcorrecting	0.00
Fault of other Driver	0.00
Other	0.00
Others / Unknown / Unreported	0.00
Speeding	0.00
Failure to maintain control of vehicle	0.00
Entering the vehicle	0.00
Abrupt acceleration	0.00
Failure to yield right of way	0.00
Failure to stop at stop sign or red light	0.00
Backing vehicle from parking space	0.00
Abrupt braking	0.00
Manual handling / Lifting	0.00



Contributing Factor	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Exiting the vehicle	71.64	52.86	85.06
Uneven surface / Object on ground / Loss of balance	17.91	7.81	35.97
Animal / Insect	4.48	0.91	19.34
Weather conditions	4.48	0.91	19.34
Abrupt postural change / Poor posture	1.49	0.13	14.89

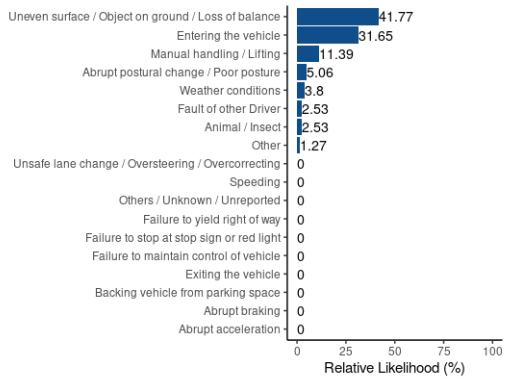
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

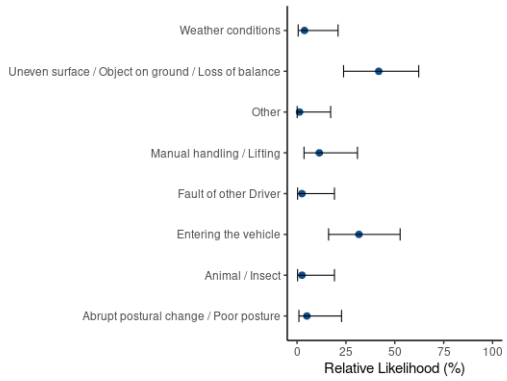
Predicted Variable: Contributing Factor

Given Variable: Driving Test Stage

Attribute for Given Variable: Before



Contributing Factor	Relative Likelihood (%)
Uneven surface / Object on ground / Loss of balance	41.77
Entering the vehicle	31.65
Manual handling / Lifting	11.39
Abrupt postural change / Poor posture	5.06
Weather conditions	3.80
Fault of other Driver	2.53
Animal / Insect	2.53
Other	1.27
Unsafe lane change / Oversteering / Overcorrecting	0.00
Others / Unknown / Unreported	0.00
Speeding	0.00
Failure to maintain control of vehicle	0.00
Exiting the vehicle	0.00
Abrupt acceleration	0.00
Failure to yield right of way	0.00
Failure to stop at stop sign or red light	0.00
Backing vehicle from parking space	0.00
Abrupt braking	0.00



Contributing Factor	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Uneven surface / Object on ground / Loss of balance	41.77	23.80	62.23
Entering the vehicle	31.65	16.13	52.71
Manual handling / Lifting	11.39	3.57	30.89
Abrupt postural change / Poor posture	5.06	0.96	22.75
Weather conditions	3.80	0.58	20.98
Animal / Insect	2.53	0.28	19.13
Fault of other Driver	2.53	0.28	19.13
Other	1.27	0.08	17.18

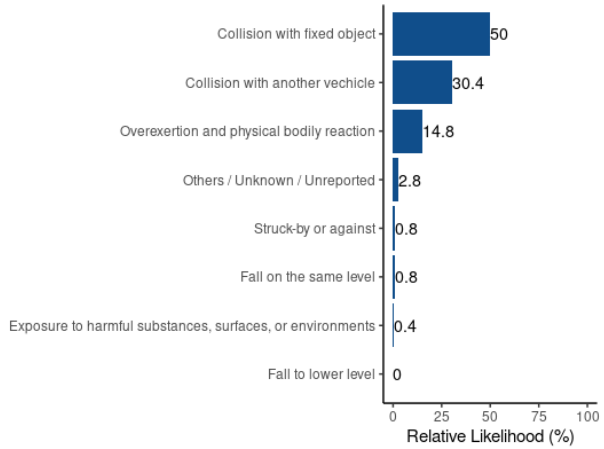
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

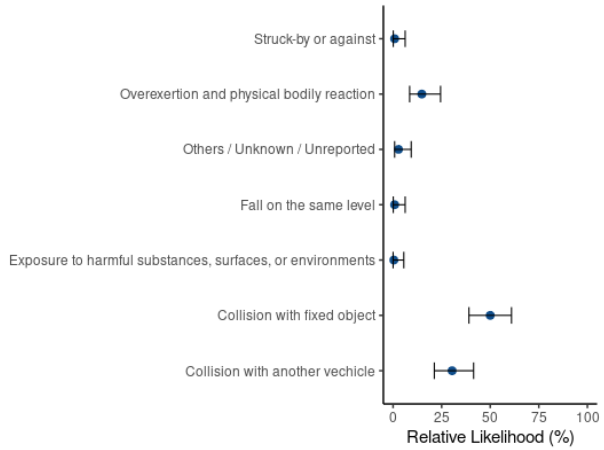
Predicted Variable: Event Type

Given Variable: Driving Test Stage

Attribute for Given Variable: During



Event Type	Relative Likelihood (%)
Collision with fixed object	50.00
Collision with another vechicle	30.40
Overexertion and physical bodily reaction	14.80
Others / Unknown / Unreported	2.80
Fall on the same level	0.80
Struck-by or against	0.80
Exposure to harmful substances, surfaces, or environments	0.40
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	50.00	39.05	60.95
Collision with another vechicle	30.40	21.22	41.46
Overexertion and physical bodily reaction	14.80	8.53	24.44
Others / Unknown / Unreported	2.80	0.80	9.33
Fall on the same level	0.80	0.10	6.22
Struck-by or against	0.80	0.10	6.22
Exposure to harmful substances, surfaces, or environments	0.40	0.03	5.53

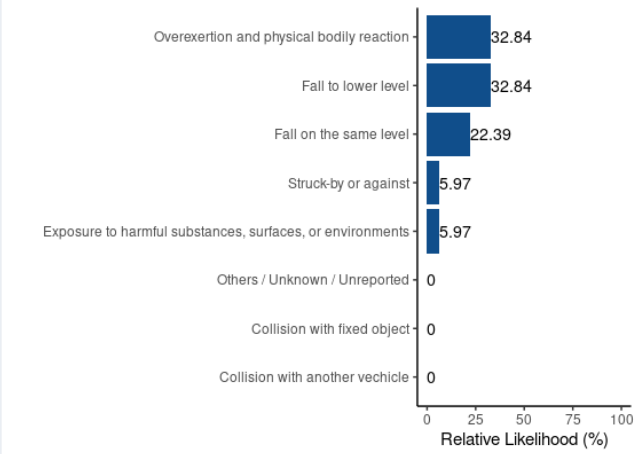
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

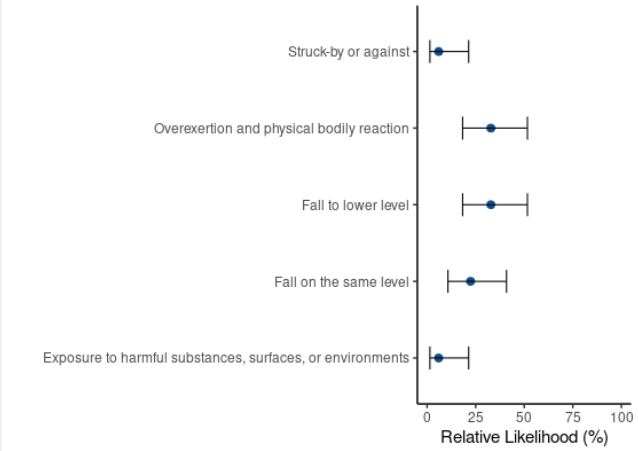
Predicted Variable: Event Type

Given Variable: Driving Test Stage

Attribute for Given Variable: After



Event Type	Relative Likelihood (%)
Overexertion and physical bodily reaction	32.84
Fall to lower level	32.84
Fall on the same level	22.39
Struck-by or against	5.97
Exposure to harmful substances, surfaces, or environments	5.97
Collision with another vechicle	0.00
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Fall to lower level	32.84	18.29	51.64
Overexertion and physical bodily reaction	32.84	18.29	51.64
Fall on the same level	22.39	10.74	40.89
Exposure to harmful substances, surfaces, or environments	5.97	1.46	21.40
Struck-by or against	5.97	1.46	21.40

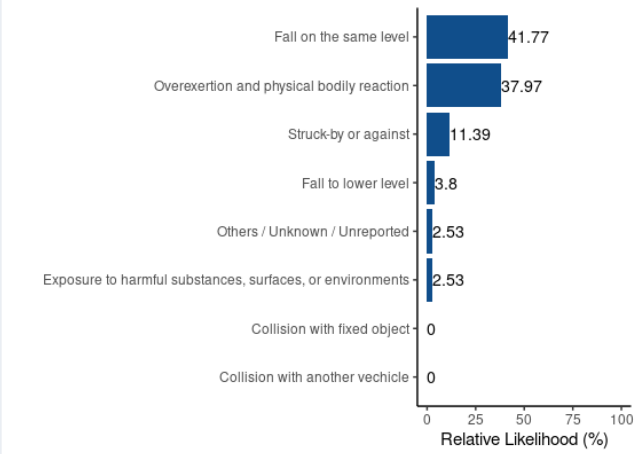
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

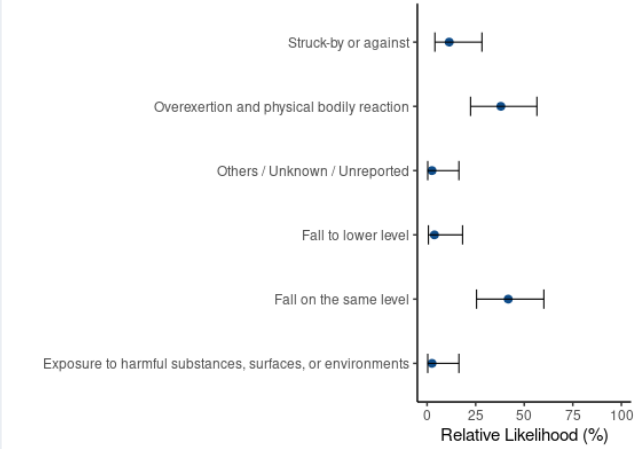
Predicted Variable: Event Type

Given Variable: Driving Test Stage

Attribute for Given Variable: Before



Event Type	Relative Likelihood (%)
Fall on the same level	41.77
Overexertion and physical bodily reaction	37.97
Struck-by or against	11.39
Fall to lower level	3.80
Others / Unknown / Unreported	2.53
Exposure to harmful substances, surfaces, or environments	2.53
Collision with another vechicle	0.00
Collision with fixed object	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Fall on the same level	41.77	25.46	60.10
Overexertion and physical bodily reaction	37.97	22.37	56.53
Struck-by or against	11.39	4.03	28.25
Fall to lower level	3.80	0.69	18.26
Exposure to harmful substances, surfaces, or environments	2.53	0.34	16.39
Others / Unknown / Unreported	2.53	0.34	16.39

Safety Incidents Prediction Tool

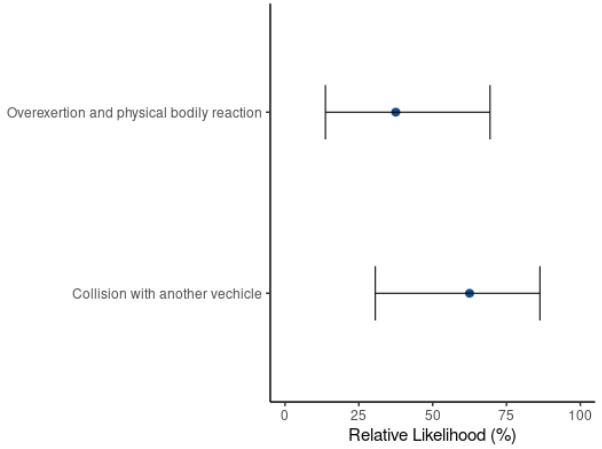
- About
- Overall Probability
- Condit. Prob. (One Variable)

Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Unsafe lane change / Oversteering / Overcorrecting

Event Type	Relative Likelihood (%)
Collision with another vechicle	62.50
Overexertion and physical bodily reaction	37.50
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with another vechicle	62.50	30.57	86.32
Overexertion and physical bodily reaction	37.50	13.68	69.43

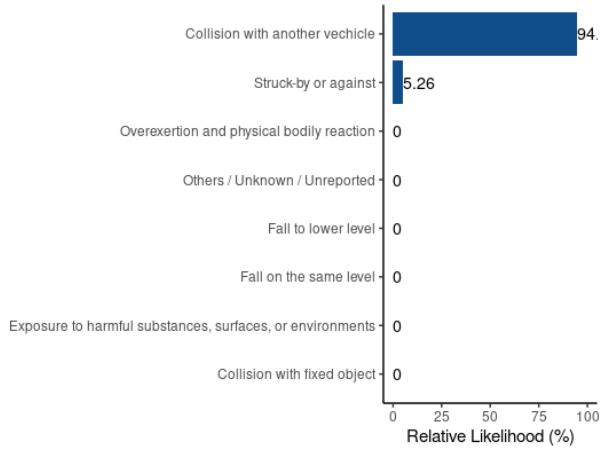
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

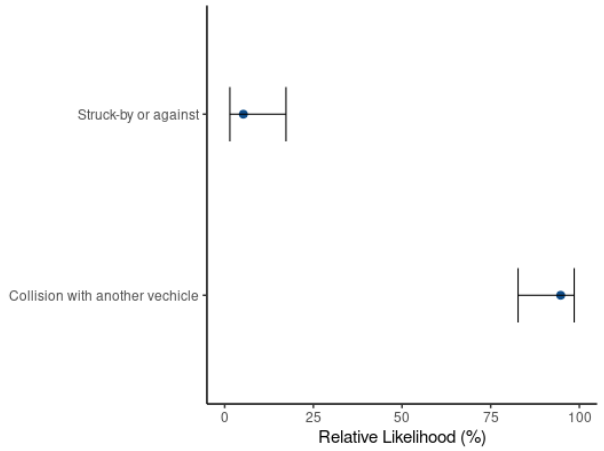
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Fault of other Driver



Event Type	Relative Likelihood (%)
Collision with another vechicle	94.74
Struck-by or against	5.26
Overexertion and physical bodily reaction	0.00
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00
Fall on the same level	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with another vechicle	94.74	82.71	98.54
Struck-by or against	5.26	1.46	17.29

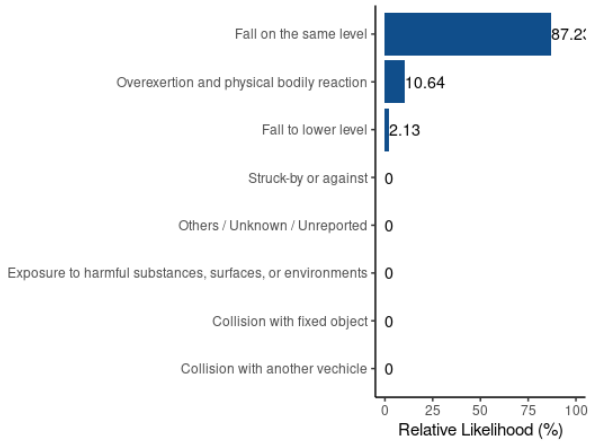
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

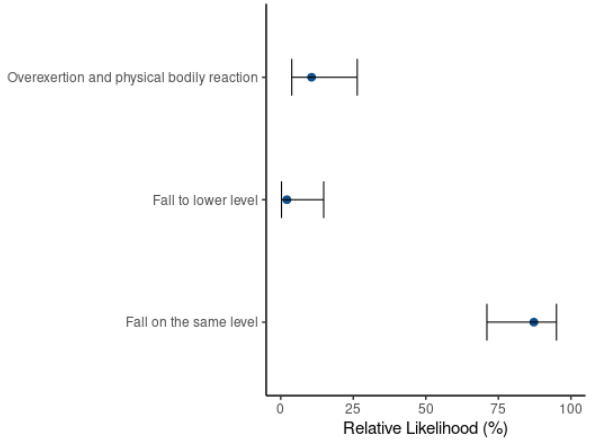
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Uneven surface / Object on ground / Loss of balance



Event Type	Relative Likelihood (%)
Fall on the same level	87.23
Overexertion and physical bodily reaction	10.64
Fall to lower level	2.13
Collision with another vechicle	0.00
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Fall on the same level	87.23	71.04	95.01
Overexertion and physical bodily reaction	10.64	3.81	26.37
Fall to lower level	2.13	0.27	14.81

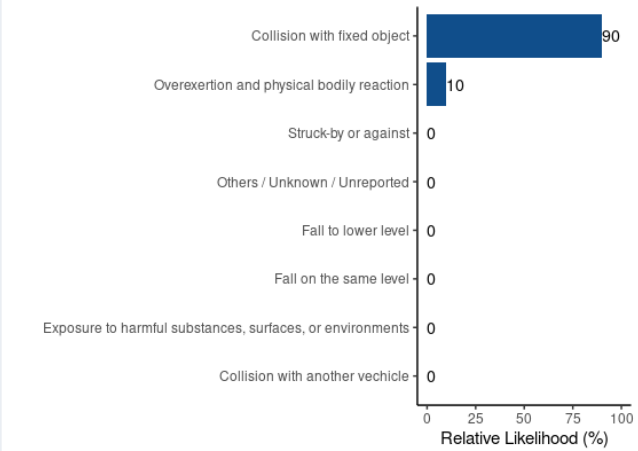
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

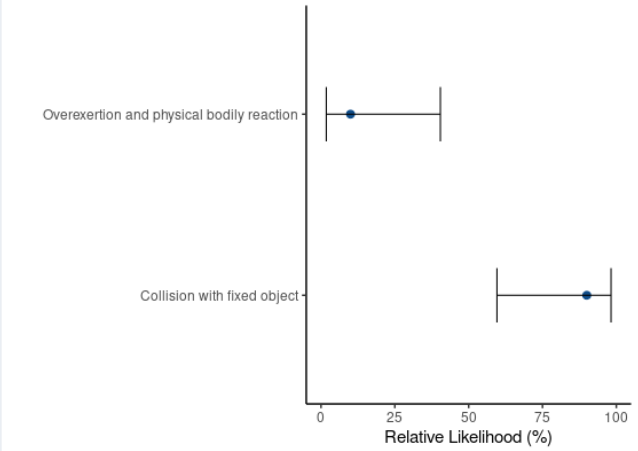
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Speeding



Event Type	Relative Likelihood (%)
Collision with fixed object	90.00
Overexertion and physical bodily reaction	10.00
Collision with another vechicle	0.00
Others / Unknown / Unreported	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	90.00	59.58	98.21
Overexertion and physical bodily reaction	10.00	1.79	40.42

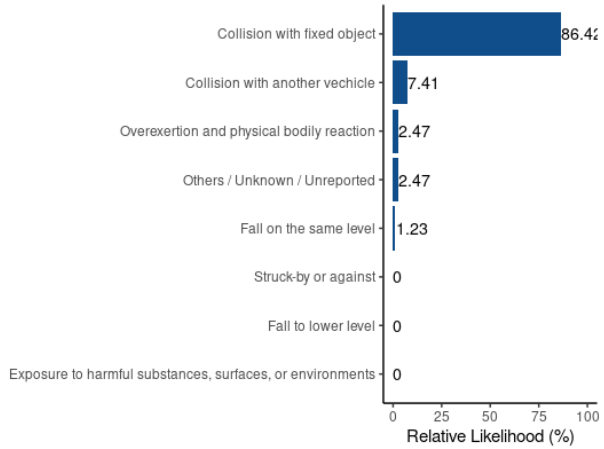
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

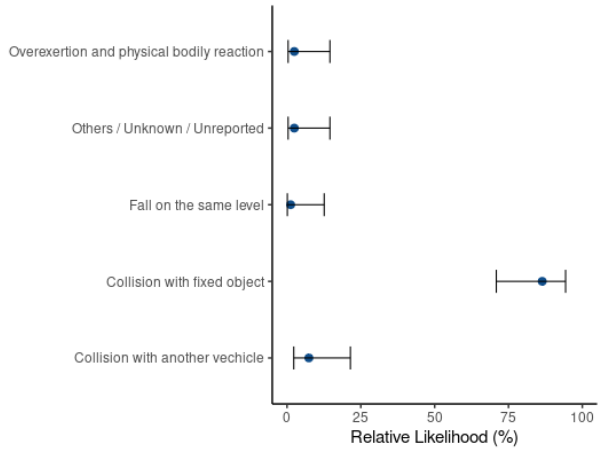
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to maintain control of vehicle



Event Type	Relative Likelihood (%)
Collision with fixed object	86.42
Collision with another vechicle	7.41
Overexertion and physical bodily reaction	2.47
Others / Unknown / Unreported	2.47
Fall on the same level	1.23
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	86.42	70.87	94.33
Collision with another vechicle	7.41	2.29	21.46
Others / Unknown / Unreported	2.47	0.38	14.53
Overexertion and physical bodily reaction	2.47	0.38	14.53
Fall on the same level	1.23	0.11	12.59

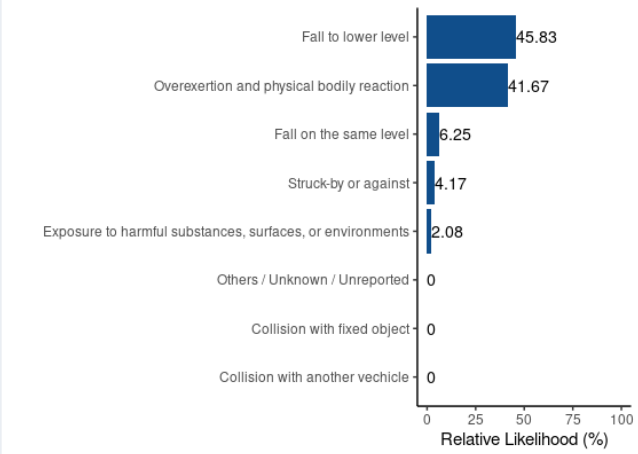
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

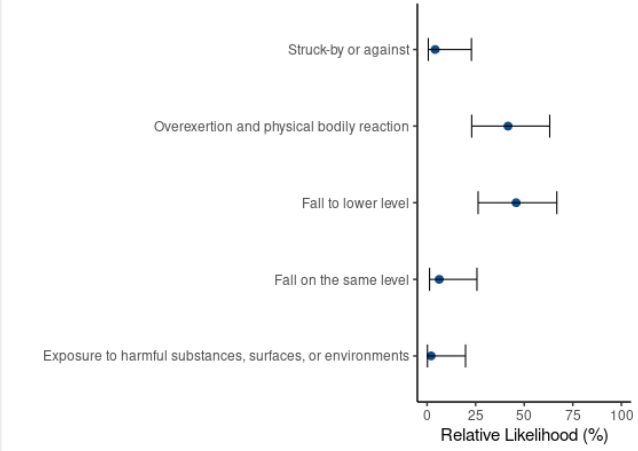
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Exiting the vehicle



Event Type	Relative Likelihood (%)
Fall to lower level	45.83
Overexertion and physical bodily reaction	41.67
Fall on the same level	6.25
Struck-by or against	4.17
Exposure to harmful substances, surfaces, or environments	2.08
Collision with another vechicle	0.00
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Fall to lower level	45.83	26.27	66.77
Overexertion and physical bodily reaction	41.67	22.97	63.12
Fall on the same level	6.25	1.27	25.67
Struck-by or against	4.17	0.64	22.83
Exposure to harmful substances, surfaces, or environments	2.08	0.18	19.80

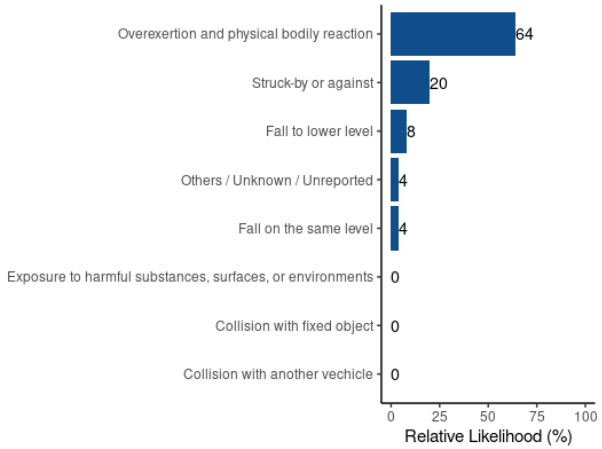
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

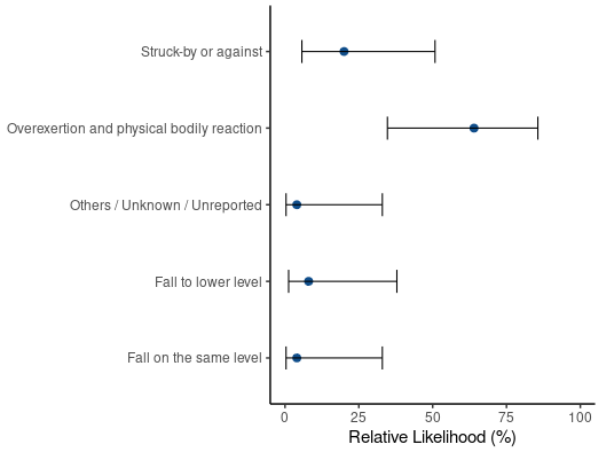
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Entering the vehicle



Event Type	Relative Likelihood (%)
Overexertion and physical bodily reaction	64.00
Struck-by or against	20.00
Fall to lower level	8.00
Others / Unknown / Unreported	4.00
Fall on the same level	4.00
Collision with another vechicle	0.00
Collision with fixed object	0.00
Exposure to harmful substances, surfaces, or environments	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Overexertion and physical bodily reaction	64.00	34.68	85.62
Struck-by or against	20.00	5.71	50.80
Fall to lower level	8.00	1.22	37.88
Fall on the same level	4.00	0.35	32.96
Others / Unknown / Unreported	4.00	0.35	32.96

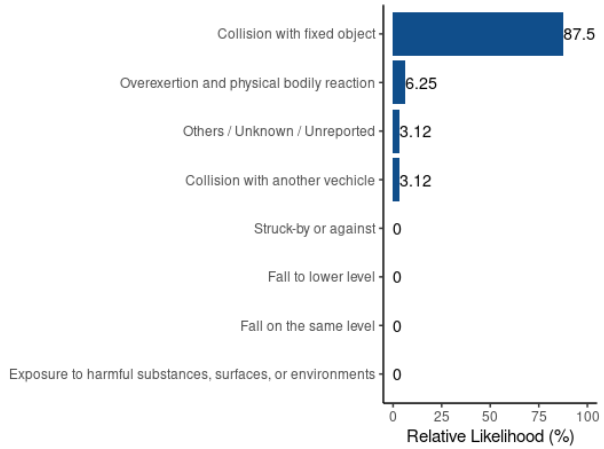
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

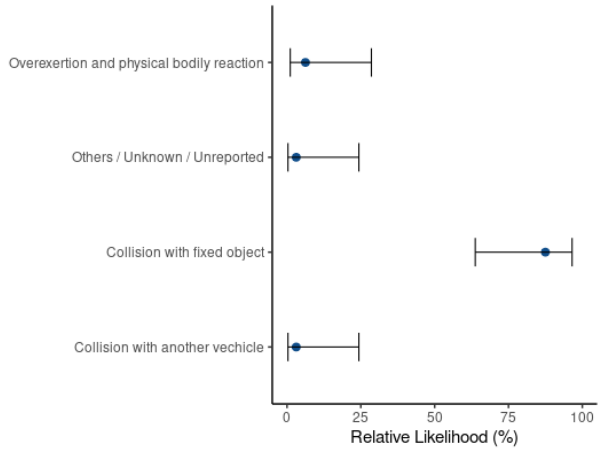
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt acceleration



Event Type	Relative Likelihood (%)
Collision with fixed object	87.50
Overexertion and physical bodily reaction	6.25
Collision with another vechicle	3.12
Others / Unknown / Unreported	3.12
Fall on the same level	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	87.50	63.74	96.54
Overexertion and physical bodily reaction	6.25	1.10	28.58
Collision with another vechicle	3.12	0.32	24.33
Others / Unknown / Unreported	3.12	0.32	24.33

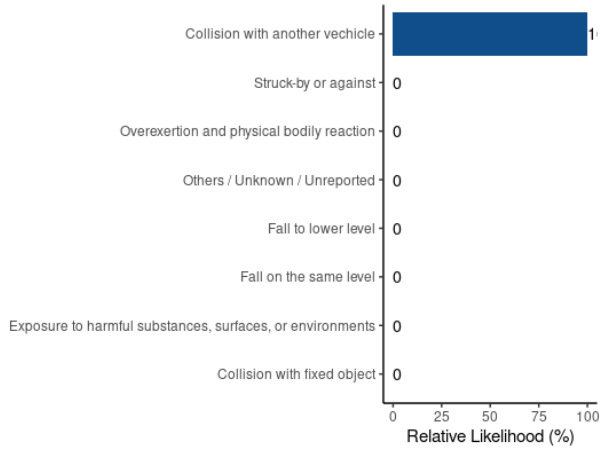
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

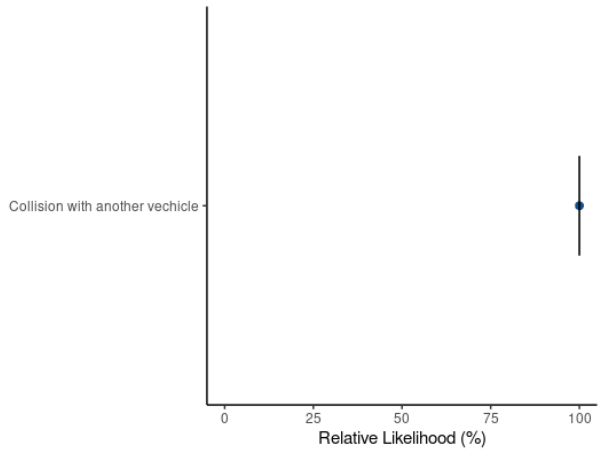
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to yield right of way



Event Type	Relative Likelihood (%)
Collision with another vechicle	100.00
Overexertion and physical bodily reaction	0.00
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with another vechicle	100.00	100.00	100.00

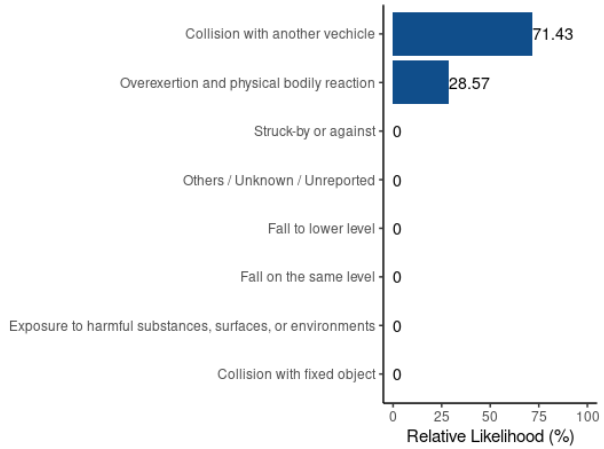
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

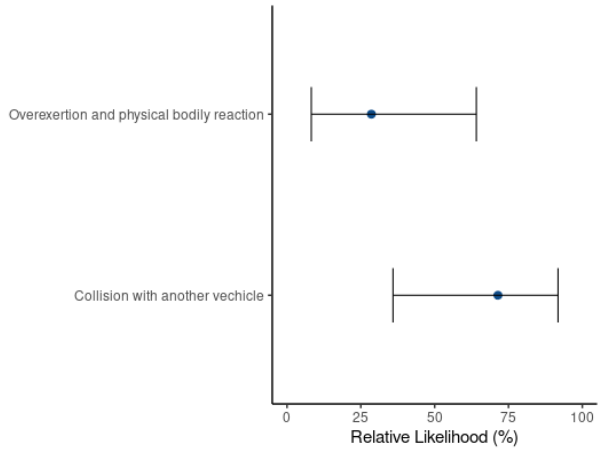
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to stop at stop sign or red light



Event Type	Relative Likelihood (%)
Collision with another vechicle	71.43
Overexertion and physical bodily reaction	28.57
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with another vechicle	71.43	35.89	91.78
Overexertion and physical bodily reaction	28.57	8.22	64.11

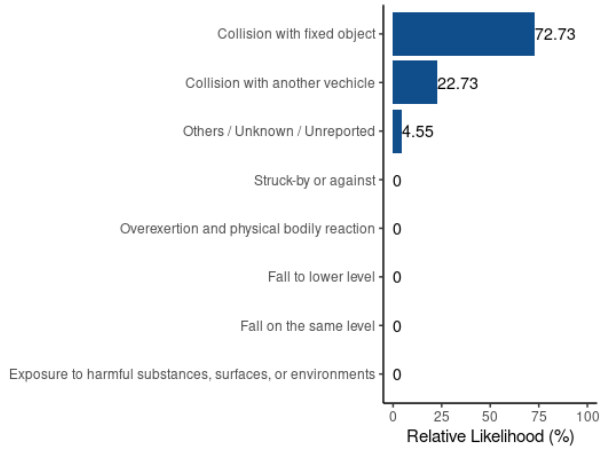
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

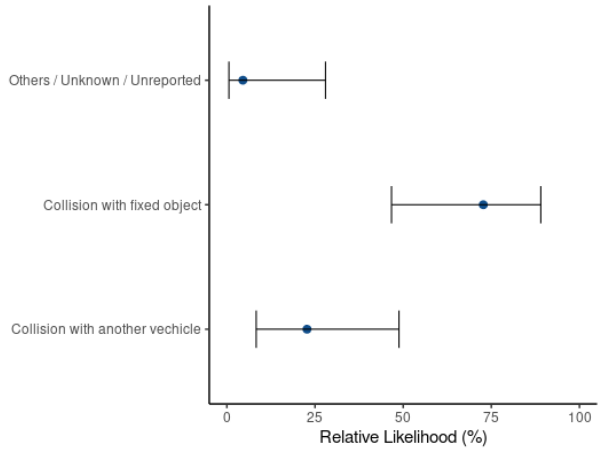
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Backing vehicle from parking space



Event Type	Relative Likelihood (%)
Collision with fixed object	72.73
Collision with another vechicle	22.73
Others / Unknown / Unreported	4.55
Overexertion and physical bodily reaction	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	72.73	46.69	89.03
Collision with another vechicle	22.73	8.32	48.81
Others / Unknown / Unreported	4.55	0.58	27.97

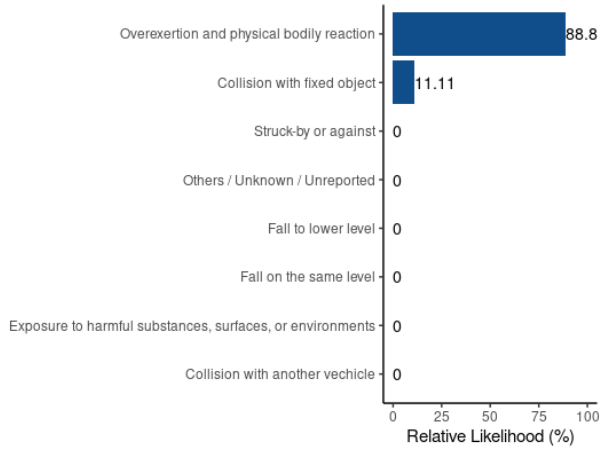
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

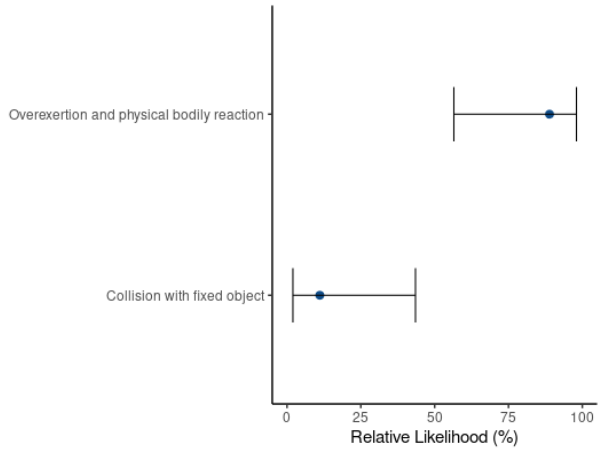
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt postural change / Poor posture



Event Type	Relative Likelihood (%)
Overexertion and physical bodily reaction	88.89
Collision with fixed object	11.11
Collision with another vechicle	0.00
Others / Unknown / Unreported	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Overexertion and physical bodily reaction	88.89	56.50	98.01
Collision with fixed object	11.11	1.99	43.50

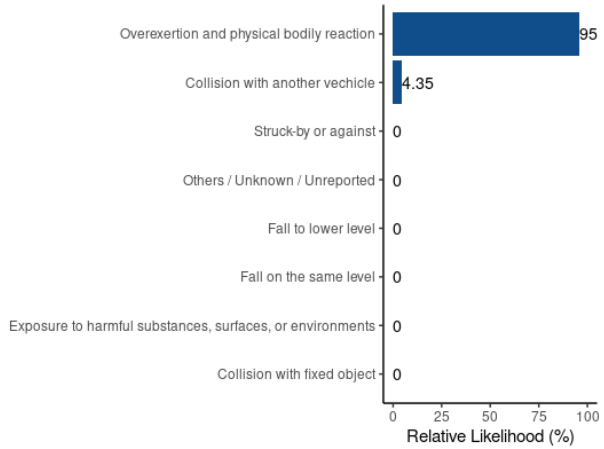
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

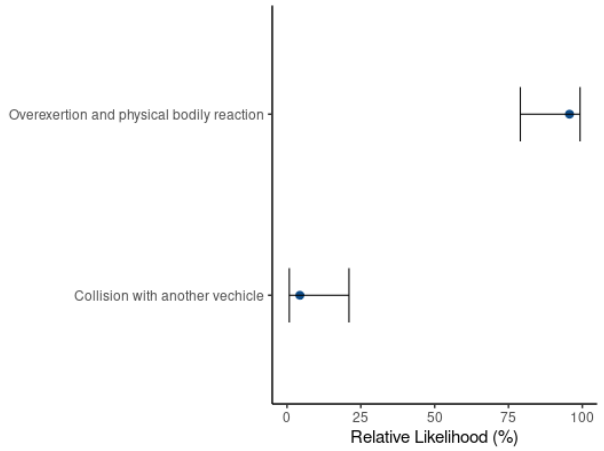
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt braking



Event Type	Relative Likelihood (%)
Overexertion and physical bodily reaction	95.65
Collision with another vechicle	4.35
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Overexertion and physical bodily reaction	95.65	79.01	99.23
Collision with another vechicle	4.35	0.77	20.99

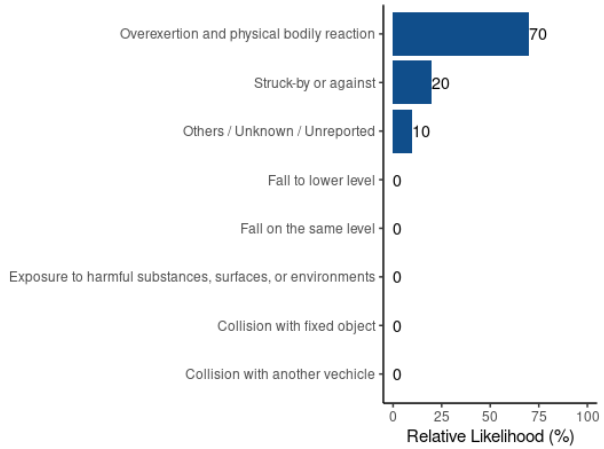
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

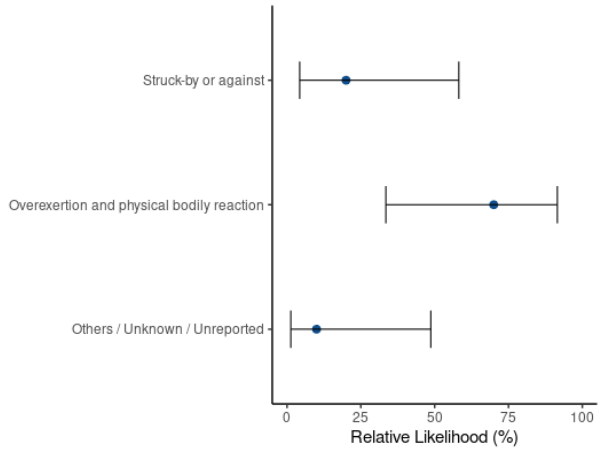
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Manual handling / Lifting



Event Type	Relative Likelihood (%)
Overexertion and physical bodily reaction	70.00
Struck-by or against	20.00
Others / Unknown / Unreported	10.00
Collision with another vechicle	0.00
Collision with fixed object	0.00
Fall on the same level	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Overexertion and physical bodily reaction	70.00	33.47	91.54
Struck-by or against	20.00	4.30	58.18
Others / Unknown / Unreported	10.00	1.28	48.69

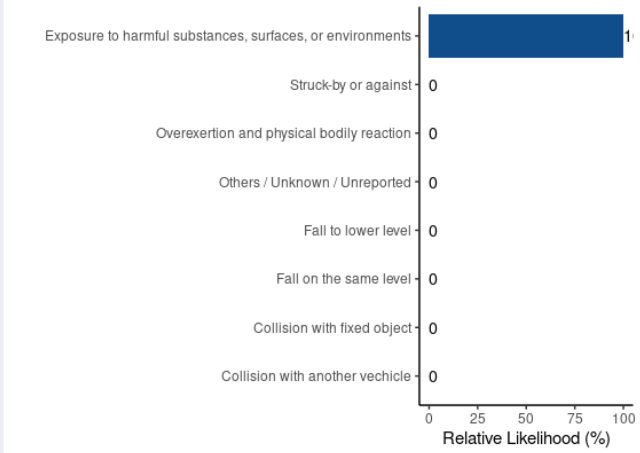
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

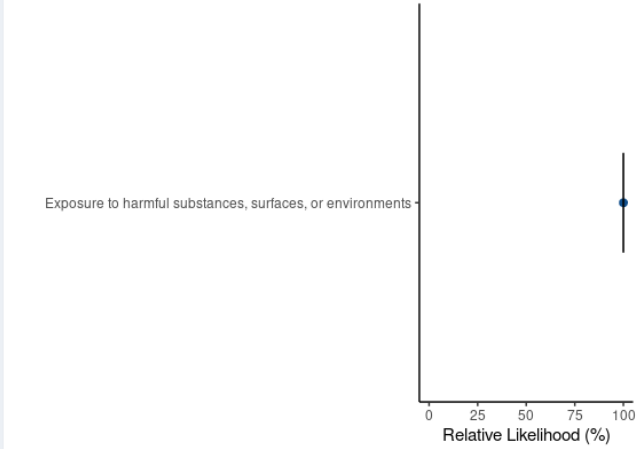
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Animal / Insect



Event Type	Relative Likelihood (%)
Exposure to harmful substances, surfaces, or environments	100.00
Collision with another vechicle	0.00
Overexertion and physical bodily reaction	0.00
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Exposure to harmful substances, surfaces, or environments	100.00	100.00	100.00

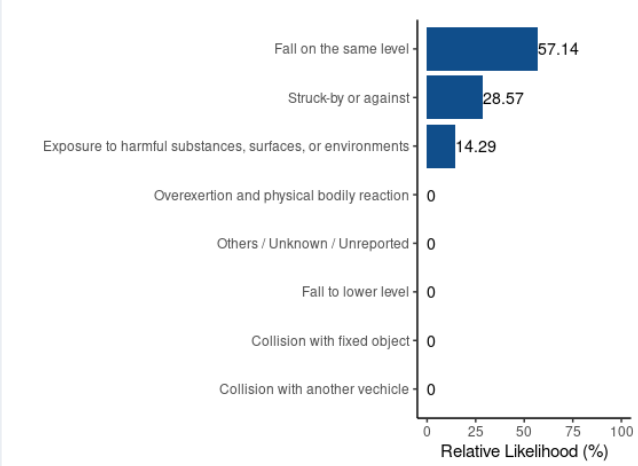
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

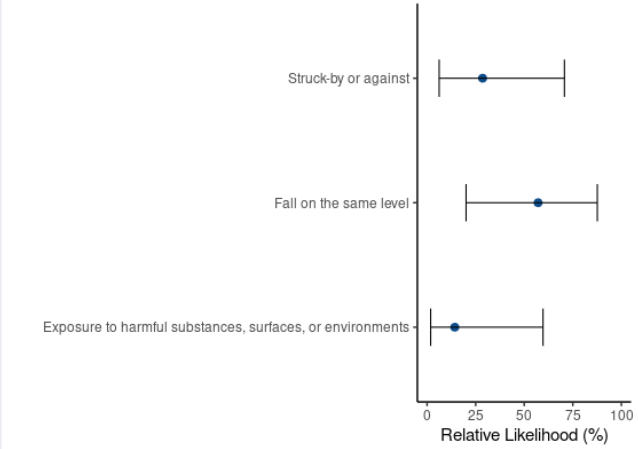
Predicted Variable: Event Type

Given Variable: Contributing Factor

Attribute for Given Variable: Weather conditions



Event Type	Relative Likelihood (%)
Fall on the same level	57.14
Struck-by or against	28.57
Exposure to harmful substances, surfaces, or environments	14.29
Collision with another vechicle	0.00
Overexertion and physical bodily reaction	0.00
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Fall on the same level	57.14	20.08	87.62
Struck-by or against	28.57	6.22	70.69
Exposure to harmful substances, surfaces, or environments	14.29	1.84	59.67

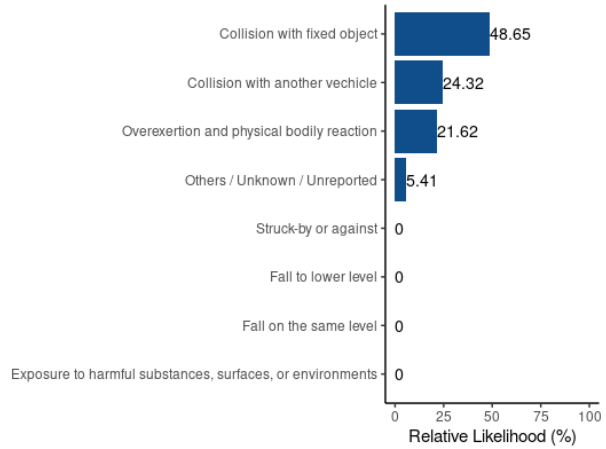
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

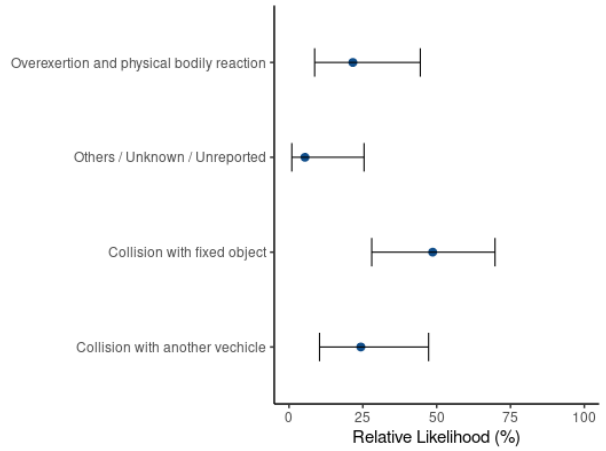
Predicted Variable: Event Type

Given Variable: Injured Body Part

Attribute for Given Variable: Neck



Event Type	Relative Likelihood (%)
Collision with fixed object	48.65
Collision with another vechicle	24.32
Overexertion and physical bodily reaction	21.62
Others / Unknown / Unreported	5.41
Fall on the same level	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	48.65	28.01	69.76
Collision with another vechicle	24.32	10.33	47.27
Overexertion and physical bodily reaction	21.62	8.68	44.46
Others / Unknown / Unreported	5.41	0.95	25.41

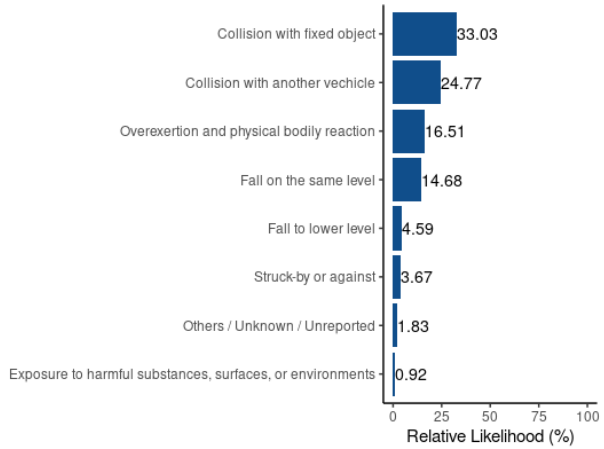
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

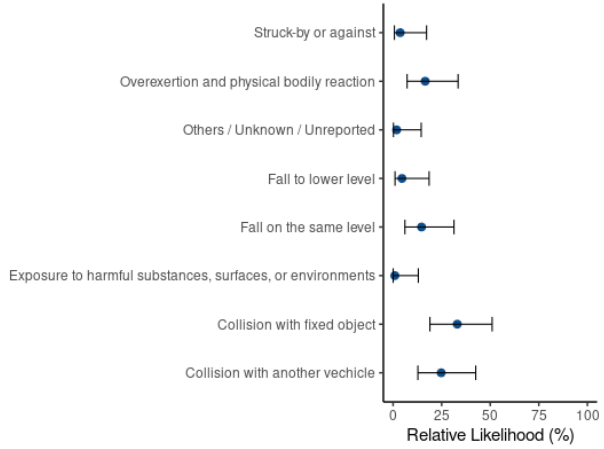
Predicted Variable: Event Type

Given Variable: Injured Body Part

Attribute for Given Variable: Multiple body parts



Event Type	Relative Likelihood (%)
Collision with fixed object	33.03
Collision with another vechicle	24.77
Overexertion and physical bodily reaction	16.51
Fall on the same level	14.68
Fall to lower level	4.59
Struck-by or against	3.67
Others / Unknown / Unreported	1.83
Exposure to harmful substances, surfaces, or environments	0.92



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	33.03	18.95	50.99
Collision with another vechicle	24.77	12.78	42.53
Overexertion and physical bodily reaction	16.51	7.22	33.47
Fall on the same level	14.68	6.09	31.34
Fall to lower level	4.59	1.00	18.55
Struck-by or against	3.67	0.69	17.24
Others / Unknown / Unreported	1.83	0.21	14.47
Exposure to harmful substances, surfaces, or environments	0.92	0.06	13.00

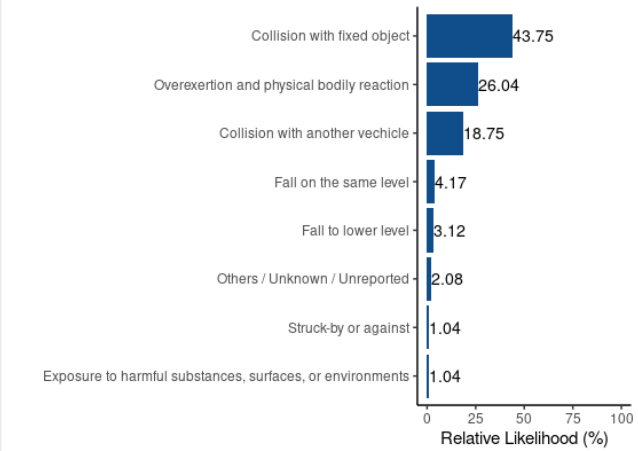
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

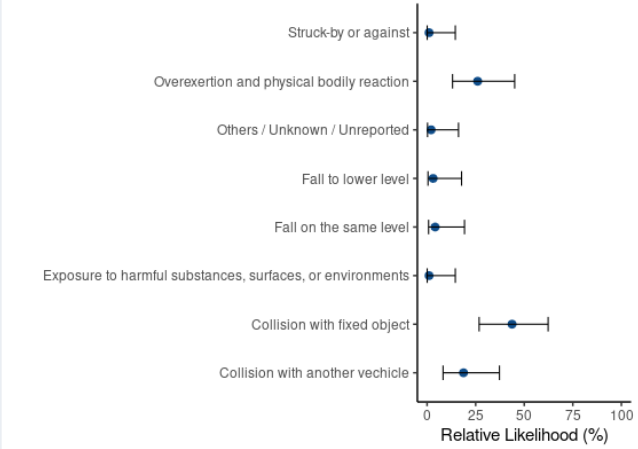
Predicted Variable: Event Type

Given Variable: Injured Body Part

Attribute for Given Variable: Back



Event Type	Relative Likelihood (%)
Collision with fixed object	43.75
Overexertion and physical bodily reaction	26.04
Collision with another vechicle	18.75
Fall on the same level	4.17
Fall to lower level	3.12
Others / Unknown / Unreported	2.08
Struck-by or against	1.04
Exposure to harmful substances, surfaces, or environments	1.04



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	43.75	26.80	62.30
Overexertion and physical bodily reaction	26.04	13.12	45.09
Collision with another vechicle	18.75	8.23	37.26
Fall on the same level	4.17	0.79	19.26
Fall to lower level	3.12	0.48	17.75
Others / Unknown / Unreported	2.08	0.23	16.18
Exposure to harmful substances, surfaces, or environments	1.04	0.07	14.53
Struck-by or against	1.04	0.07	14.53

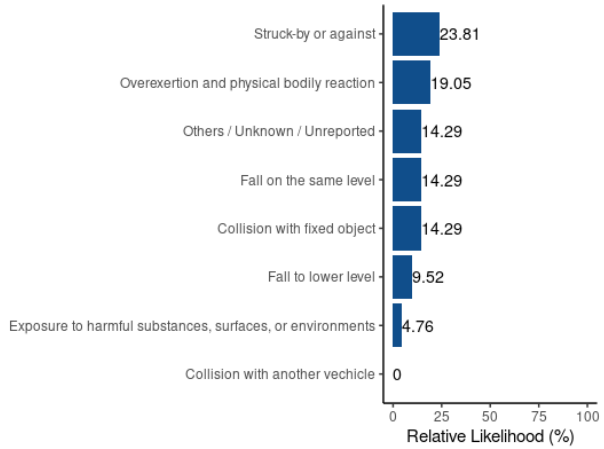
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

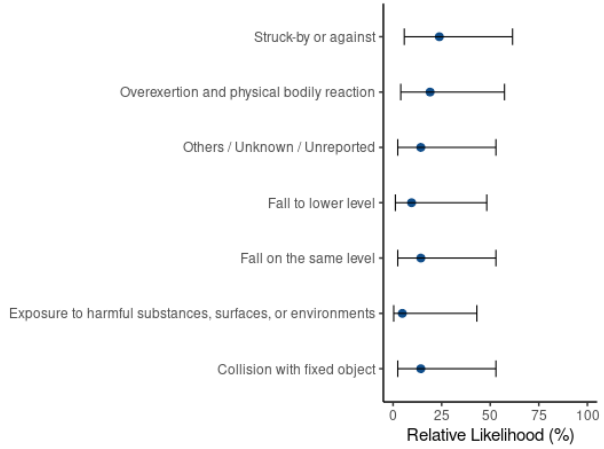
Predicted Variable: Event Type

Given Variable: Injured Body Part

Attribute for Given Variable: Hand



Event Type	Relative Likelihood (%)
Struck-by or against	23.81
Overexertion and physical bodily reaction	19.05
Others / Unknown / Unreported	14.29
Collision with fixed object	14.29
Fall on the same level	14.29
Fall to lower level	9.52
Exposure to harmful substances, surfaces, or environments	4.76
Collision with another vechicle	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Struck-by or against	23.81	5.76	61.49
Overexertion and physical bodily reaction	19.05	3.96	57.34
Collision with fixed object	14.29	2.41	52.94
Fall on the same level	14.29	2.41	52.94
Others / Unknown / Unreported	14.29	2.41	52.94
Fall to lower level	9.52	1.18	48.22
Exposure to harmful substances, surfaces, or environments	4.76	0.33	43.11

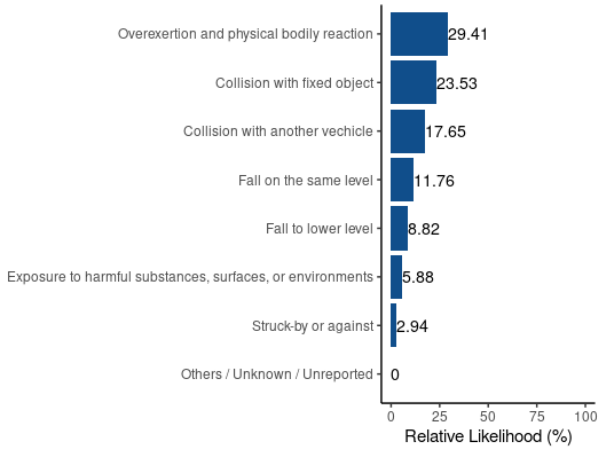
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

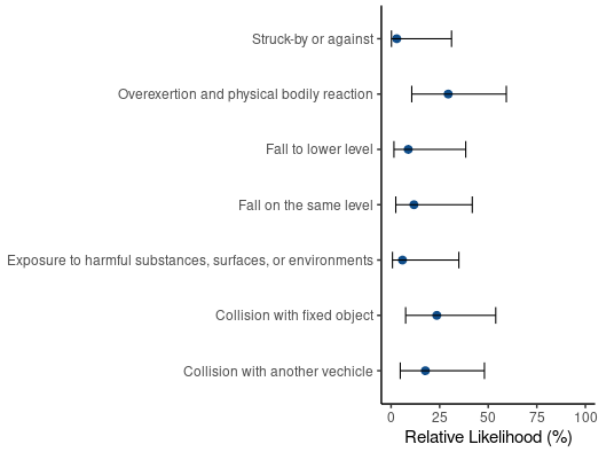
Predicted Variable: Event Type

Given Variable: Injured Body Part

Attribute for Given Variable: Arm and shoulder



Event Type	Relative Likelihood (%)
Overexertion and physical bodily reaction	29.41
Collision with fixed object	23.53
Collision with another vechicle	17.65
Fall on the same level	11.76
Fall to lower level	8.82
Exposure to harmful substances, surfaces, or environments	5.88
Struck-by or against	2.94
Others / Unknown / Unreported	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Overexertion and physical bodily reaction	29.41	10.64	59.31
Collision with fixed object	23.53	7.50	53.87
Collision with another vechicle	17.65	4.73	48.05
Fall on the same level	11.76	2.42	41.78
Fall to lower level	8.82	1.48	38.42
Exposure to harmful substances, surfaces, or environments	5.88	0.72	34.89
Struck-by or against	2.94	0.20	31.12

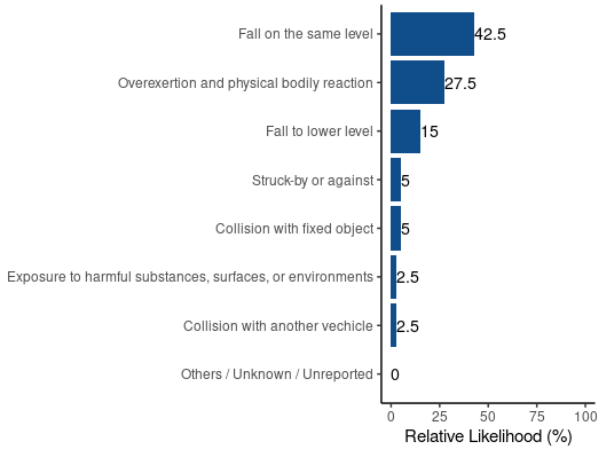
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

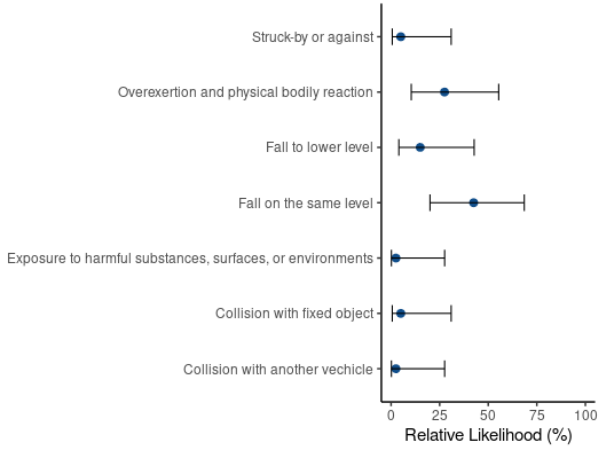
Predicted Variable: Event Type

Given Variable: Injured Body Part

Attribute for Given Variable: Leg



Event Type	Relative Likelihood (%)
Fall on the same level	42.50
Overexertion and physical bodily reaction	27.50
Fall to lower level	15.00
Collision with fixed object	5.00
Struck-by or against	5.00
Collision with another vechicle	2.50
Exposure to harmful substances, surfaces, or environments	2.50
Others / Unknown / Unreported	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Fall on the same level	42.50	20.04	68.55
Overexertion and physical bodily reaction	27.50	10.38	55.39
Fall to lower level	15.00	4.00	42.76
Collision with fixed object	5.00	0.61	30.93
Struck-by or against	5.00	0.61	30.93
Collision with another vechicle	2.50	0.17	27.57
Exposure to harmful substances, surfaces, or environments	2.50	0.17	27.57

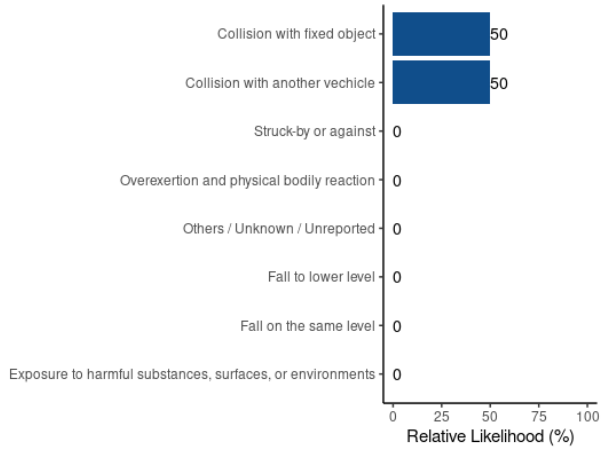
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

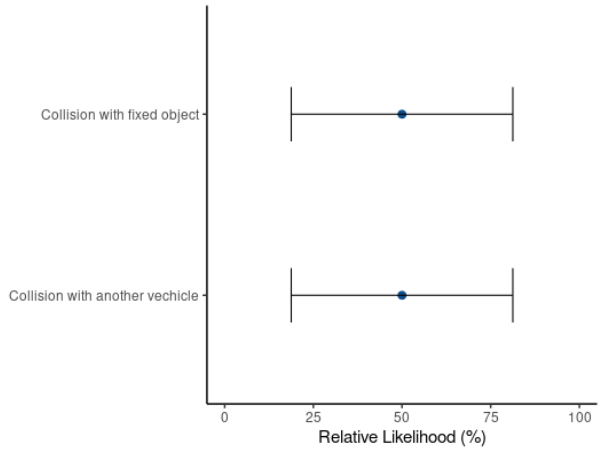
Predicted Variable: Event Type

Given Variable: Injured Body Part

Attribute for Given Variable: Chest



Event Type	Relative Likelihood (%)
Collision with another vechicle	50.00
Collision with fixed object	50.00
Overexertion and physical bodily reaction	0.00
Others / Unknown / Unreported	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with another vechicle	50.00	18.76	81.24
Collision with fixed object	50.00	18.76	81.24

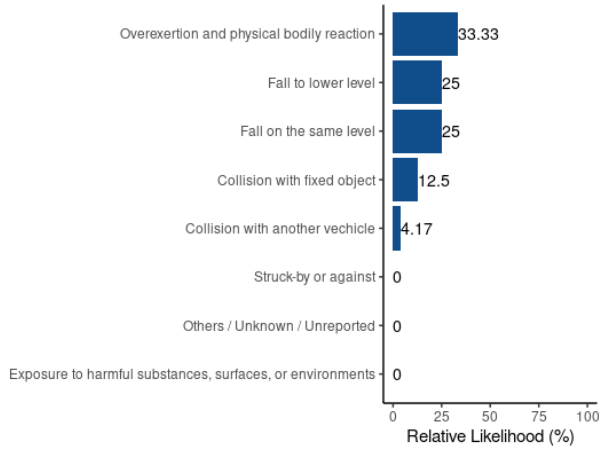
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

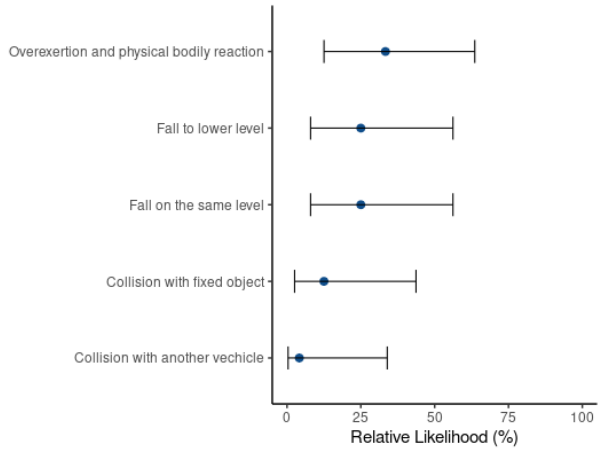
Predicted Variable: Event Type

Given Variable: Injured Body Part

Attribute for Given Variable: Knee



Event Type	Relative Likelihood (%)
Overexertion and physical bodily reaction	33.33
Fall on the same level	25.00
Fall to lower level	25.00
Collision with fixed object	12.50
Collision with another vechicle	4.17
Others / Unknown / Unreported	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Overexertion and physical bodily reaction	33.33	12.52	63.59
Fall on the same level	25.00	7.97	56.20
Fall to lower level	25.00	7.97	56.20
Collision with fixed object	12.50	2.56	43.69
Collision with another vechicle	4.17	0.37	33.94

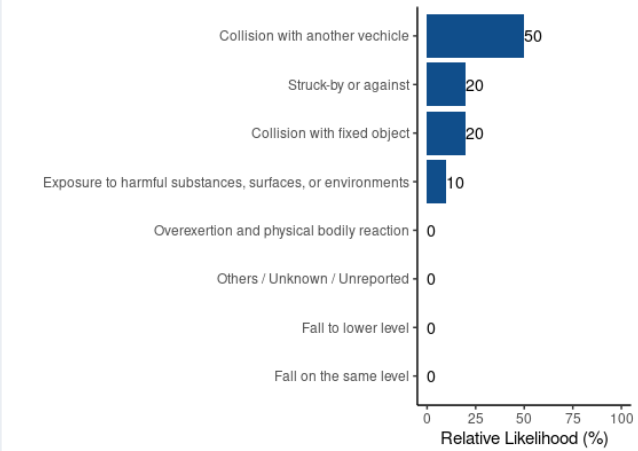
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

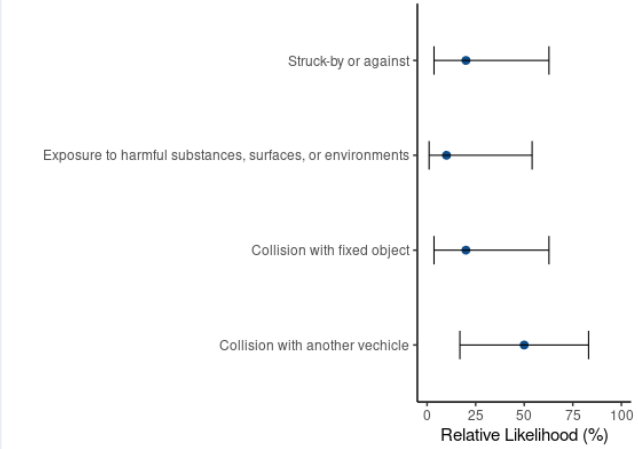
Predicted Variable: Event Type

Given Variable: Injured Body Part

Attribute for Given Variable: Head



Event Type	Relative Likelihood (%)
Collision with another vechicle	50.00
Collision with fixed object	20.00
Struck-by or against	20.00
Exposure to harmful substances, surfaces, or environments	10.00
Overexertion and physical bodily reaction	0.00
Others / Unknown / Unreported	0.00
Fall on the same level	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with another vechicle	50.00	16.88	83.12
Collision with fixed object	20.00	3.58	62.74
Struck-by or against	20.00	3.58	62.74
Exposure to harmful substances, surfaces, or environments	10.00	1.04	54.05

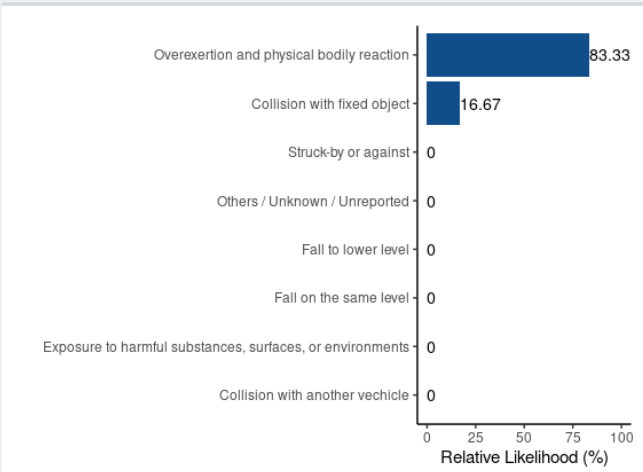
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

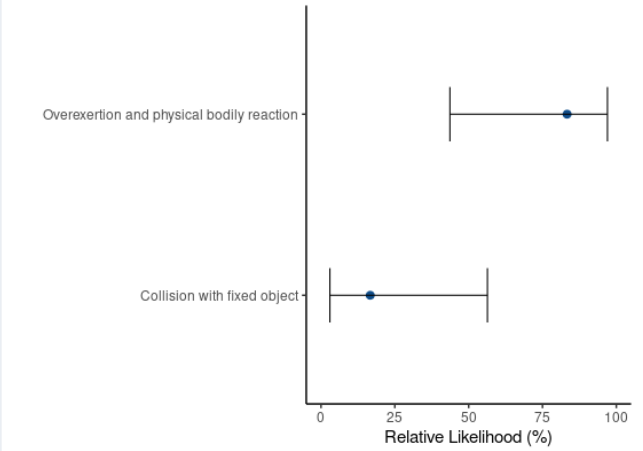
Predicted Variable: Event Type

Given Variable: Injured Body Part

Attribute for Given Variable: Abdomen and hip



Event Type	Relative Likelihood (%)
Overexertion and physical bodily reaction	83.33
Collision with fixed object	16.67
Collision with another vechicle	0.00
Others / Unknown / Unreported	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Overexertion and physical bodily reaction	83.33	43.65	96.99
Collision with fixed object	16.67	3.01	56.35

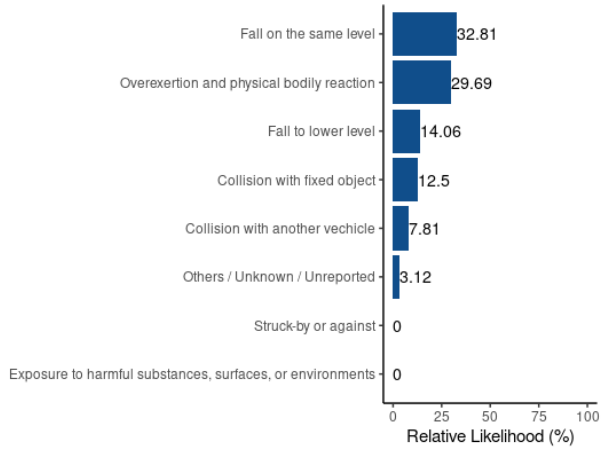
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

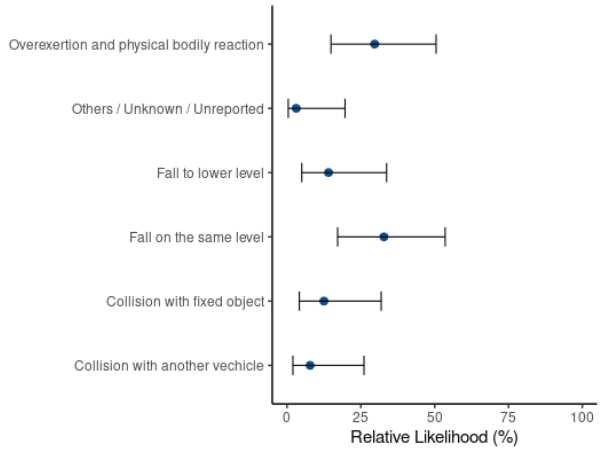
Predicted Variable: Event Type

Given Variable: Injury Type

Attribute for Given Variable: Sprain



Event Type	Relative Likelihood (%)
Fall on the same level	32.81
Overexertion and physical bodily reaction	29.69
Fall to lower level	14.06
Collision with fixed object	12.50
Collision with another vechicle	7.81
Others / Unknown / Unreported	3.12
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Fall on the same level	32.81	17.14	53.56
Overexertion and physical bodily reaction	29.69	14.88	50.48
Fall to lower level	14.06	5.00	33.73
Collision with fixed object	12.50	4.18	31.88
Collision with another vechicle	7.81	2.00	26.07
Others / Unknown / Unreported	3.12	0.42	19.65

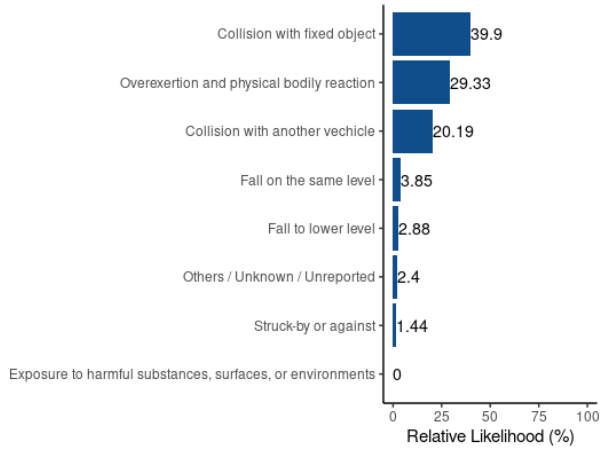
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

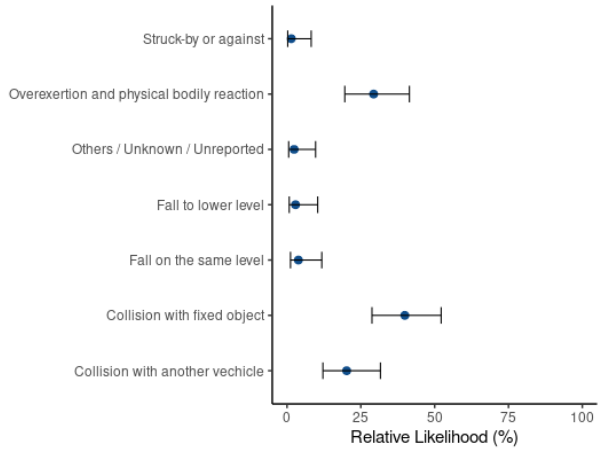
Predicted Variable: Event Type

Given Variable: Injury Type

Attribute for Given Variable: Strain



Event Type	Relative Likelihood (%)
Collision with fixed object	39.90
Overexertion and physical bodily reaction	29.33
Collision with another vechicle	20.19
Fall on the same level	3.85
Fall to lower level	2.88
Others / Unknown / Unreported	2.40
Struck-by or against	1.44
Exposure to harmful substances, surfaces, or environments	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	39.90	28.77	52.19
Overexertion and physical bodily reaction	29.33	19.57	41.45
Collision with another vechicle	20.19	12.15	31.63
Fall on the same level	3.85	1.18	11.78
Fall to lower level	2.88	0.75	10.39
Others / Unknown / Unreported	2.40	0.56	9.68
Struck-by or against	1.44	0.24	8.19

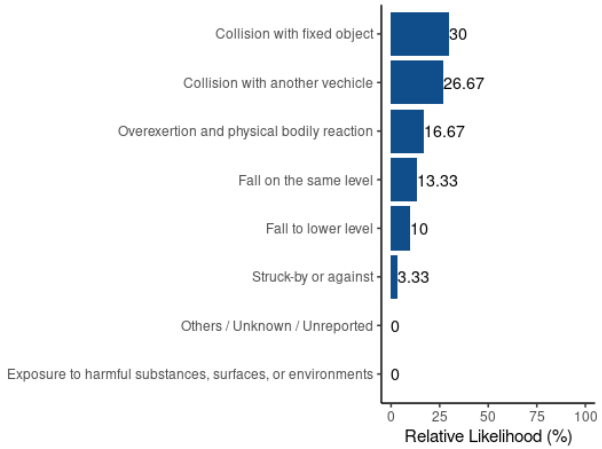
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

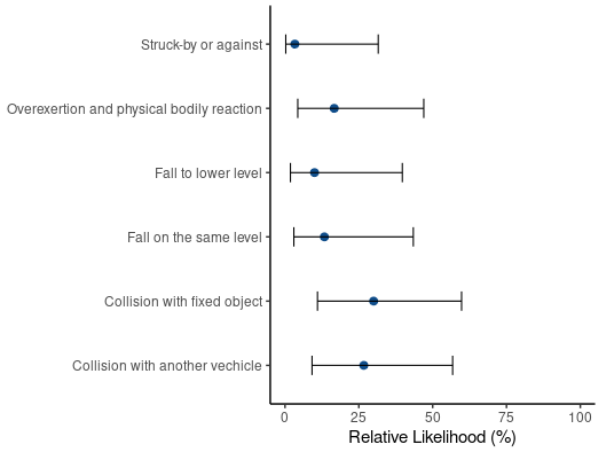
Predicted Variable: Event Type

Given Variable: Injury Type

Attribute for Given Variable: Multiple types



Event Type	Relative Likelihood (%)
Collision with fixed object	30.00
Collision with another vechicle	26.67
Overexertion and physical bodily reaction	16.67
Fall on the same level	13.33
Fall to lower level	10.00
Struck-by or against	3.33
Others / Unknown / Unreported	0.00
Exposure to harmful substances, surfaces, or environments	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	30.00	11.00	59.79
Collision with another vechicle	26.67	9.15	56.76
Overexertion and physical bodily reaction	16.67	4.32	46.98
Fall on the same level	13.33	2.99	43.44
Fall to lower level	10.00	1.84	39.73
Struck-by or against	3.33	0.26	31.57

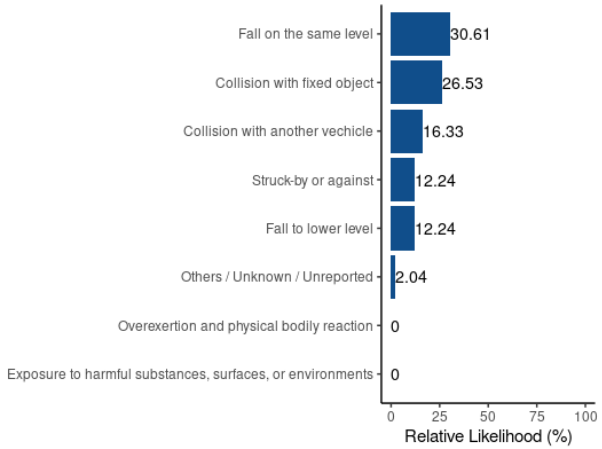
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

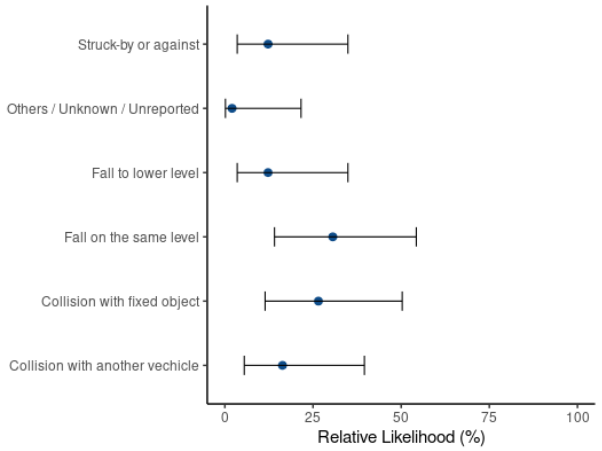
Predicted Variable: Event Type

Given Variable: Injury Type

Attribute for Given Variable: Bruising or contusion



Event Type	Relative Likelihood (%)
Fall on the same level	30.61
Collision with fixed object	26.53
Collision with another vechicle	16.33
Struck-by or against	12.24
Fall to lower level	12.24
Others / Unknown / Unreported	2.04
Overexertion and physical bodily reaction	0.00
Exposure to harmful substances, surfaces, or environments	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Fall on the same level	30.61	14.08	54.29
Collision with fixed object	26.53	11.42	50.30
Collision with another vechicle	16.33	5.49	39.57
Fall to lower level	12.24	3.50	34.90
Struck-by or against	12.24	3.50	34.90
Others / Unknown / Unreported	2.04	0.16	21.60

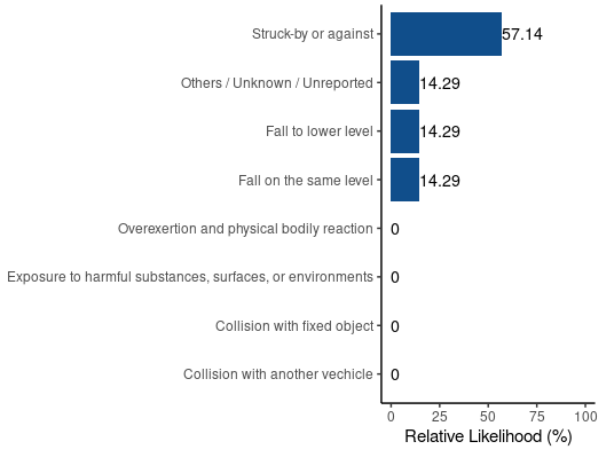
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

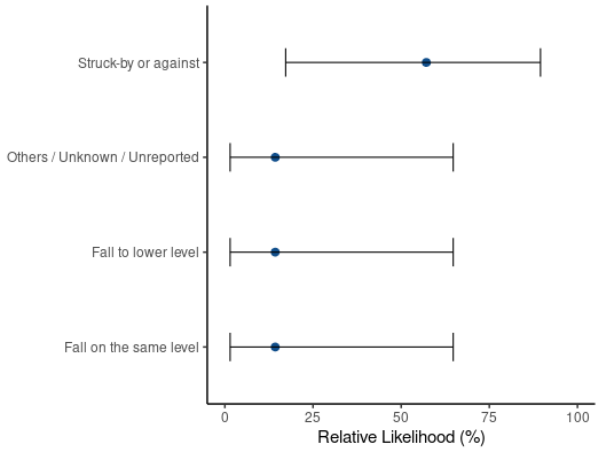
Predicted Variable: Event Type

Given Variable: Injury Type

Attribute for Given Variable: Laceration



Event Type	Relative Likelihood (%)
Struck-by or against	57.14
Others / Unknown / Unreported	14.29
Fall on the same level	14.29
Fall to lower level	14.29
Collision with another vechicle	0.00
Overexertion and physical bodily reaction	0.00
Collision with fixed object	0.00
Exposure to harmful substances, surfaces, or environments	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Struck-by or against	57.14	17.24	89.51
Fall on the same level	14.29	1.49	64.76
Fall to lower level	14.29	1.49	64.76
Others / Unknown / Unreported	14.29	1.49	64.76

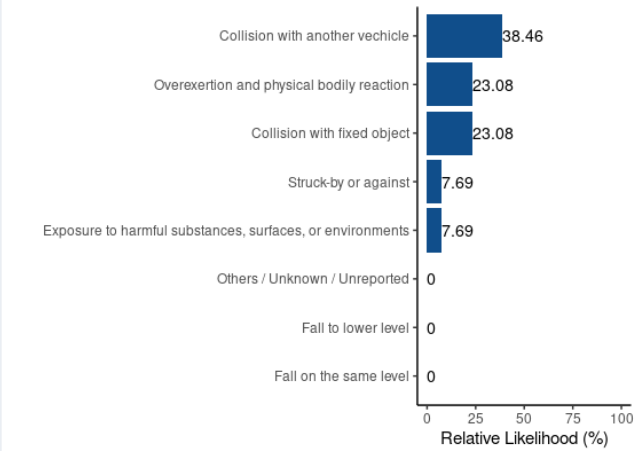
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

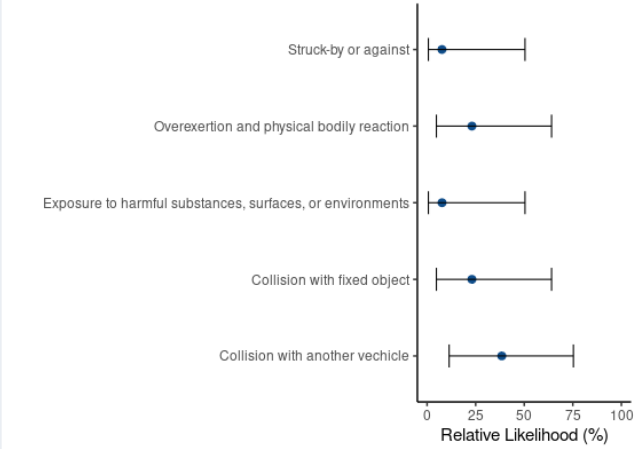
Predicted Variable: Event Type

Given Variable: Injury Type

Attribute for Given Variable: Discomfort and pain



Event Type	Relative Likelihood (%)
Collision with another vechicle	38.46
Overexertion and physical bodily reaction	23.08
Collision with fixed object	23.08
Struck-by or against	7.69
Exposure to harmful substances, surfaces, or environments	7.69
Others / Unknown / Unreported	0.00
Fall on the same level	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with another vechicle	38.46	11.36	75.30
Collision with fixed object	23.08	4.81	64.07
Overexertion and physical bodily reaction	23.08	4.81	64.07
Exposure to harmful substances, surfaces, or environments	7.69	0.68	50.41
Struck-by or against	7.69	0.68	50.41

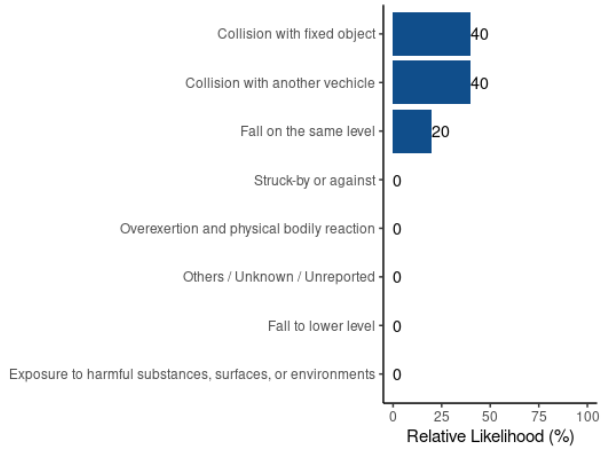
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

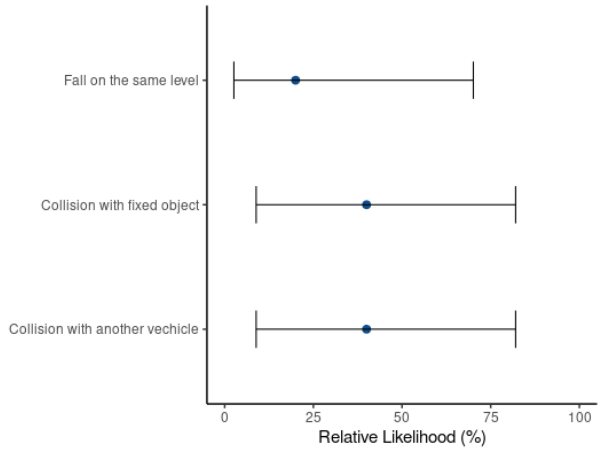
Predicted Variable: Event Type

Given Variable: Injury Type

Attribute for Given Variable: Fracture



Event Type	Relative Likelihood (%)
Collision with another vechicle	40.00
Collision with fixed object	40.00
Fall on the same level	20.00
Overexertion and physical bodily reaction	0.00
Others / Unknown / Unreported	0.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with another vechicle	40.00	8.87	82.03
Collision with fixed object	40.00	8.87	82.03
Fall on the same level	20.00	2.60	70.11

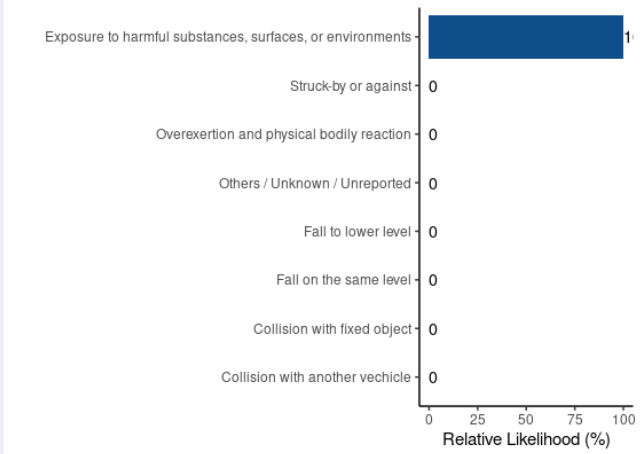
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

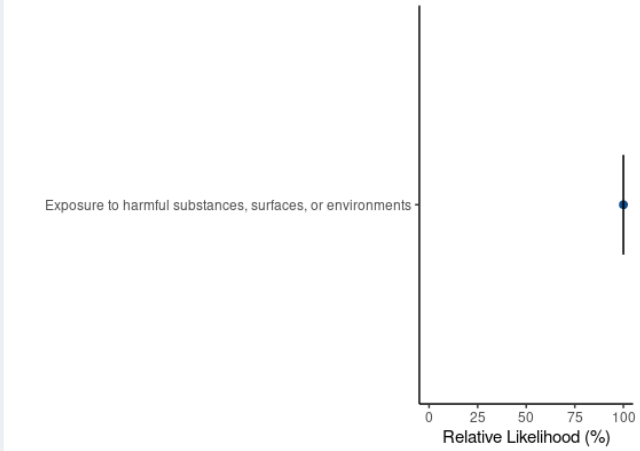
Predicted Variable: Event Type

Given Variable: Injury Type

Attribute for Given Variable: Burn



Event Type	Relative Likelihood (%)
Exposure to harmful substances, surfaces, or environments	100.00
Collision with another vechicle	0.00
Overexertion and physical bodily reaction	0.00
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Exposure to harmful substances, surfaces, or environments	100.00	100.00	100.00

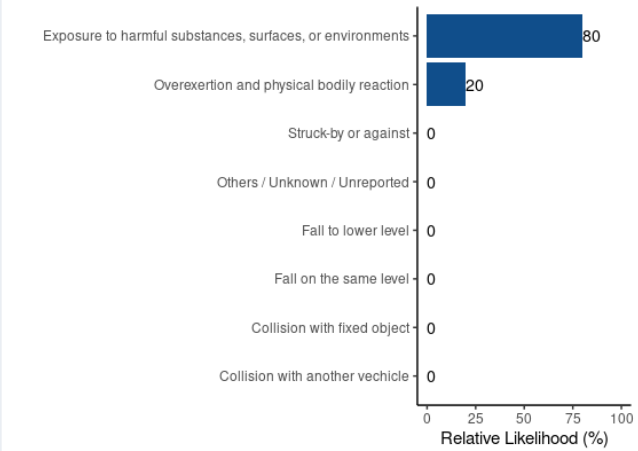
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

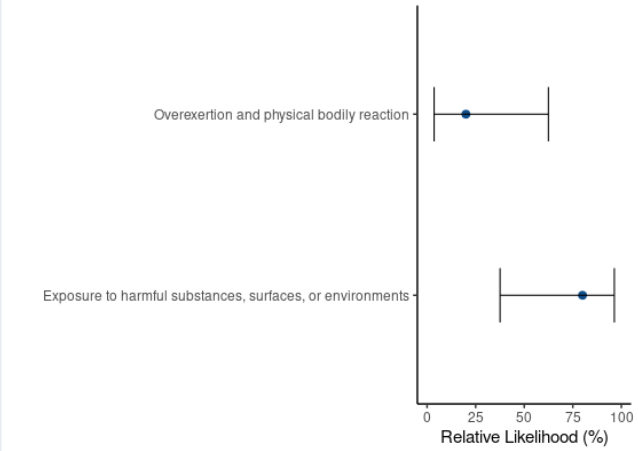
Predicted Variable: Event Type

Given Variable: Injury Type

Attribute for Given Variable: Inflammation



Event Type	Relative Likelihood (%)
Exposure to harmful substances, surfaces, or environments	80.00
Overexertion and physical bodily reaction	20.00
Collision with another vechicle	0.00
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Exposure to harmful substances, surfaces, or environments	80.00	37.55	96.38
Overexertion and physical bodily reaction	20.00	3.62	62.45

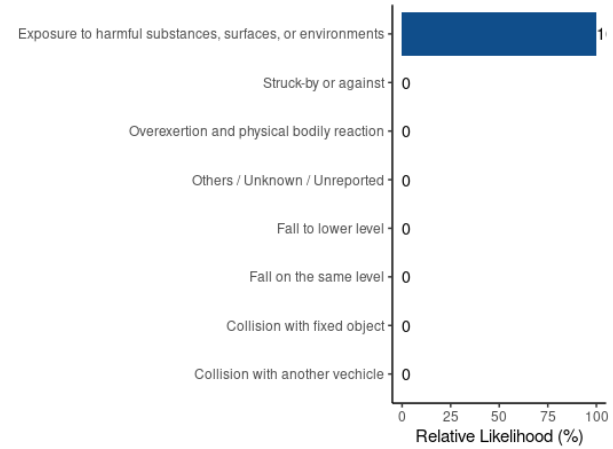
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

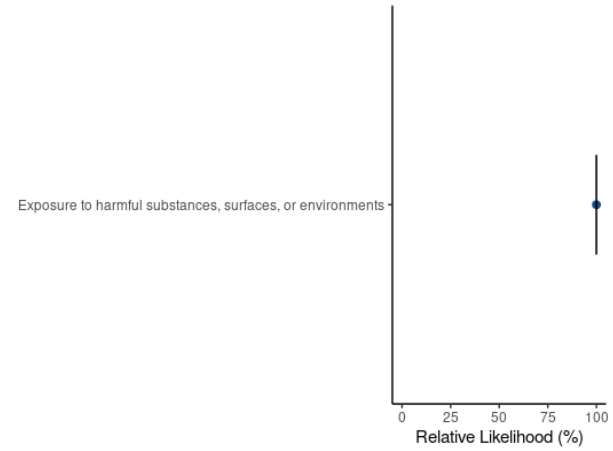
Predicted Variable: Event Type

Given Variable: Injury Type

Attribute for Given Variable: Heatstroke



Event Type	Relative Likelihood (%)
Exposure to harmful substances, surfaces, or environments	100.00
Collision with another vechicle	0.00
Overexertion and physical bodily reaction	0.00
Others / Unknown / Unreported	0.00
Collision with fixed object	0.00
Fall on the same level	0.00
Struck-by or against	0.00
Fall to lower level	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Exposure to harmful substances, surfaces, or environments	100.00	100.00	100.00

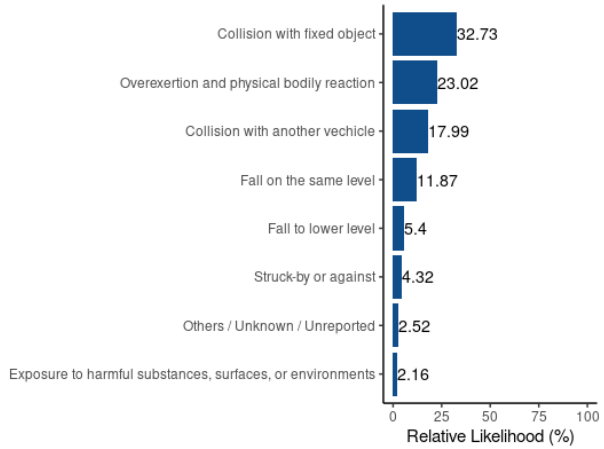
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

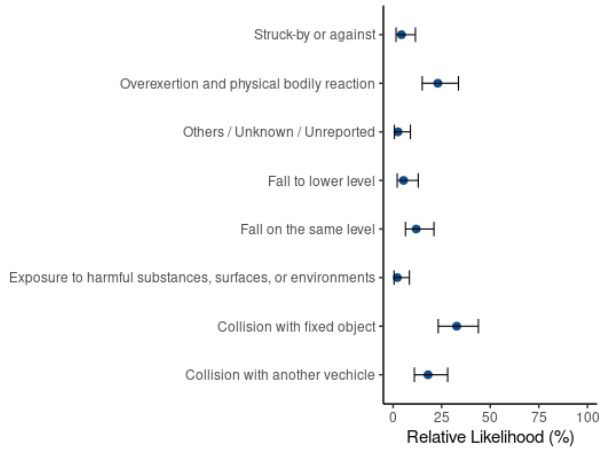
Predicted Variable: Event Type

Given Variable: Injury Outcome

Attribute for Given Variable: Medical Case



Event Type	Relative Likelihood (%)
Collision with fixed object	32.73
Overexertion and physical bodily reaction	23.02
Collision with another vechicle	17.99
Fall on the same level	11.87
Fall to lower level	5.40
Struck-by or against	4.32
Others / Unknown / Unreported	2.52
Exposure to harmful substances, surfaces, or environments	2.16



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	32.73	23.23	43.90
Overexertion and physical bodily reaction	23.02	14.99	33.65
Collision with another vechicle	17.99	10.96	28.10
Fall on the same level	11.87	6.37	21.04
Fall to lower level	5.40	2.14	12.95
Struck-by or against	4.32	1.54	11.49
Others / Unknown / Unreported	2.52	0.68	8.93
Exposure to harmful substances, surfaces, or environments	2.16	0.53	8.40

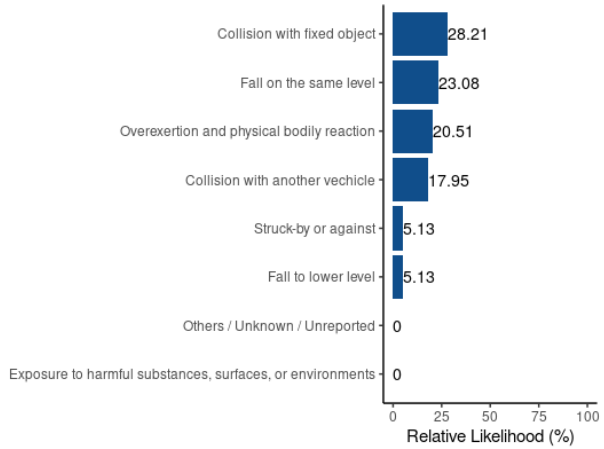
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

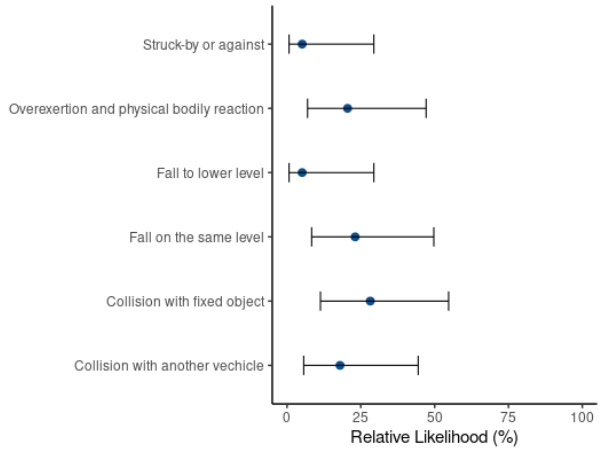
Predicted Variable: Event Type

Given Variable: Injury Outcome

Attribute for Given Variable: Report only



Event Type	Relative Likelihood (%)
Collision with fixed object	28.21
Fall on the same level	23.08
Overexertion and physical bodily reaction	20.51
Collision with another vechicle	17.95
Struck-by or against	5.13
Fall to lower level	5.13
Others / Unknown / Unreported	0.00
Exposure to harmful substances, surfaces, or environments	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	28.21	11.32	54.73
Fall on the same level	23.08	8.34	49.72
Overexertion and physical bodily reaction	20.51	6.96	47.11
Collision with another vechicle	17.95	5.65	44.42
Fall to lower level	5.13	0.70	29.40
Struck-by or against	5.13	0.70	29.40

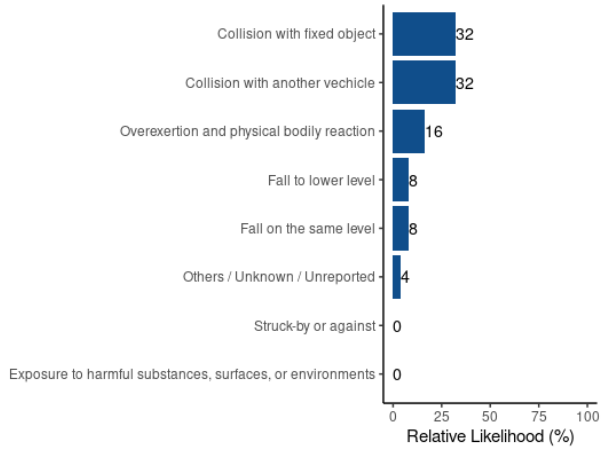
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

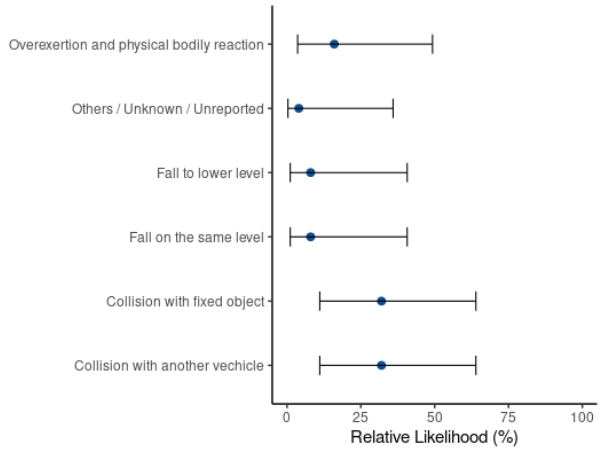
Predicted Variable: Event Type

Given Variable: Injury Outcome

Attribute for Given Variable: Temporary disability



Event Type	Relative Likelihood (%)
Collision with another vechicle	32.00
Collision with fixed object	32.00
Overexertion and physical bodily reaction	16.00
Fall on the same level	8.00
Fall to lower level	8.00
Others / Unknown / Unreported	4.00
Struck-by or against	0.00
Exposure to harmful substances, surfaces, or environments	0.00



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with another vechicle	32.00	11.10	63.95
Collision with fixed object	32.00	11.10	63.95
Overexertion and physical bodily reaction	16.00	3.60	49.27
Fall on the same level	8.00	1.09	40.69
Fall to lower level	8.00	1.09	40.69
Others / Unknown / Unreported	4.00	0.31	35.93

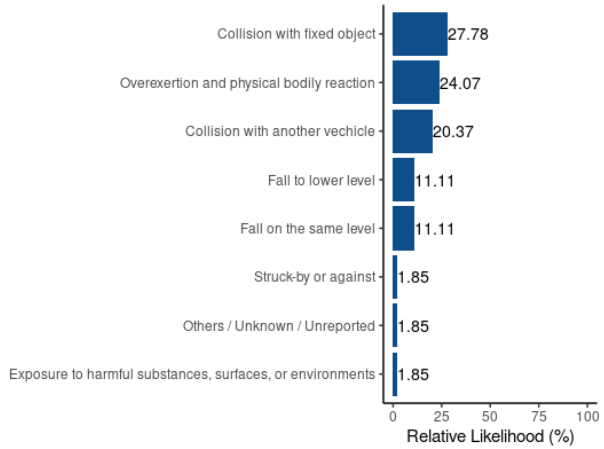
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

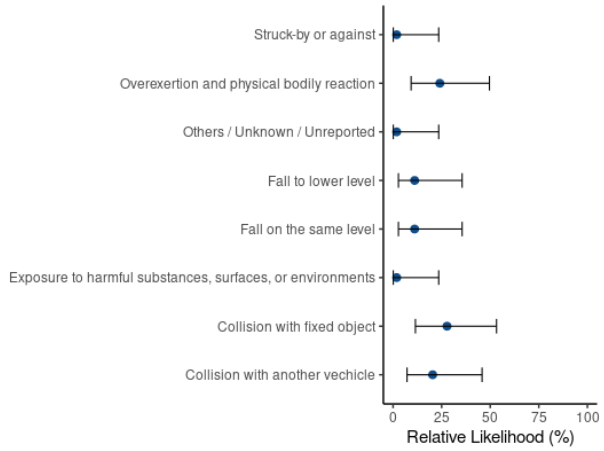
Predicted Variable: Event Type

Given Variable: Injury Outcome

Attribute for Given Variable: Permanent disability



Event Type	Relative Likelihood (%)
Collision with fixed object	27.78
Overexertion and physical bodily reaction	24.07
Collision with another vechicle	20.37
Fall on the same level	11.11
Fall to lower level	11.11
Others / Unknown / Unreported	1.85
Struck-by or against	1.85
Exposure to harmful substances, surfaces, or environments	1.85



Event Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Collision with fixed object	27.78	11.50	53.24
Overexertion and physical bodily reaction	24.07	9.27	49.59
Collision with another vechicle	20.37	7.19	45.80
Fall on the same level	11.11	2.76	35.54
Fall to lower level	11.11	2.76	35.54
Exposure to harmful substances, surfaces, or environments	1.85	0.12	23.49
Others / Unknown / Unreported	1.85	0.12	23.49
Struck-by or against	1.85	0.12	23.49

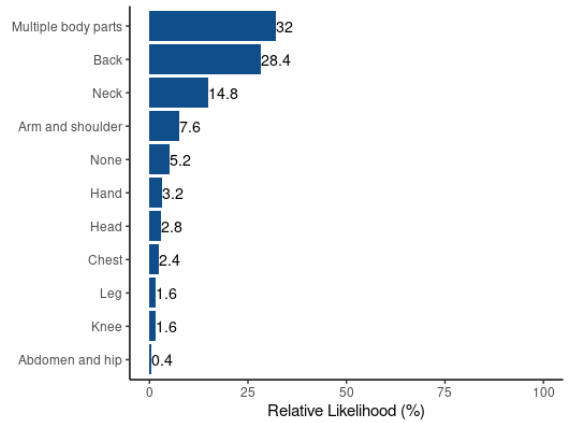
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

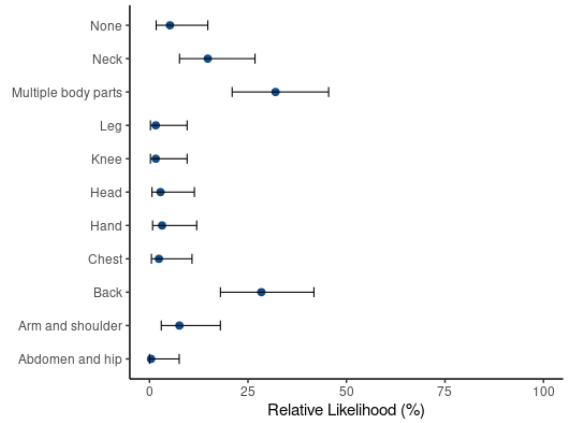
Predicted Variable: Injured Body Part

Given Variable: Driving Test Stage

Attribute for Given Variable: During



Injured Body Part	Relative Likelihood (%)
Multiple body parts	32.00
Back	28.40
Neck	14.80
Arm and shoulder	7.60
None	5.20
Hand	3.20
Head	2.80
Chest	2.40
Leg	1.60
Knee	1.60
Abdomen and hip	0.40



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	32.00	20.98	45.47
Back	28.40	18.00	41.74
Neck	14.80	7.62	26.78
Arm and shoulder	7.60	2.99	18.00
None	5.20	1.70	14.81
Hand	3.20	0.80	11.99
Head	2.80	0.64	11.40
Chest	2.40	0.50	10.80
Knee	1.60	0.25	9.56
Leg	1.60	0.25	9.56
Abdomen and hip	0.40	0.02	7.55

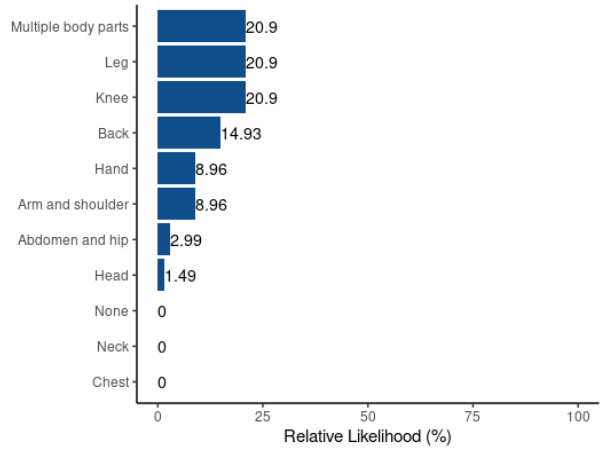
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

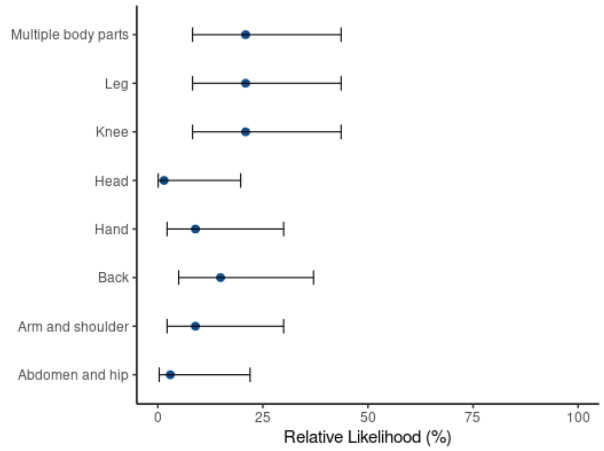
Predicted Variable: Injured Body Part

Given Variable: Driving Test Stage

Attribute for Given Variable: After



Injured Body Part	Relative Likelihood (%)
Multiple body parts	20.90
Leg	20.90
Knee	20.90
Back	14.93
Hand	8.96
Arm and shoulder	8.96
Abdomen and hip	2.99
Head	1.49
Neck	0.00
None	0.00
Chest	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Knee	20.90	8.27	43.62
Leg	20.90	8.27	43.62
Multiple body parts	20.90	8.27	43.62
Back	14.93	4.97	37.05
Arm and shoulder	8.96	2.21	29.94
Hand	8.96	2.21	29.94
Abdomen and hip	2.99	0.34	21.95
Head	1.49	0.09	19.73

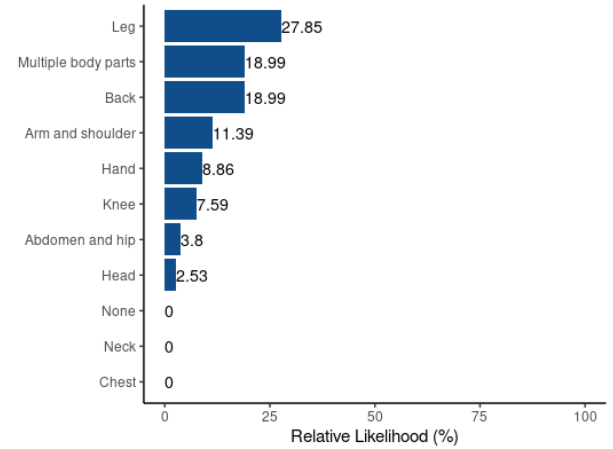
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

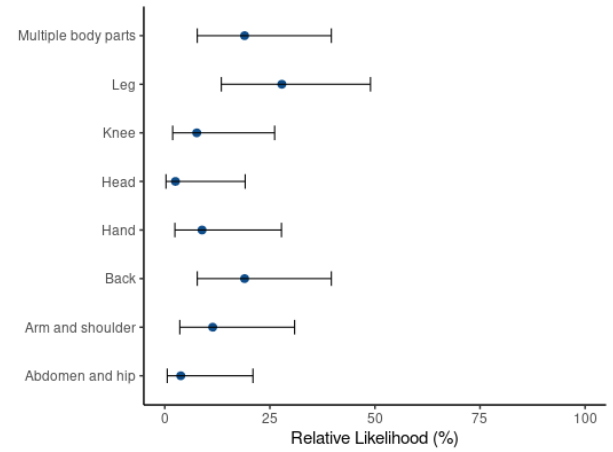
Predicted Variable: Injured Body Part

Given Variable: Driving Test Stage

Attribute for Given Variable: Before



Injured Body Part	Relative Likelihood (%)
Leg	27.85
Multiple body parts	18.99
Back	18.99
Arm and shoulder	11.39
Hand	8.86
Knee	7.59
Abdomen and hip	3.80
Head	2.53
Neck	0.00
None	0.00
Chest	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Leg	27.85	13.45	48.94
Back	18.99	7.72	39.63
Multiple body parts	18.99	7.72	39.63
Arm and shoulder	11.39	3.57	30.89
Hand	8.86	2.40	27.76
Knee	7.59	1.87	26.14
Abdomen and hip	3.80	0.58	20.98
Head	2.53	0.28	19.13

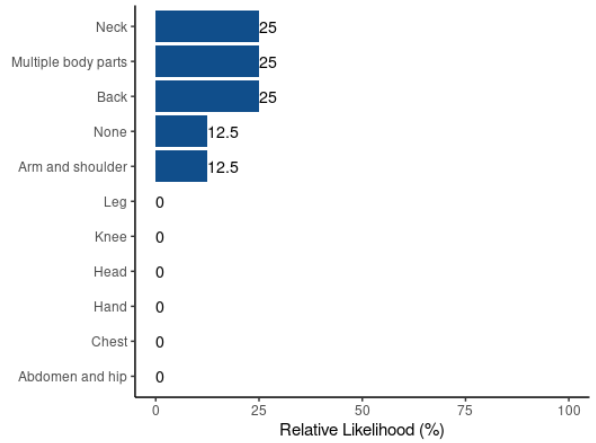
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

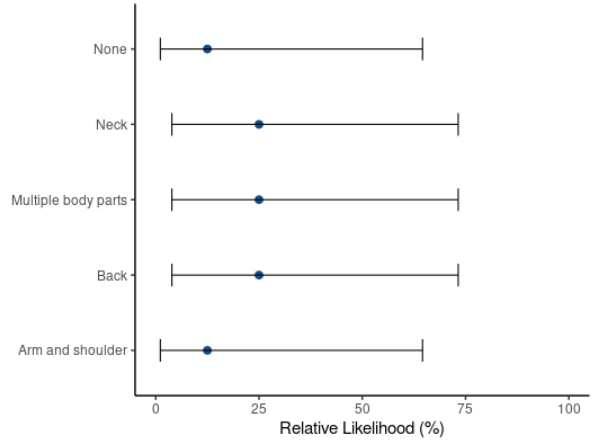
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Unsafe lane change / Oversteering / Overcorrecting



Injured Body Part	Relative Likelihood (%)
Neck	25.00
Multiple body parts	25.00
Back	25.00
None	12.50
Arm and shoulder	12.50
Hand	0.00
Leg	0.00
Chest	0.00
Knee	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	25.00	3.90	73.22
Multiple body parts	25.00	3.90	73.22
Neck	25.00	3.90	73.22
Arm and shoulder	12.50	1.11	64.58
None	12.50	1.11	64.58

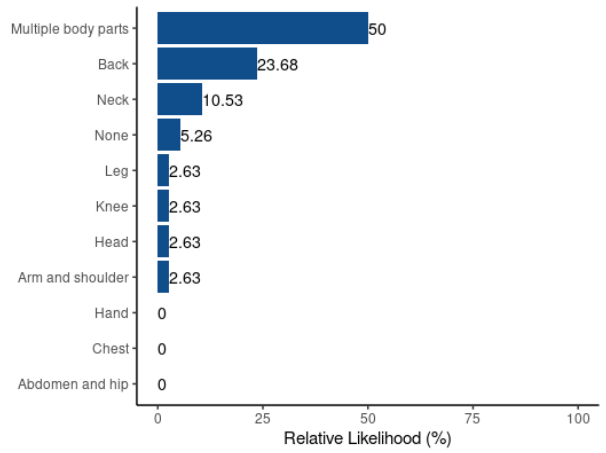
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

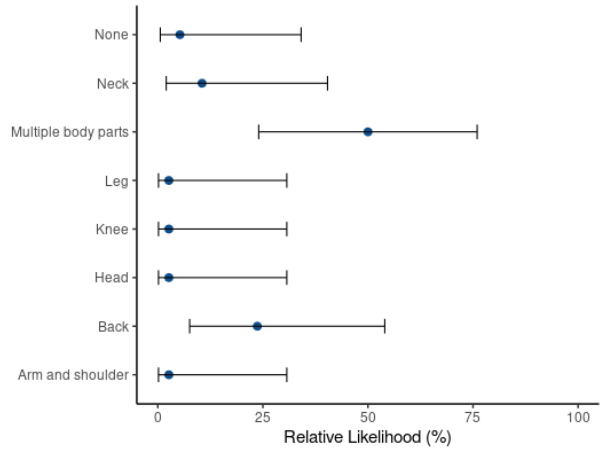
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Fault of other Driver



Injured Body Part	Relative Likelihood (%)
Multiple body parts	50.00
Back	23.68
Neck	10.53
None	5.26
Arm and shoulder	2.63
Leg	2.63
Knee	2.63
Head	2.63
Hand	0.00
Chest	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	50.00	24.01	75.99
Back	23.68	7.58	54.01
Neck	10.53	2.00	40.38
None	5.26	0.59	34.11
Arm and shoulder	2.63	0.16	30.69
Head	2.63	0.16	30.69
Knee	2.63	0.16	30.69
Leg	2.63	0.16	30.69

Safety Incidents Prediction Tool

About

Overall Probability

Condit. Prob. (One Variable)

Predicted Variable

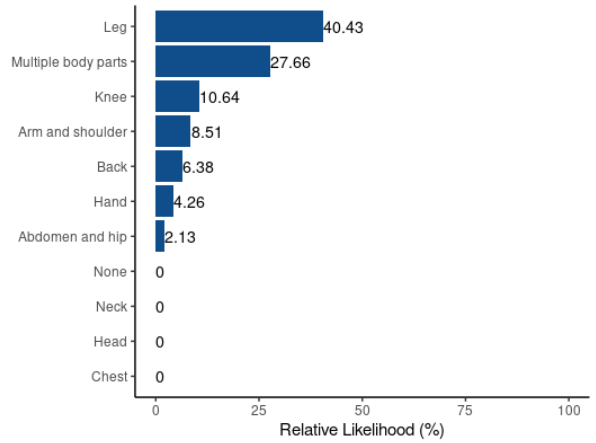
Injured Body Part

Given Variable

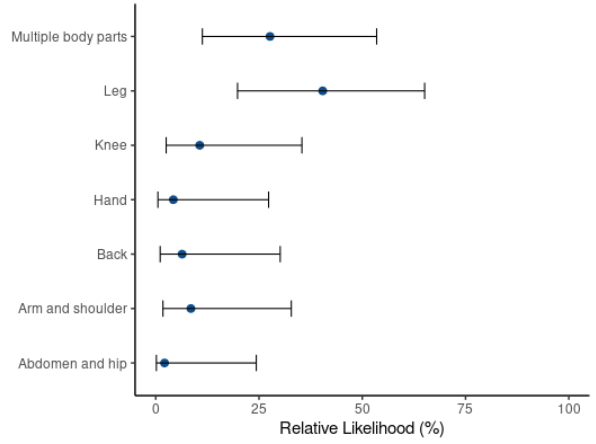
Contributing Factor

Attribute for Given Variable

Uneven surface / Object on ground / Loss of balance



Injured Body Part	Relative Likelihood (%)
Leg	40.43
Multiple body parts	27.66
Knee	10.64
Arm and shoulder	8.51
Back	6.38
Hand	4.26
Abdomen and hip	2.13
Neck	0.00
None	0.00
Chest	0.00
Head	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Leg	40.43	19.80	65.10
Multiple body parts	27.66	11.28	53.48
Knee	10.64	2.52	35.39
Arm and shoulder	8.51	1.74	32.81
Back	6.38	1.07	30.13
Hand	4.26	0.52	27.32
Abdomen and hip	2.13	0.15	24.34

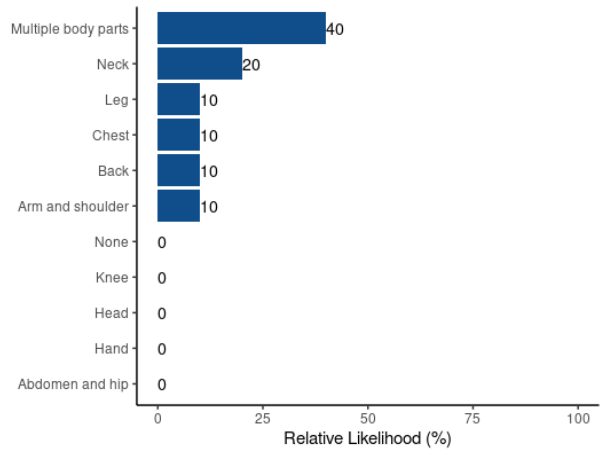
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

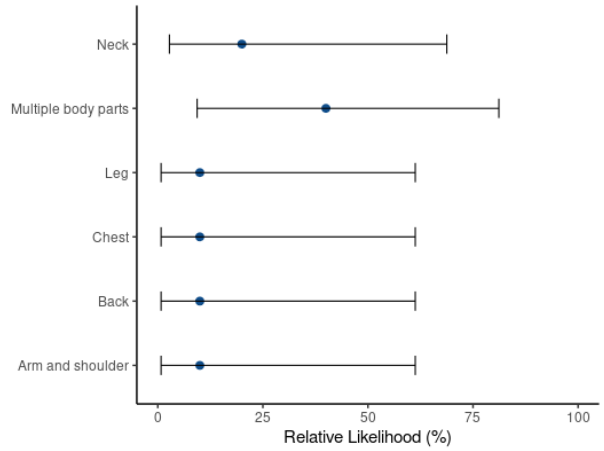
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Speeding



Injured Body Part	Relative Likelihood (%)
Multiple body parts	40.00
Neck	20.00
Back	10.00
Arm and shoulder	10.00
Leg	10.00
Chest	10.00
None	0.00
Hand	0.00
Knee	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	40.00	9.36	81.15
Neck	20.00	2.76	68.76
Arm and shoulder	10.00	0.77	61.26
Back	10.00	0.77	61.26
Chest	10.00	0.77	61.26
Leg	10.00	0.77	61.26

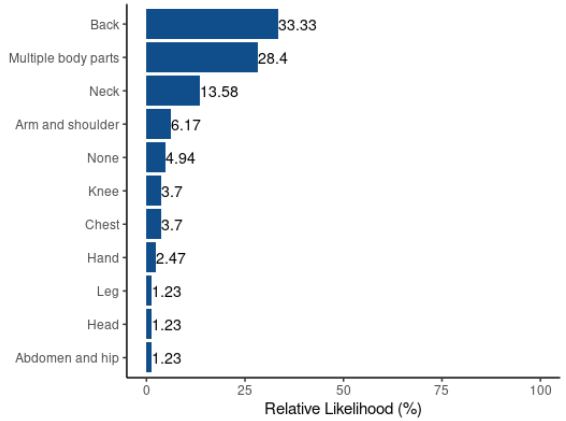
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

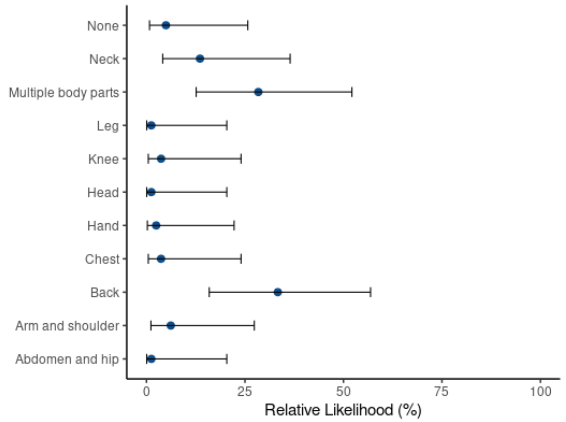
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to maintain control of vehicle



Injured Body Part	Relative Likelihood (%)
Back	33.33
Multiple body parts	28.40
Neck	13.58
Arm and shoulder	6.17
None	4.94
Chest	3.70
Knee	3.70
Hand	2.47
Leg	1.23
Head	1.23
Abdomen and hip	1.23



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	33.33	15.93	56.88
Multiple body parts	28.40	12.61	52.14
Neck	13.58	4.13	36.46
Arm and shoulder	6.17	1.14	27.37
None	4.94	0.77	25.72
Chest	3.70	0.47	24.01
Knee	3.70	0.47	24.01
Hand	2.47	0.22	22.24
Abdomen and hip	1.23	0.06	20.39
Head	1.23	0.06	20.39
Leg	1.23	0.06	20.39

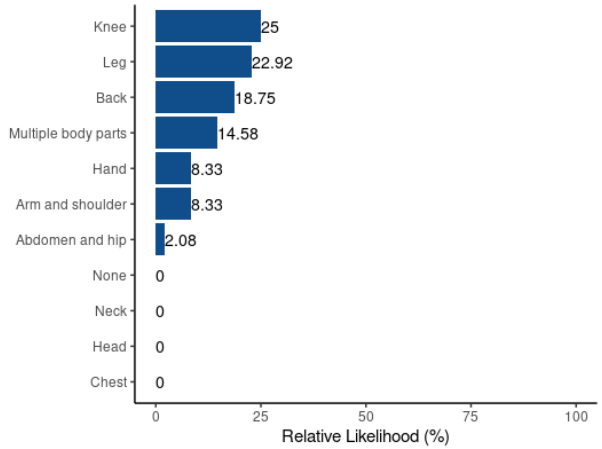
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

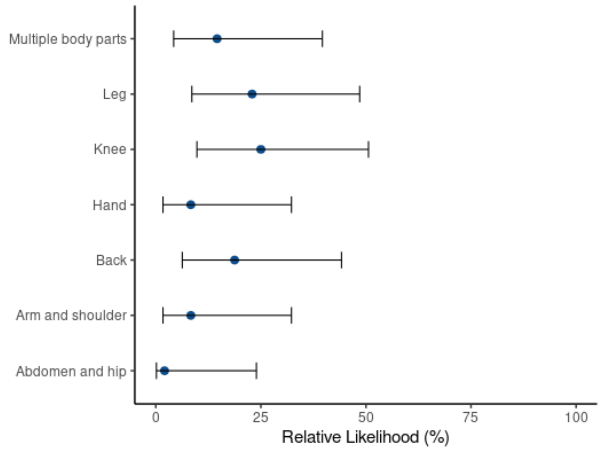
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Exiting the vehicle



Injured Body Part	Relative Likelihood (%)
Knee	25.00
Leg	22.92
Back	18.75
Multiple body parts	14.58
Hand	8.33
Arm and shoulder	8.33
Abdomen and hip	2.08
Neck	0.00
None	0.00
Chest	0.00
Head	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Knee	25.00	9.78	50.61
Leg	22.92	8.58	48.51
Back	18.75	6.30	44.19
Multiple body parts	14.58	4.25	39.64
Arm and shoulder	8.33	1.70	32.28
Hand	8.33	1.70	32.28
Abdomen and hip	2.08	0.14	23.94

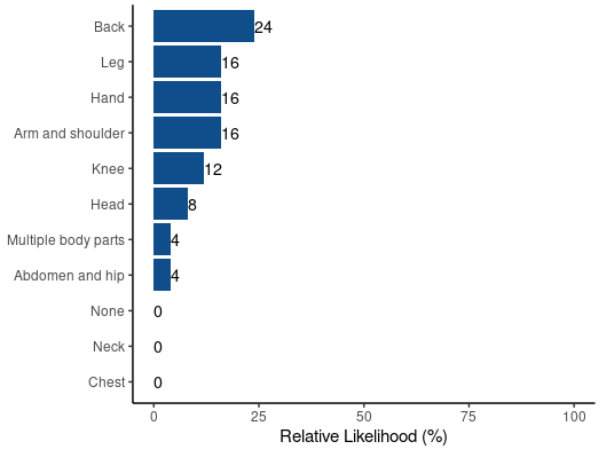
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

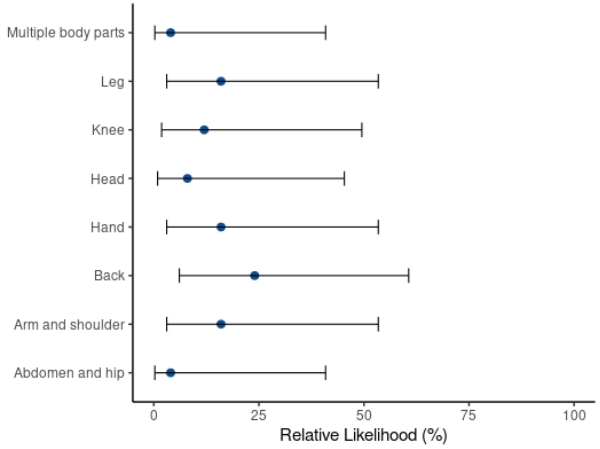
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Entering the vehicle



Injured Body Part	Relative Likelihood (%)
Back	24.00
Hand	16.00
Arm and shoulder	16.00
Leg	16.00
Knee	12.00
Head	8.00
Multiple body parts	4.00
Abdomen and hip	4.00
Neck	0.00
None	0.00
Chest	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	24.00	6.08	60.65
Arm and shoulder	16.00	3.07	53.42
Hand	16.00	3.07	53.42
Leg	16.00	3.07	53.42
Knee	12.00	1.86	49.50
Head	8.00	0.90	45.34
Abdomen and hip	4.00	0.25	40.88
Multiple body parts	4.00	0.25	40.88

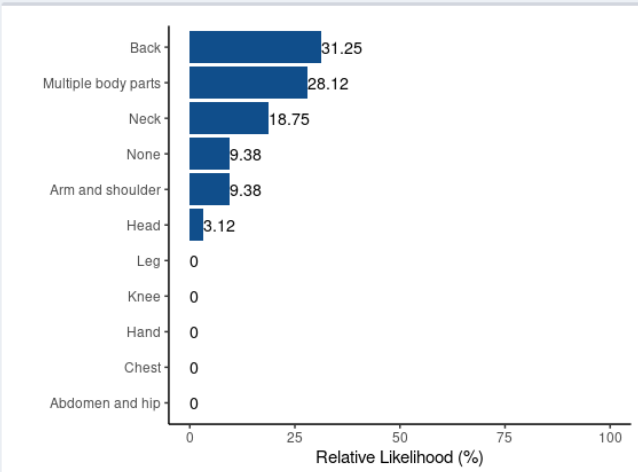
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

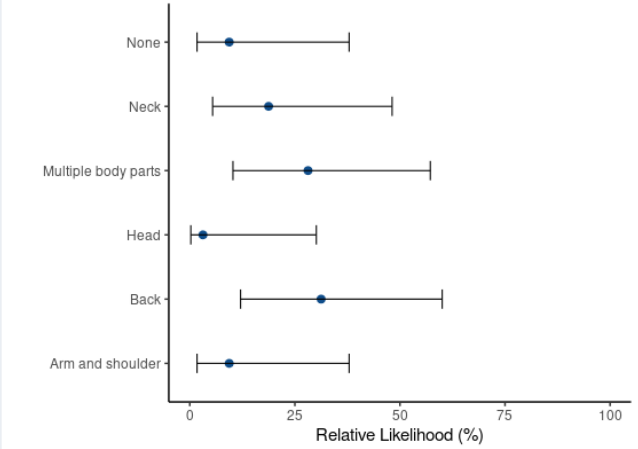
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt acceleration



Injured Body Part	Relative Likelihood (%)
Back	31.25
Multiple body parts	28.12
Neck	18.75
None	9.38
Arm and shoulder	9.38
Head	3.12
Hand	0.00
Leg	0.00
Chest	0.00
Knee	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	31.25	12.08	60.06
Multiple body parts	28.12	10.27	57.23
Neck	18.75	5.43	48.14
Arm and shoulder	9.38	1.72	37.91
None	9.38	1.72	37.91
Head	3.12	0.24	30.11

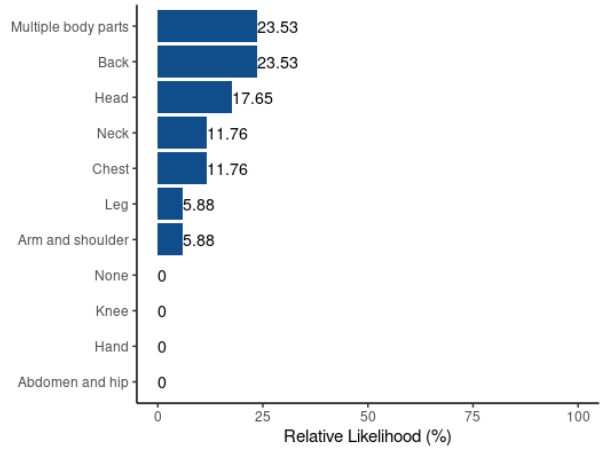
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

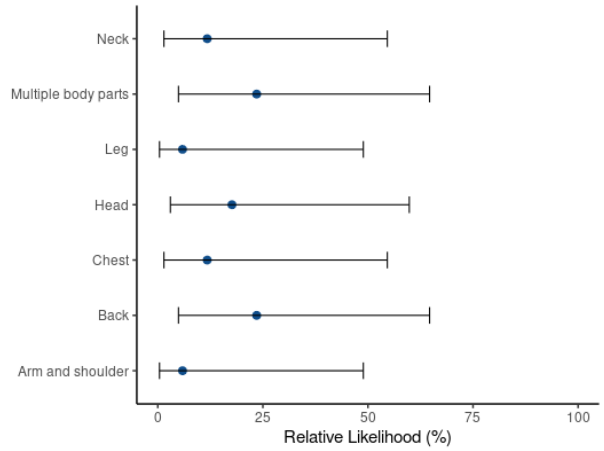
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to yield right of way



Injured Body Part	Relative Likelihood (%)
Multiple body parts	23.53
Back	23.53
Head	17.65
Neck	11.76
Chest	11.76
Arm and shoulder	5.88
Leg	5.88
None	0.00
Hand	0.00
Knee	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	23.53	4.92	64.67
Multiple body parts	23.53	4.92	64.67
Head	17.65	2.99	59.84
Chest	11.76	1.46	54.61
Neck	11.76	1.46	54.61
Arm and shoulder	5.88	0.41	48.90
Leg	5.88	0.41	48.90

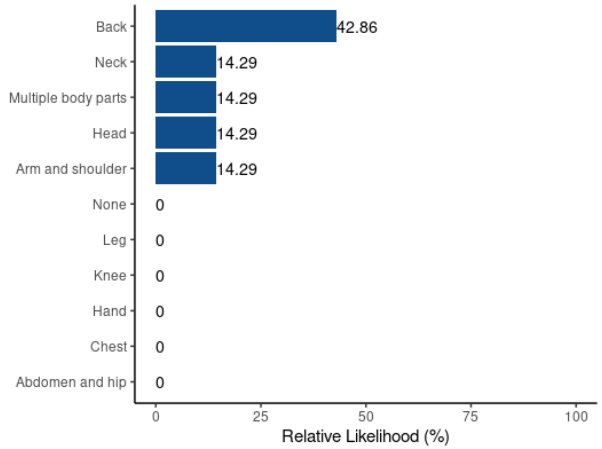
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

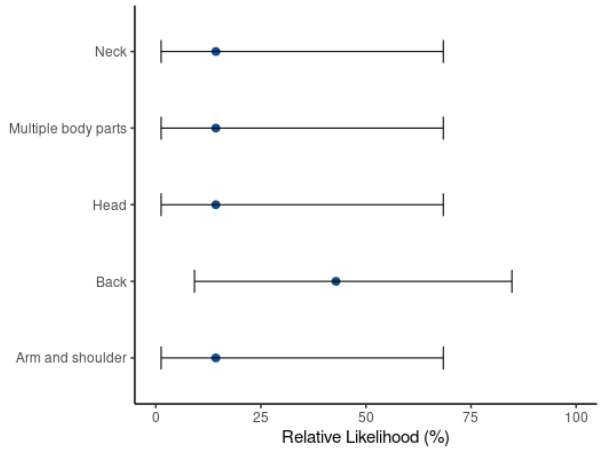
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to stop at stop sign or red light



Injured Body Part	Relative Likelihood (%)
Back	42.86
Neck	14.29
Multiple body parts	14.29
Arm and shoulder	14.29
Head	14.29
None	0.00
Hand	0.00
Leg	0.00
Chest	0.00
Knee	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	42.86	9.20	84.73
Arm and shoulder	14.29	1.27	68.41
Head	14.29	1.27	68.41
Multiple body parts	14.29	1.27	68.41
Neck	14.29	1.27	68.41

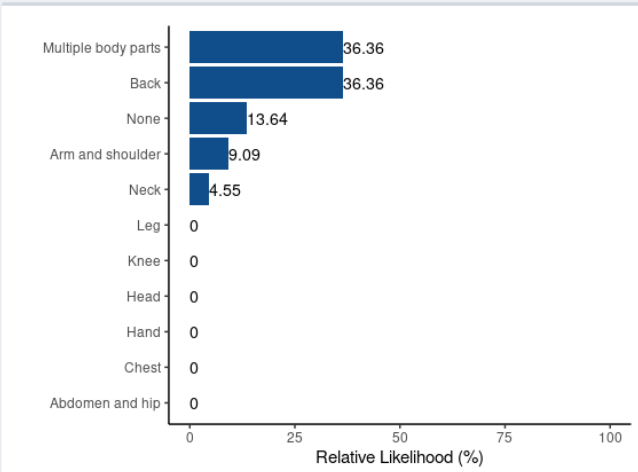
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

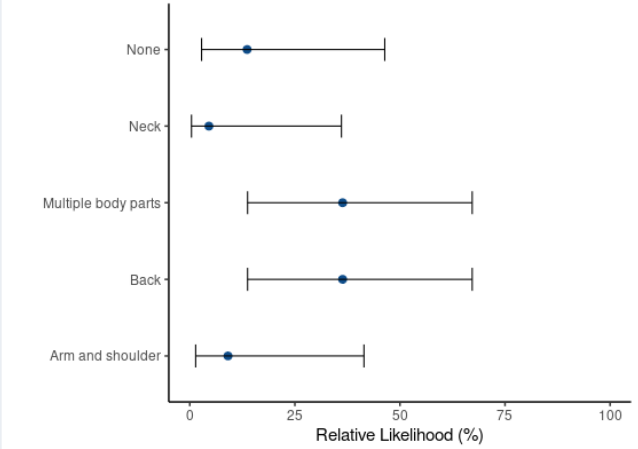
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Backing vehicle from parking space



Injured Body Part	Relative Likelihood (%)
Multiple body parts	36.36
Back	36.36
None	13.64
Arm and shoulder	9.09
Neck	4.55
Hand	0.00
Leg	0.00
Chest	0.00
Knee	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	36.36	13.75	67.20
Multiple body parts	36.36	13.75	67.20
None	13.64	2.80	46.39
Arm and shoulder	9.09	1.39	41.44
Neck	4.55	0.40	36.08

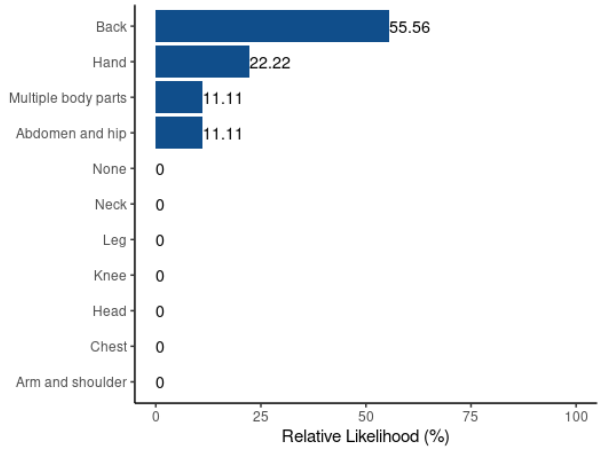
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

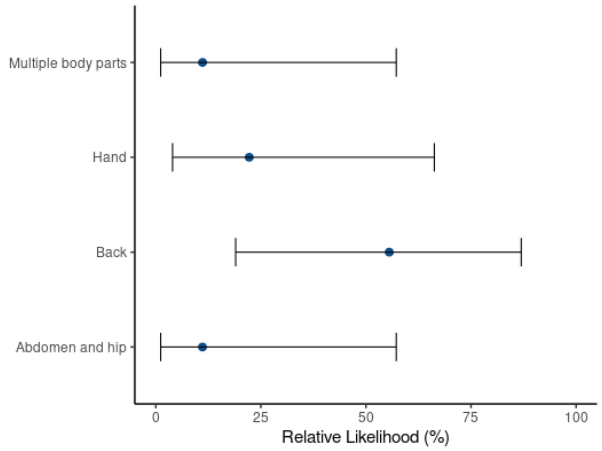
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt postural change / Poor posture



Injured Body Part	Relative Likelihood (%)
Back	55.56
Hand	22.22
Multiple body parts	11.11
Abdomen and hip	11.11
Neck	0.00
None	0.00
Arm and shoulder	0.00
Leg	0.00
Chest	0.00
Knee	0.00
Head	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	55.56	19.00	86.95
Hand	22.22	3.99	66.28
Abdomen and hip	11.11	1.15	57.21
Multiple body parts	11.11	1.15	57.21

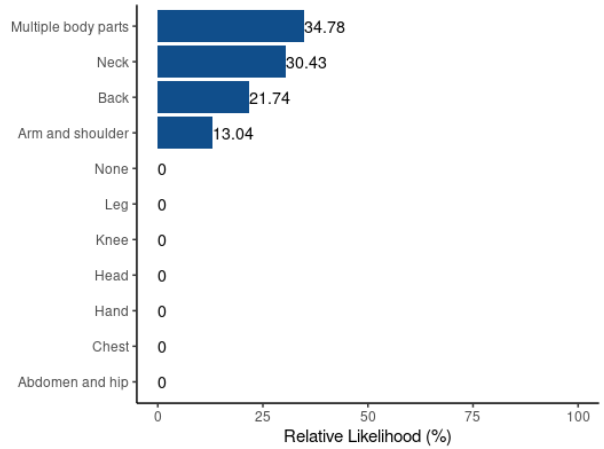
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

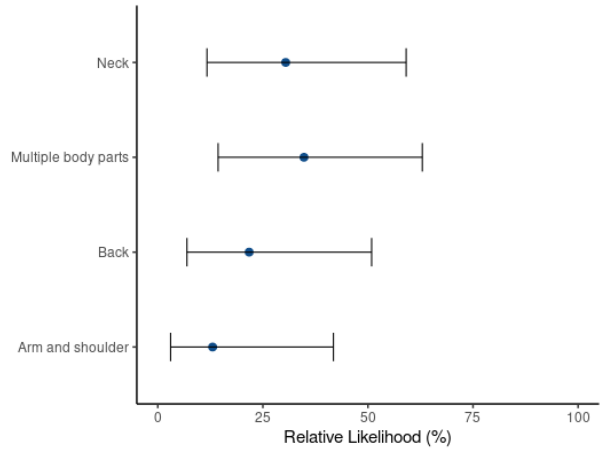
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt braking



Injured Body Part	Relative Likelihood (%)
Multiple body parts	34.78
Neck	30.43
Back	21.74
Arm and shoulder	13.04
None	0.00
Hand	0.00
Leg	0.00
Chest	0.00
Knee	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	34.78	14.35	62.94
Neck	30.43	11.70	59.09
Back	21.74	6.93	50.88
Arm and shoulder	13.04	3.04	41.79

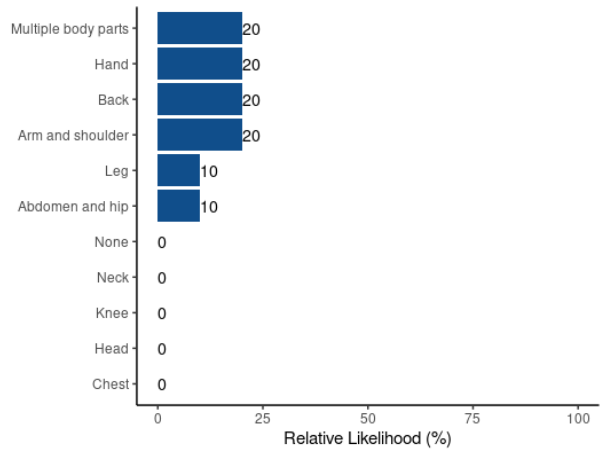
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

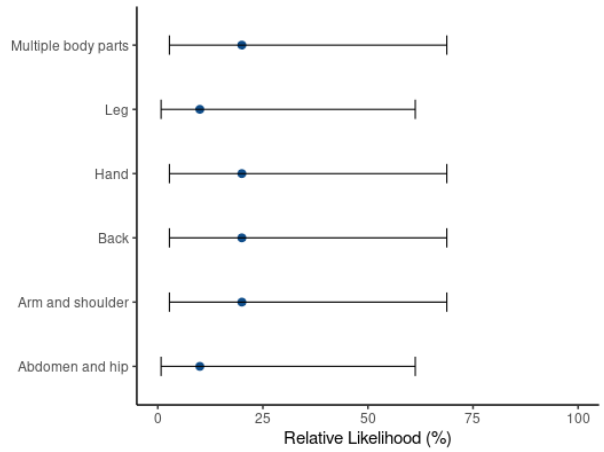
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Manual handling / Lifting



Injured Body Part	Relative Likelihood (%)
Multiple body parts	20.00
Back	20.00
Hand	20.00
Arm and shoulder	20.00
Leg	10.00
Abdomen and hip	10.00
Neck	0.00
None	0.00
Chest	0.00
Knee	0.00
Head	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Arm and shoulder	20.00	2.76	68.76
Back	20.00	2.76	68.76
Hand	20.00	2.76	68.76
Multiple body parts	20.00	2.76	68.76
Abdomen and hip	10.00	0.77	61.26
Leg	10.00	0.77	61.26

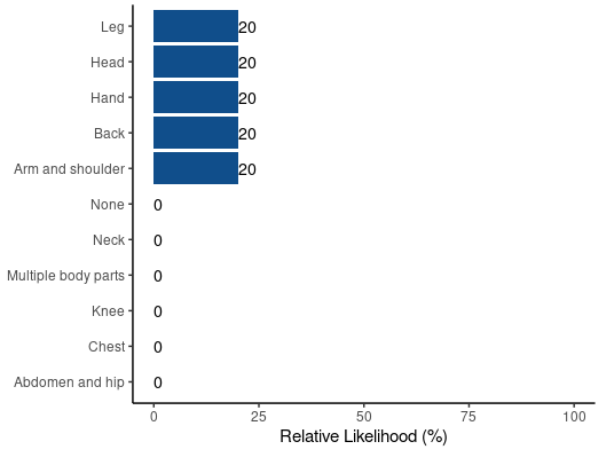
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

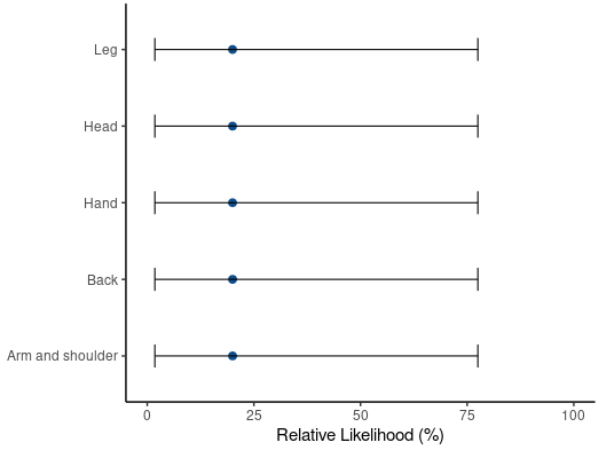
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Animal / Insect



Injured Body Part	Relative Likelihood (%)
Back	20.00
Hand	20.00
Arm and shoulder	20.00
Leg	20.00
Head	20.00
Neck	0.00
Multiple body parts	0.00
None	0.00
Chest	0.00
Knee	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Arm and shoulder	20.00	1.78	77.51
Back	20.00	1.78	77.51
Hand	20.00	1.78	77.51
Head	20.00	1.78	77.51
Leg	20.00	1.78	77.51

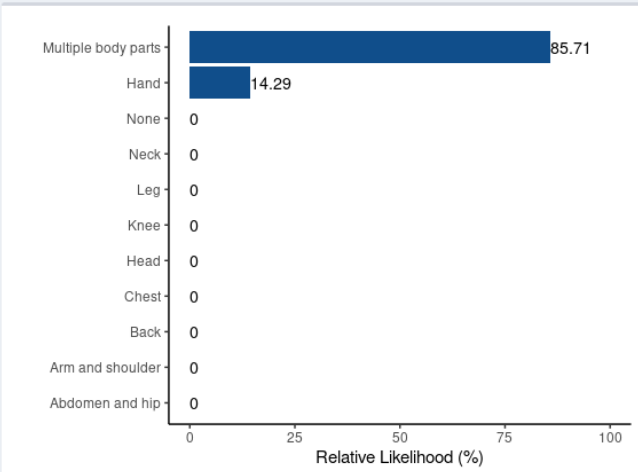
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

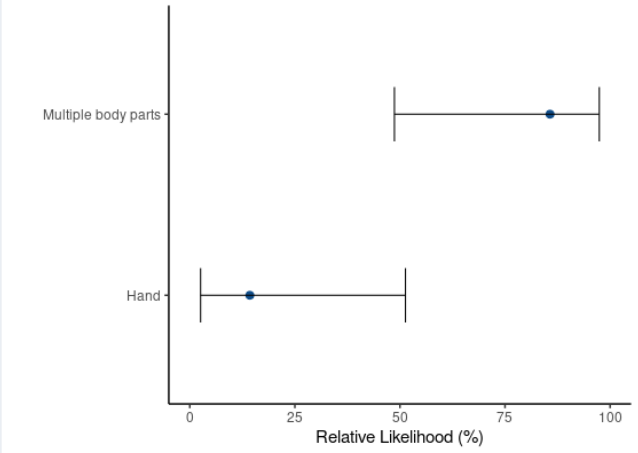
Predicted Variable: Injured Body Part

Given Variable: Contributing Factor

Attribute for Given Variable: Weather conditions



Injured Body Part	Relative Likelihood (%)
Multiple body parts	85.71
Hand	14.29
Neck	0.00
None	0.00
Back	0.00
Arm and shoulder	0.00
Leg	0.00
Chest	0.00
Knee	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	85.71	48.69	97.43
Hand	14.29	2.57	51.31

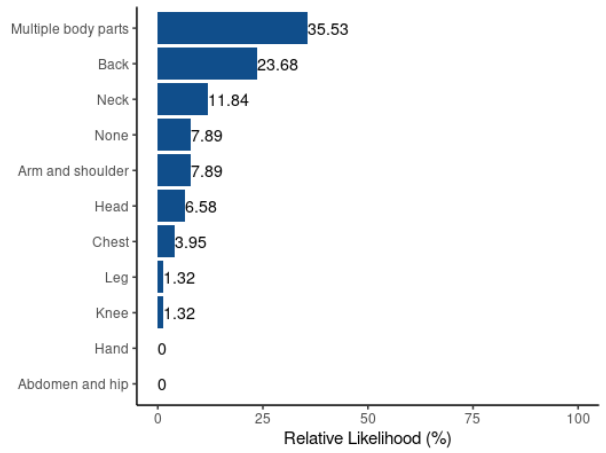
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

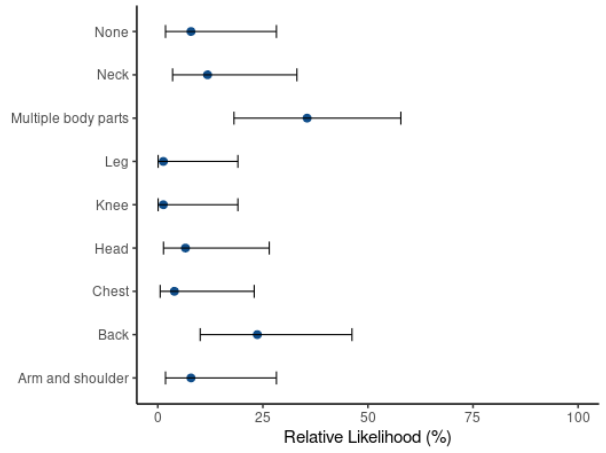
Predicted Variable: Injured Body Part

Given Variable: Event Type

Attribute for Given Variable: Collision with another vechicle



Injured Body Part	Relative Likelihood (%)
Multiple body parts	35.53
Back	23.68
Neck	11.84
None	7.89
Arm and shoulder	7.89
Head	6.58
Chest	3.95
Leg	1.32
Knee	1.32
Hand	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	35.53	18.13	57.83
Back	23.68	10.08	46.20
Neck	11.84	3.52	33.10
Arm and shoulder	7.89	1.83	28.23
None	7.89	1.83	28.23
Head	6.58	1.36	26.52
Chest	3.95	0.56	22.94
Knee	1.32	0.08	19.06
Leg	1.32	0.08	19.06

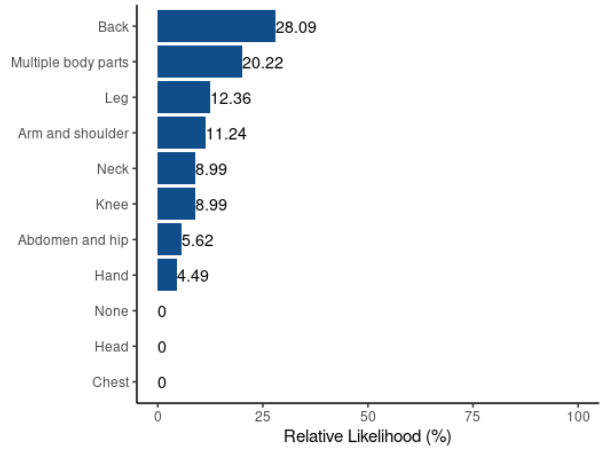
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

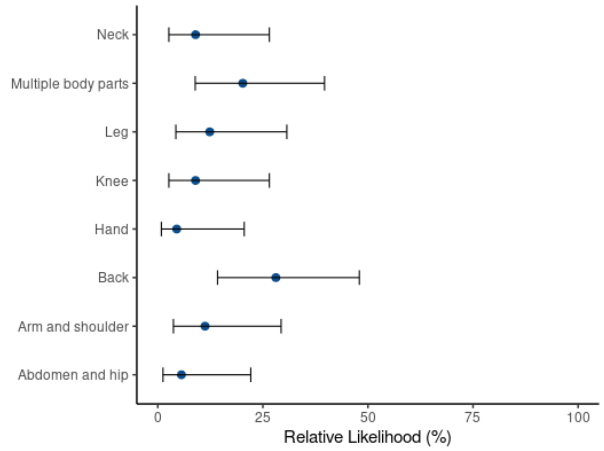
Predicted Variable: Injured Body Part

Given Variable: Event Type

Attribute for Given Variable: Overexertion and physical bodily reaction



Injured Body Part	Relative Likelihood (%)
Back	28.09
Multiple body parts	20.22
Leg	12.36
Arm and shoulder	11.24
Neck	8.99
Knee	8.99
Abdomen and hip	5.62
Hand	4.49
None	0.00
Chest	0.00
Head	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	28.09	14.21	47.95
Multiple body parts	20.22	8.90	39.67
Leg	12.36	4.30	30.70
Arm and shoulder	11.24	3.72	29.34
Knee	8.99	2.63	26.54
Neck	8.99	2.63	26.54
Abdomen and hip	5.62	1.23	22.12
Hand	4.49	0.85	20.56

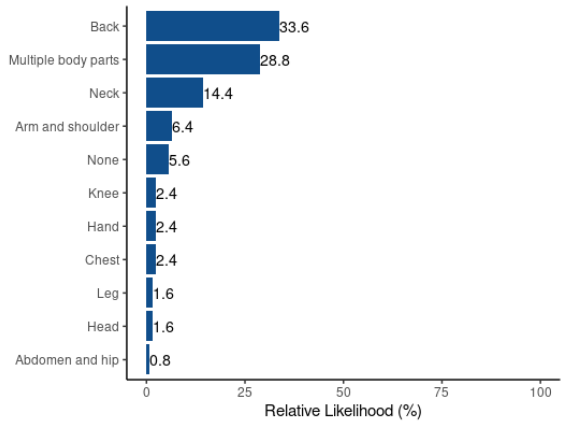
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

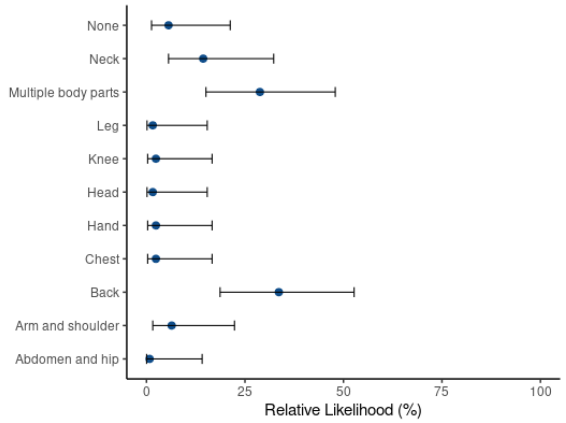
Predicted Variable: Injured Body Part

Given Variable: Event Type

Attribute for Given Variable: Collision with fixed object



Injured Body Part	Relative Likelihood (%)
Back	33.60
Multiple body parts	28.80
Neck	14.40
Arm and shoulder	6.40
None	5.60
Hand	2.40
Chest	2.40
Knee	2.40
Leg	1.60
Head	1.60
Abdomen and hip	0.80



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	33.60	18.68	52.71
Multiple body parts	28.80	15.10	47.92
Neck	14.40	5.60	32.30
Arm and shoulder	6.40	1.60	22.34
None	5.60	1.29	21.26
Chest	2.40	0.30	16.66
Hand	2.40	0.30	16.66
Knee	2.40	0.30	16.66
Head	1.60	0.14	15.42
Leg	1.60	0.14	15.42
Abdomen and hip	0.80	0.04	14.13

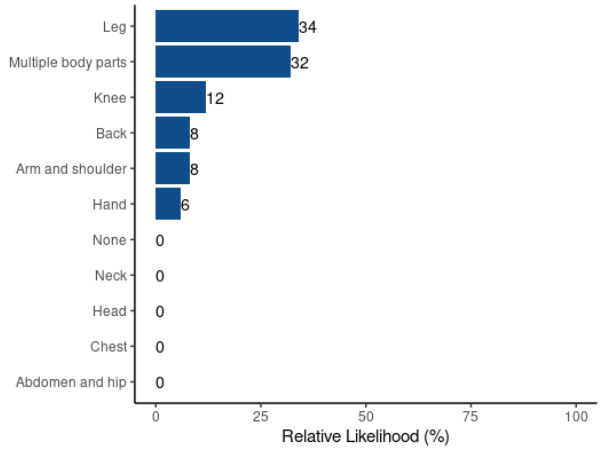
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

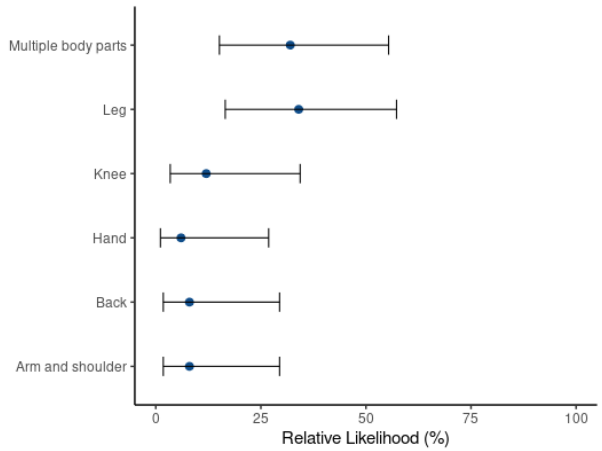
Predicted Variable: Injured Body Part

Given Variable: Event Type

Attribute for Given Variable: Fall on the same level



Injured Body Part	Relative Likelihood (%)
Leg	34.00
Multiple body parts	32.00
Knee	12.00
Back	8.00
Arm and shoulder	8.00
Hand	6.00
Neck	0.00
None	0.00
Chest	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Leg	34.00	16.52	57.28
Multiple body parts	32.00	15.14	55.39
Knee	12.00	3.43	34.34
Arm and shoulder	8.00	1.78	29.45
Back	8.00	1.78	29.45
Hand	6.00	1.10	26.85

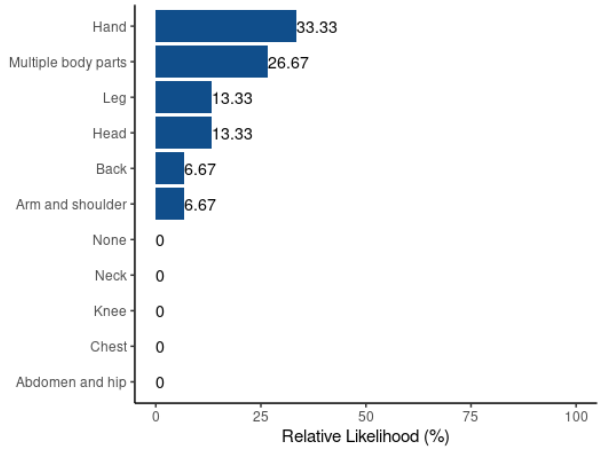
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

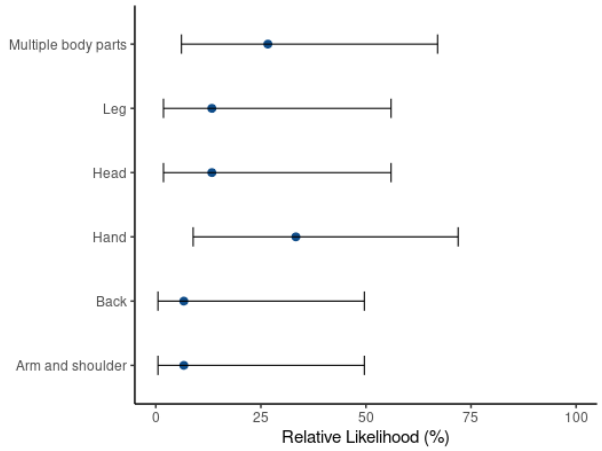
Predicted Variable: Injured Body Part

Given Variable: Event Type

Attribute for Given Variable: Struck-by or against



Injured Body Part	Relative Likelihood (%)
Hand	33.33
Multiple body parts	26.67
Leg	13.33
Head	13.33
Back	6.67
Arm and shoulder	6.67
Neck	0.00
None	0.00
Chest	0.00
Knee	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Hand	33.33	8.89	71.93
Multiple body parts	26.67	6.10	67.05
Head	13.33	1.83	55.98
Leg	13.33	1.83	55.98
Arm and shoulder	6.67	0.52	49.62
Back	6.67	0.52	49.62

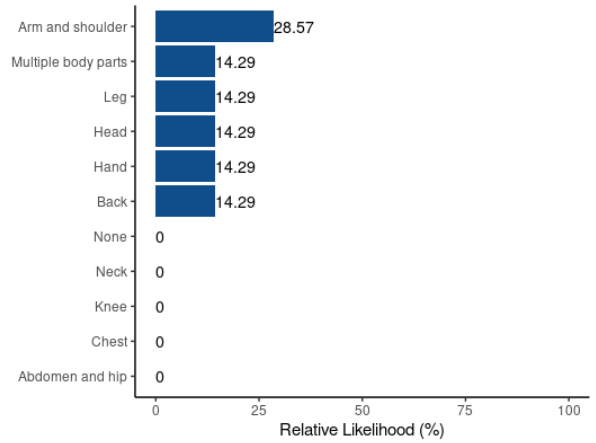
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

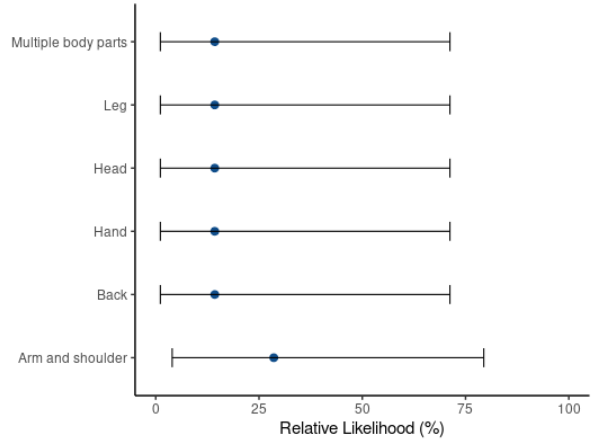
Predicted Variable: Injured Body Part

Given Variable: Event Type

Attribute for Given Variable: Exposure to harmful substances, surfaces, or environments



Injured Body Part	Relative Likelihood (%)
Arm and shoulder	28.57
Multiple body parts	14.29
Back	14.29
Hand	14.29
Leg	14.29
Head	14.29
Neck	0.00
None	0.00
Chest	0.00
Knee	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Arm and shoulder	28.57	3.98	79.42
Back	14.29	1.11	71.22
Hand	14.29	1.11	71.22
Head	14.29	1.11	71.22
Leg	14.29	1.11	71.22
Multiple body parts	14.29	1.11	71.22

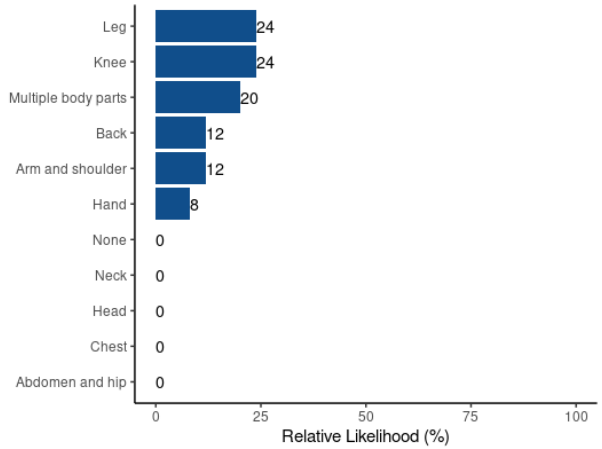
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

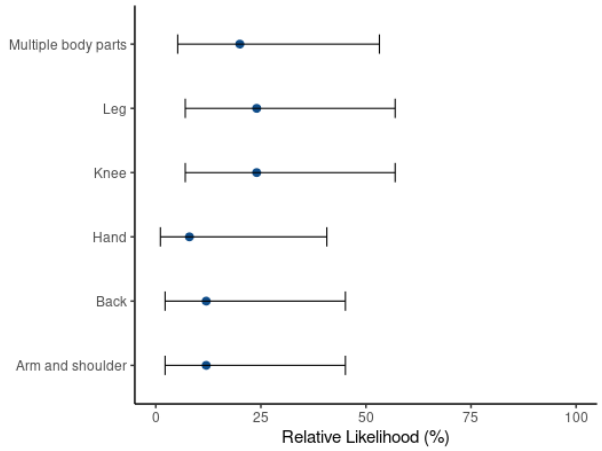
Predicted Variable: Injured Body Part

Given Variable: Event Type

Attribute for Given Variable: Fall to lower level



Injured Body Part	Relative Likelihood (%)
Leg	24.00
Knee	24.00
Multiple body parts	20.00
Back	12.00
Arm and shoulder	12.00
Hand	8.00
Neck	0.00
None	0.00
Chest	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Knee	24.00	7.01	56.95
Leg	24.00	7.01	56.95
Multiple body parts	20.00	5.21	53.20
Arm and shoulder	12.00	2.21	45.11
Back	12.00	2.21	45.11
Hand	8.00	1.09	40.69

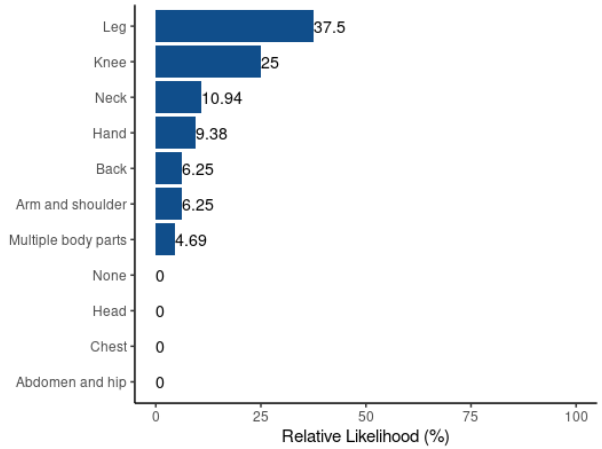
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

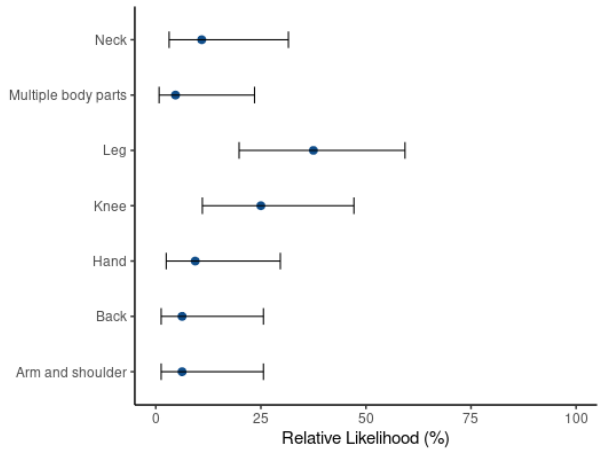
Predicted Variable: Injured Body Part

Given Variable: Injury Type

Attribute for Given Variable: Sprain



Injured Body Part	Relative Likelihood (%)
Leg	37.50
Knee	25.00
Neck	10.94
Hand	9.38
Back	6.25
Arm and shoulder	6.25
Multiple body parts	4.69
None	0.00
Chest	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Leg	37.50	19.82	59.29
Knee	25.00	11.08	47.14
Neck	10.94	3.17	31.55
Hand	9.38	2.48	29.63
Arm and shoulder	6.25	1.27	25.61
Back	6.25	1.27	25.61
Multiple body parts	4.69	0.78	23.49

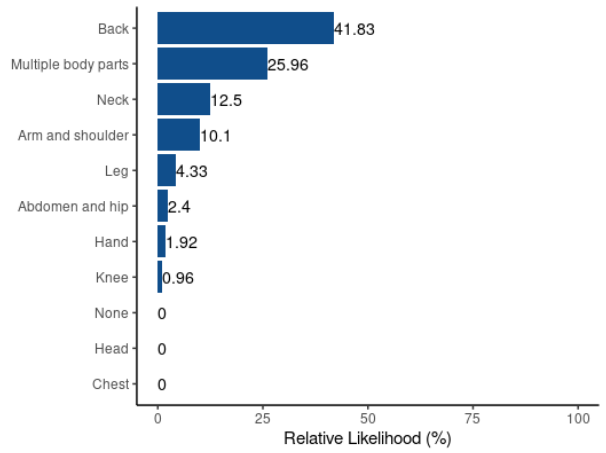
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

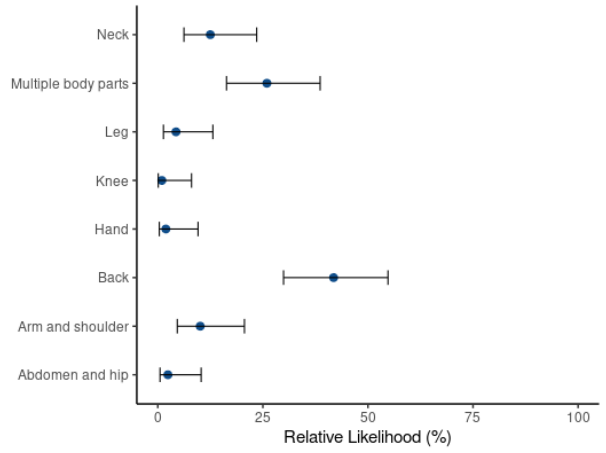
Predicted Variable: Injured Body Part

Given Variable: Injury Type

Attribute for Given Variable: Strain



Injured Body Part	Relative Likelihood (%)
Back	41.83
Multiple body parts	25.96
Neck	12.50
Arm and shoulder	10.10
Leg	4.33
Abdomen and hip	2.40
Hand	1.92
Knee	0.96
None	0.00
Chest	0.00
Head	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	41.83	29.92	54.77
Multiple body parts	25.96	16.35	38.62
Neck	12.50	6.22	23.53
Arm and shoulder	10.10	4.63	20.62
Leg	4.33	1.34	13.10
Abdomen and hip	2.40	0.52	10.31
Hand	1.92	0.36	9.58
Knee	0.96	0.11	8.03

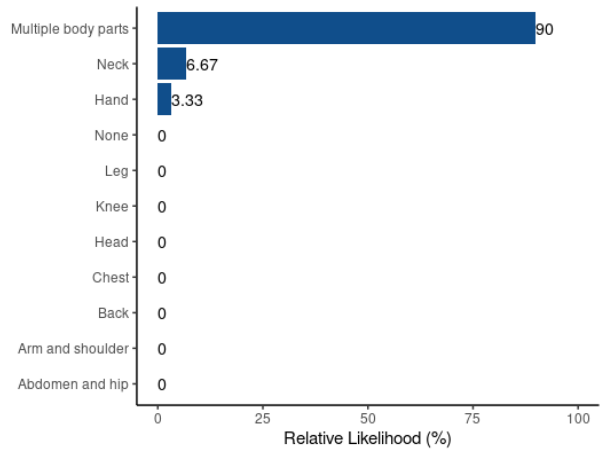
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

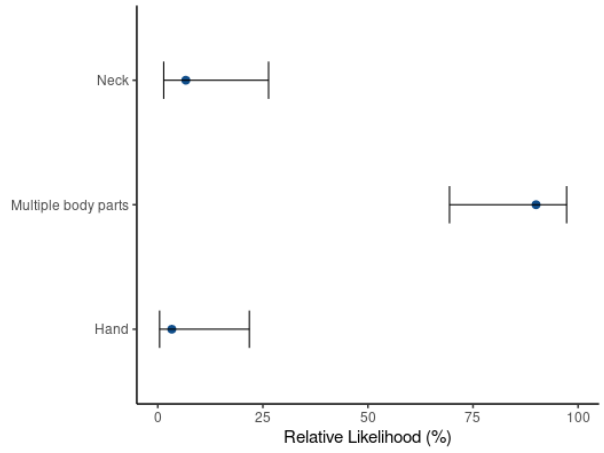
Predicted Variable: Injured Body Part

Given Variable: Injury Type

Attribute for Given Variable: Multiple types



Injured Body Part	Relative Likelihood (%)
Multiple body parts	90.00
Neck	6.67
Hand	3.33
None	0.00
Back	0.00
Arm and shoulder	0.00
Leg	0.00
Chest	0.00
Knee	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	90.00	69.41	97.28
Neck	6.67	1.41	26.36
Hand	3.33	0.43	21.78

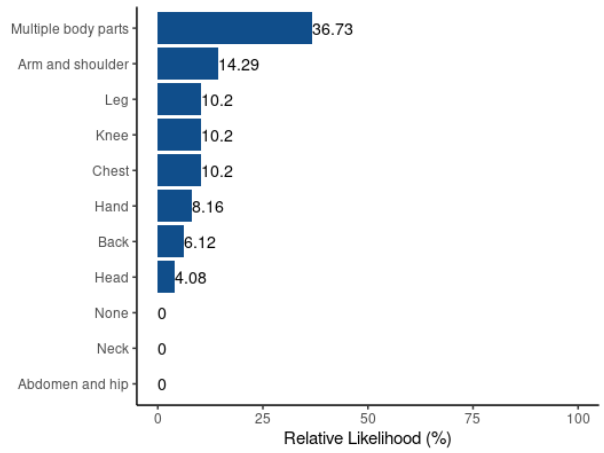
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

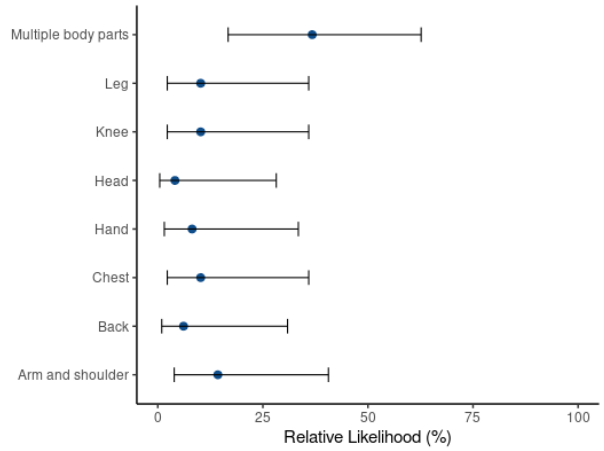
Predicted Variable: Injured Body Part

Given Variable: Injury Type

Attribute for Given Variable: Bruising or contusion



Injured Body Part	Relative Likelihood (%)
Multiple body parts	36.73
Arm and shoulder	14.29
Leg	10.20
Chest	10.20
Knee	10.20
Hand	8.16
Back	6.12
Head	4.08
Neck	0.00
None	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	36.73	16.73	62.65
Arm and shoulder	14.29	3.91	40.60
Chest	10.20	2.25	35.91
Knee	10.20	2.25	35.91
Leg	10.20	2.25	35.91
Hand	8.16	1.55	33.44
Back	6.12	0.94	30.88
Head	4.08	0.46	28.19

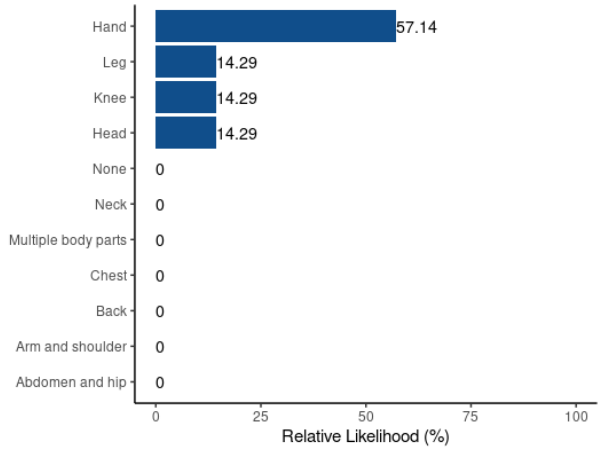
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

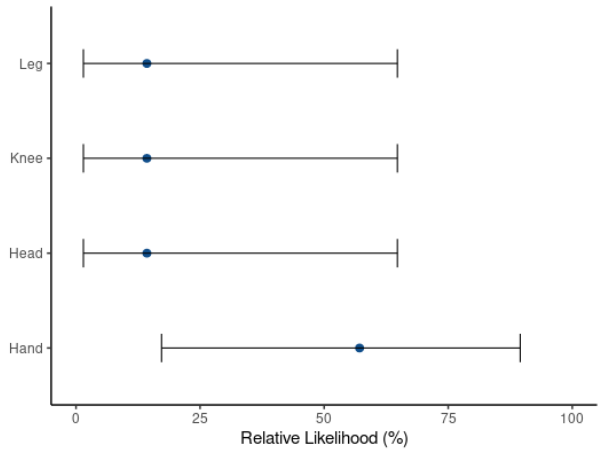
Predicted Variable: Injured Body Part

Given Variable: Injury Type

Attribute for Given Variable: Laceration



Injured Body Part	Relative Likelihood (%)
Hand	57.14
Leg	14.29
Knee	14.29
Head	14.29
Neck	0.00
Multiple body parts	0.00
None	0.00
Back	0.00
Arm and shoulder	0.00
Chest	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Hand	57.14	17.24	89.51
Head	14.29	1.49	64.76
Knee	14.29	1.49	64.76
Leg	14.29	1.49	64.76

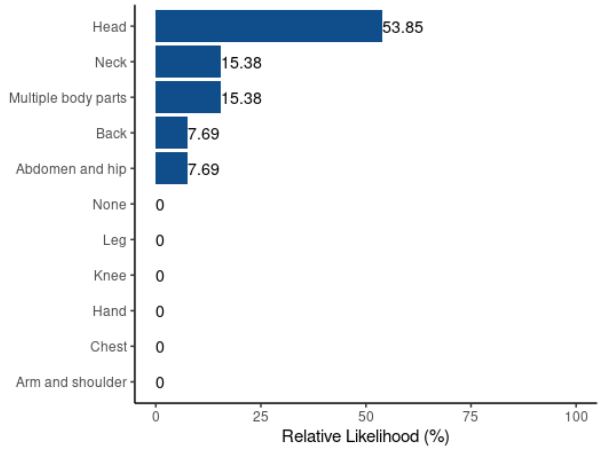
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

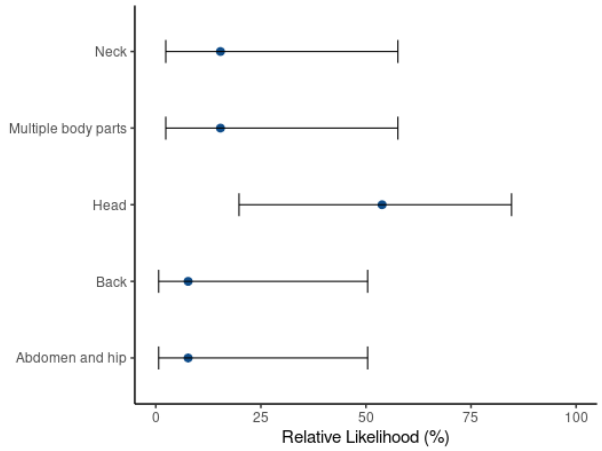
Predicted Variable: Injured Body Part

Given Variable: Injury Type

Attribute for Given Variable: Discomfort and pain



Injured Body Part	Relative Likelihood (%)
Head	53.85
Neck	15.38
Multiple body parts	15.38
Back	7.69
Abdomen and hip	7.69
None	0.00
Hand	0.00
Arm and shoulder	0.00
Leg	0.00
Chest	0.00
Knee	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Head	53.85	19.80	84.65
Multiple body parts	15.38	2.38	57.60
Neck	15.38	2.38	57.60
Abdomen and hip	7.69	0.68	50.41
Back	7.69	0.68	50.41

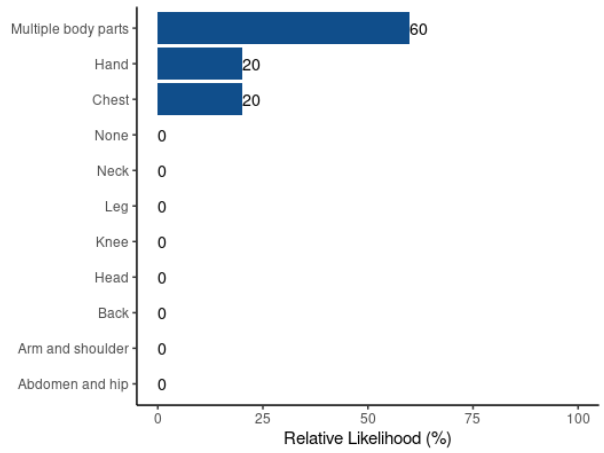
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

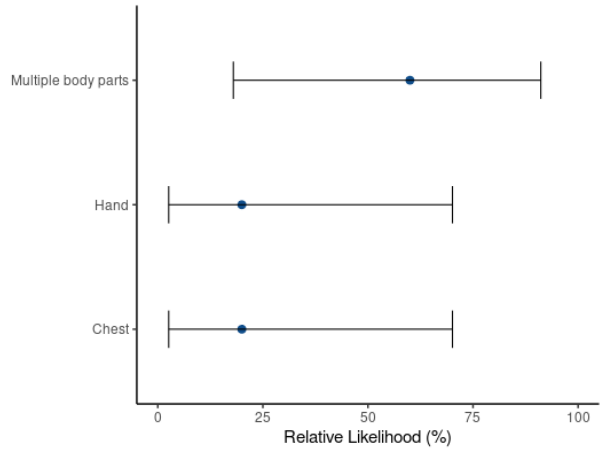
Predicted Variable: Injured Body Part

Given Variable: Injury Type

Attribute for Given Variable: Fracture



Injured Body Part	Relative Likelihood (%)
Multiple body parts	60.00
Hand	20.00
Chest	20.00
Neck	0.00
None	0.00
Back	0.00
Arm and shoulder	0.00
Leg	0.00
Knee	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	60.00	17.97	91.13
Chest	20.00	2.60	70.11
Hand	20.00	2.60	70.11

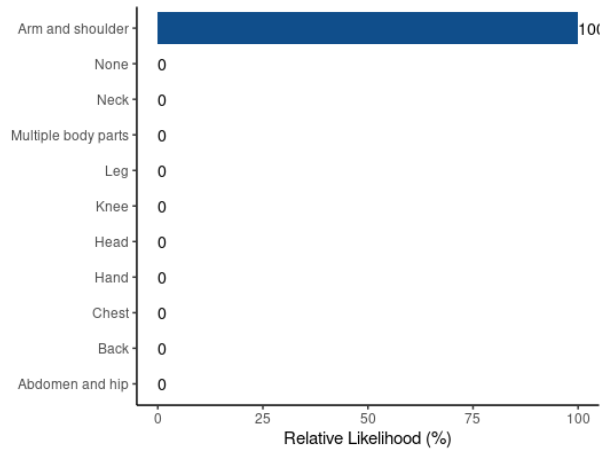
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

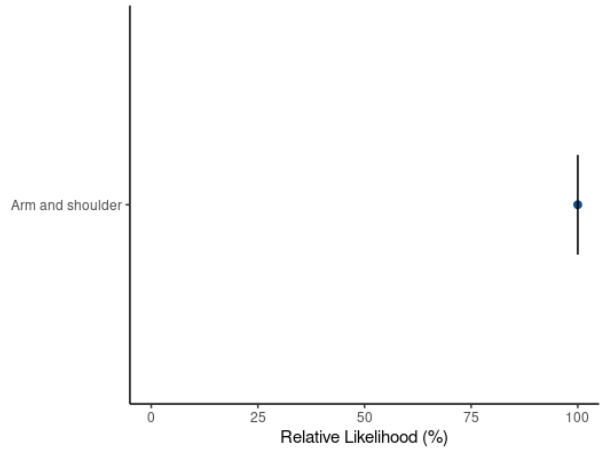
Predicted Variable: Injured Body Part

Given Variable: Injury Type

Attribute for Given Variable: Burn



Injured Body Part	Relative Likelihood (%)
Arm and shoulder	100.00
Neck	0.00
Multiple body parts	0.00
None	0.00
Back	0.00
Hand	0.00
Leg	0.00
Chest	0.00
Knee	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Arm and shoulder	100.00	100.00	100.00

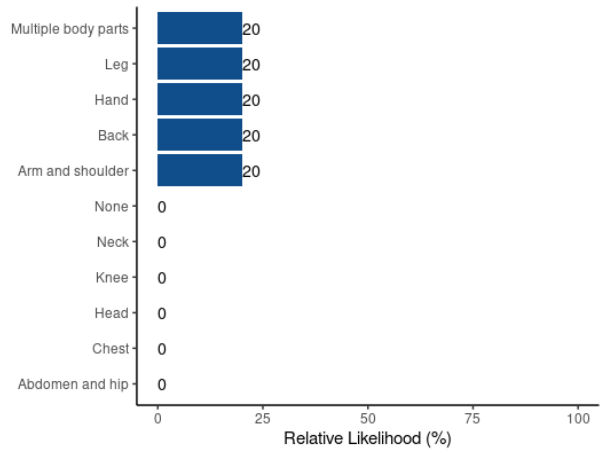
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

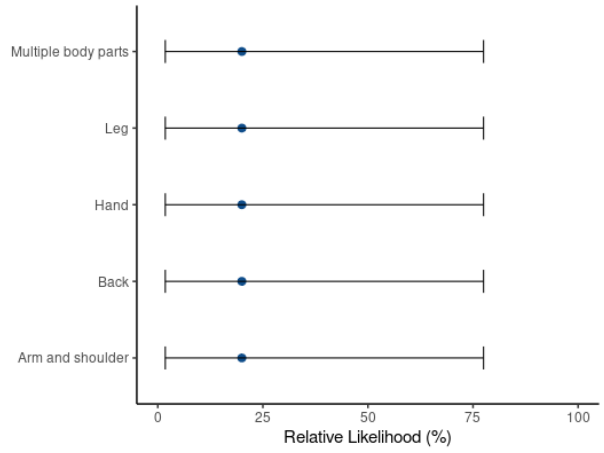
Predicted Variable: Injured Body Part

Given Variable: Injury Type

Attribute for Given Variable: Inflammation



Injured Body Part	Relative Likelihood (%)
Multiple body parts	20.00
Back	20.00
Hand	20.00
Arm and shoulder	20.00
Leg	20.00
Neck	0.00
None	0.00
Chest	0.00
Knee	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Arm and shoulder	20.00	1.78	77.51
Back	20.00	1.78	77.51
Hand	20.00	1.78	77.51
Leg	20.00	1.78	77.51
Multiple body parts	20.00	1.78	77.51

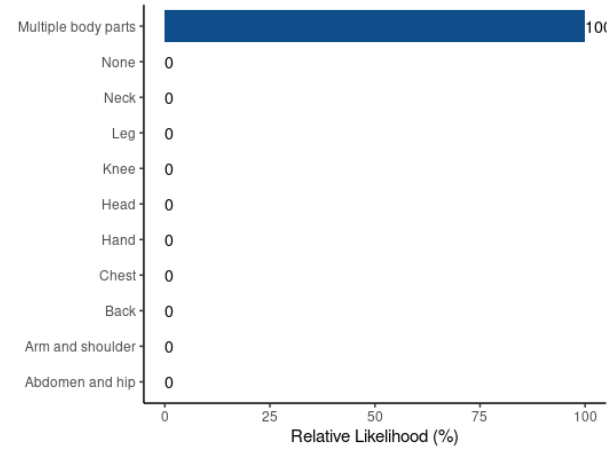
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

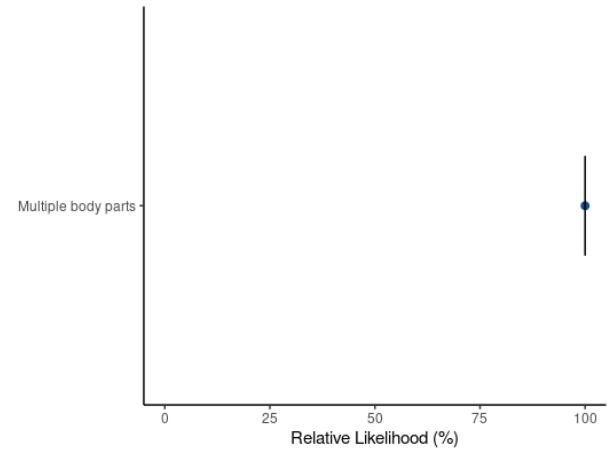
Predicted Variable: Injured Body Part

Given Variable: Injury Type

Attribute for Given Variable: Heatstroke



Injured Body Part	Relative Likelihood (%)
Multiple body parts	100.00
Neck	0.00
None	0.00
Back	0.00
Hand	0.00
Arm and shoulder	0.00
Leg	0.00
Chest	0.00
Knee	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	100.00	100.00	100.00

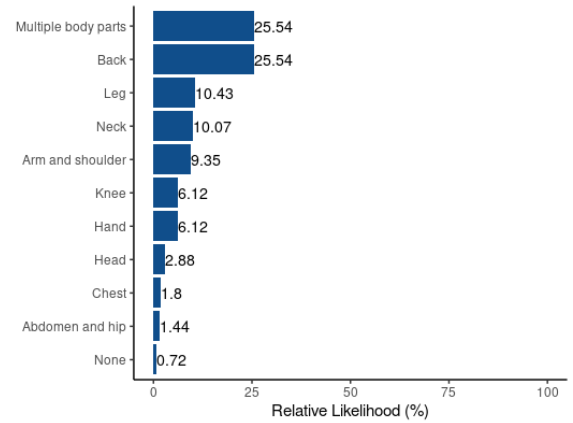
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

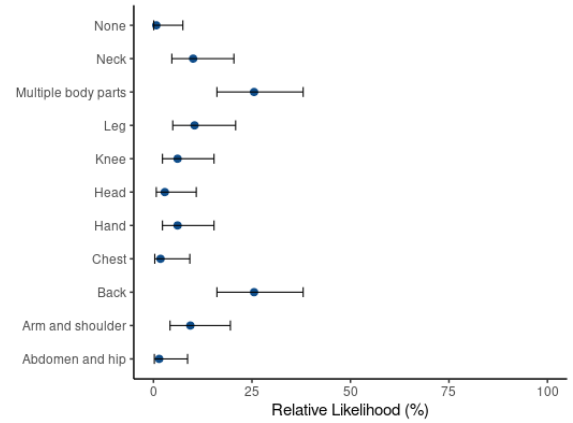
Predicted Variable: Injured Body Part

Given Variable: Injury Outcome

Attribute for Given Variable: Medical Case



Injured Body Part	Relative Likelihood (%)
Multiple body parts	25.54
Back	25.54
Leg	10.43
Neck	10.07
Arm and shoulder	9.35
Hand	6.12
Knee	6.12
Head	2.88
Chest	1.80
Abdomen and hip	1.44
None	0.72



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	25.54	16.11	38.00
Multiple body parts	25.54	16.11	38.00
Leg	10.43	4.89	20.86
Neck	10.07	4.66	20.42
Arm and shoulder	9.35	4.20	19.52
Hand	6.12	2.28	15.37
Knee	6.12	2.28	15.37
Head	2.88	0.72	10.86
Chest	1.80	0.33	9.22
Abdomen and hip	1.44	0.22	8.65
None	0.72	0.07	7.46

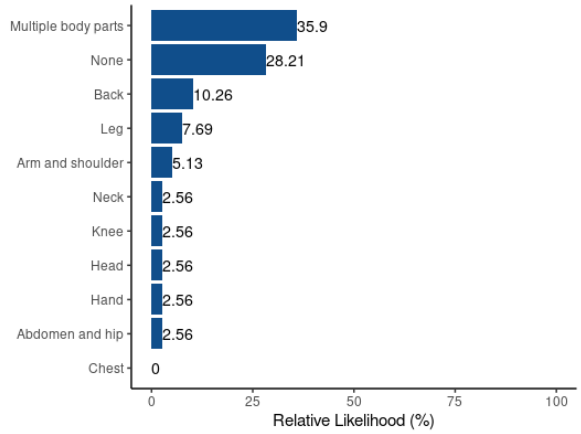
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

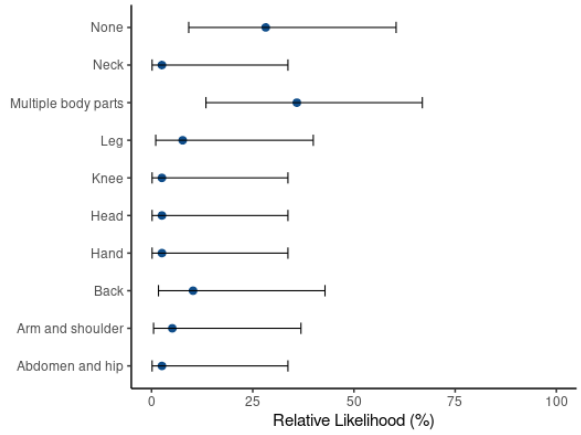
Predicted Variable: Injured Body Part

Given Variable: Injury Outcome

Attribute for Given Variable: Report only



Injured Body Part	Relative Likelihood (%)
Multiple body parts	35.90
None	28.21
Back	10.26
Leg	7.69
Arm and shoulder	5.13
Neck	2.56
Hand	2.56
Knee	2.56
Head	2.56
Abdomen and hip	2.56
Chest	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	35.90	13.44	66.89
None	28.21	9.18	60.42
Back	10.26	1.71	42.85
Leg	7.69	1.03	39.95
Arm and shoulder	5.13	0.50	36.91
Abdomen and hip	2.56	0.14	33.70
Hand	2.56	0.14	33.70
Head	2.56	0.14	33.70
Knee	2.56	0.14	33.70
Neck	2.56	0.14	33.70

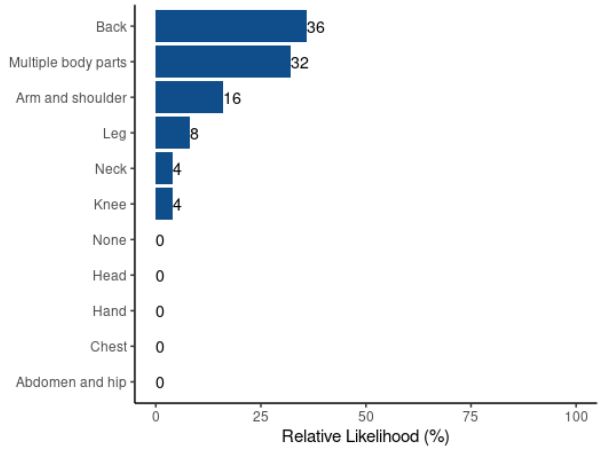
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

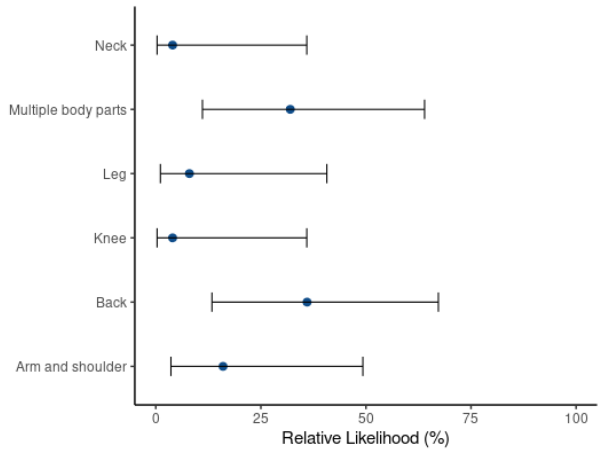
Predicted Variable: Injured Body Part

Given Variable: Injury Outcome

Attribute for Given Variable: Temporary disability



Injured Body Part	Relative Likelihood (%)
Back	36.00
Multiple body parts	32.00
Arm and shoulder	16.00
Leg	8.00
Neck	4.00
Knee	4.00
None	0.00
Hand	0.00
Chest	0.00
Head	0.00
Abdomen and hip	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Back	36.00	13.36	67.23
Multiple body parts	32.00	11.10	63.95
Arm and shoulder	16.00	3.60	49.27
Leg	8.00	1.09	40.69
Knee	4.00	0.31	35.93
Neck	4.00	0.31	35.93

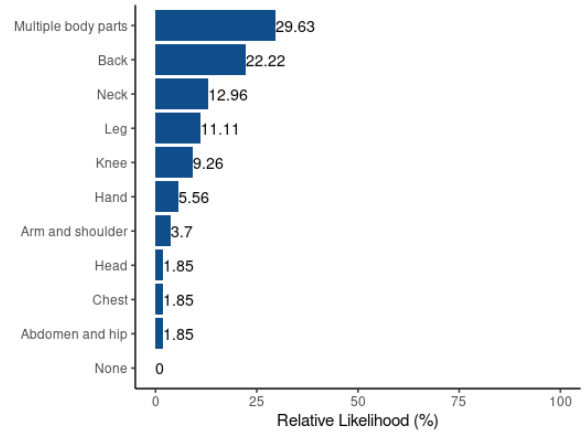
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

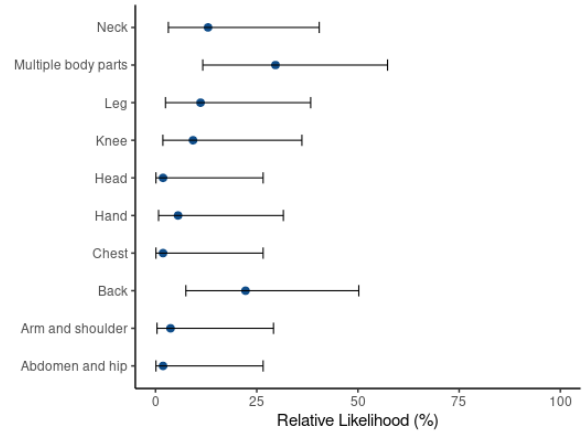
Predicted Variable: Injured Body Part

Given Variable: Injury Outcome

Attribute for Given Variable: Permanent disability



Injured Body Part	Relative Likelihood (%)
Multiple body parts	29.63
Back	22.22
Neck	12.96
Leg	11.11
Knee	9.26
Hand	5.56
Arm and shoulder	3.70
Chest	1.85
Head	1.85
Abdomen and hip	1.85
None	0.00



Injured Body Part	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Multiple body parts	29.63	11.66	57.32
Back	22.22	7.49	50.21
Neck	12.96	3.16	40.43
Leg	11.11	2.45	38.32
Knee	9.26	1.81	36.15
Hand	5.56	0.74	31.57
Arm and shoulder	3.70	0.36	29.14
Abdomen and hip	1.85	0.10	26.58
Chest	1.85	0.10	26.58
Head	1.85	0.10	26.58

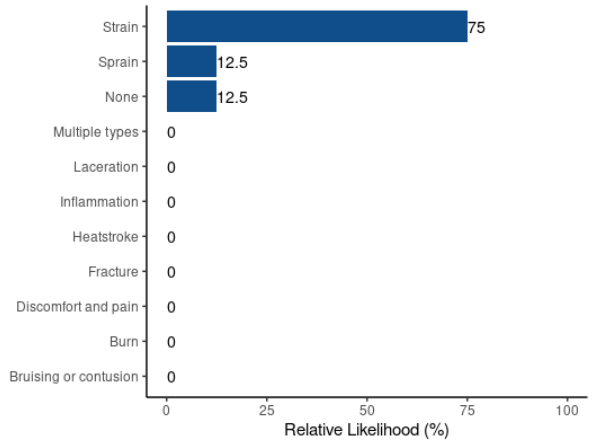
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

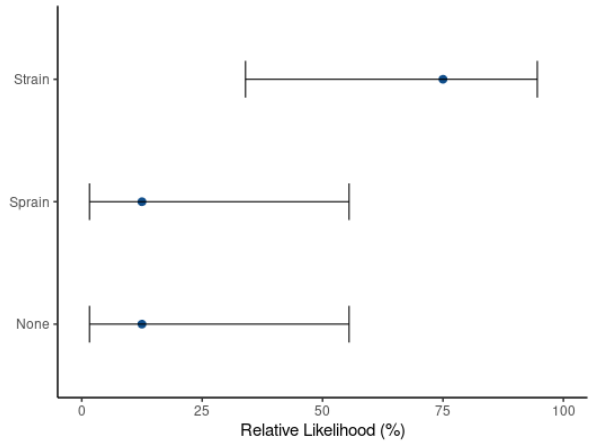
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Unsafe lane change / Oversteering / Overcorrecting



Injury Type	Relative Likelihood (%)
Strain	75.00
Sprain	12.50
None	12.50
Multiple types	0.00
Bruising or contusion	0.00
Laceration	0.00
Discomfort and pain	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	75.00	34.00	94.59
None	12.50	1.61	55.51
Sprain	12.50	1.61	55.51

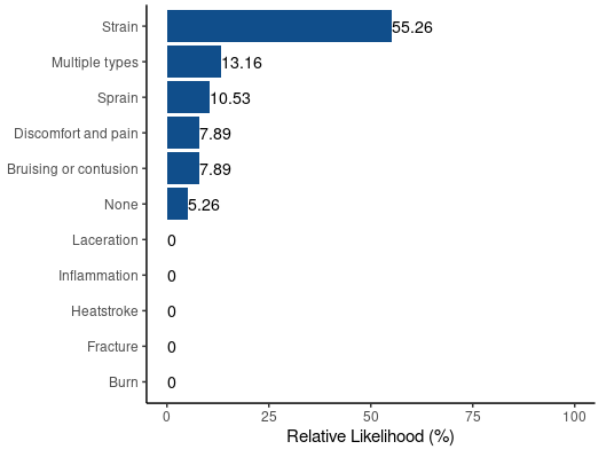
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

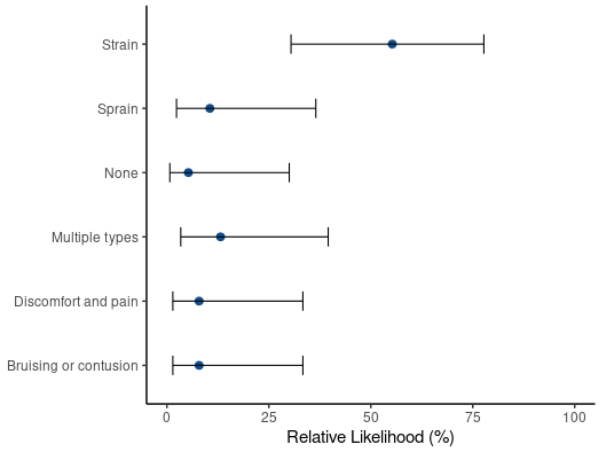
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Fault of other Driver



Injury Type	Relative Likelihood (%)
Strain	55.26
Multiple types	13.16
Sprain	10.53
Bruising or contusion	7.89
Discomfort and pain	7.89
None	5.26
Laceration	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	55.26	30.43	77.72
Multiple types	13.16	3.39	39.55
Sprain	10.53	2.35	36.51
Bruising or contusion	7.89	1.45	33.34
Discomfort and pain	7.89	1.45	33.34
None	5.26	0.72	30.00

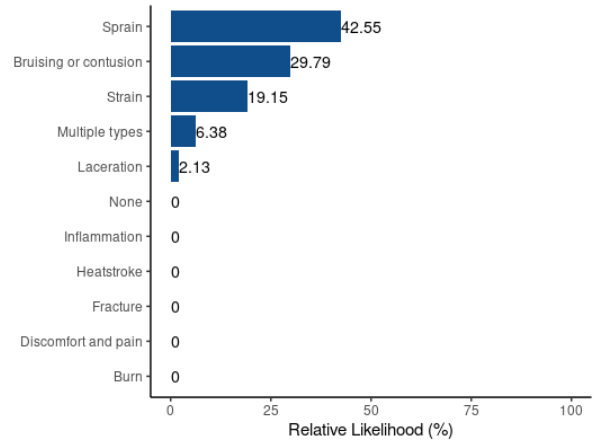
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

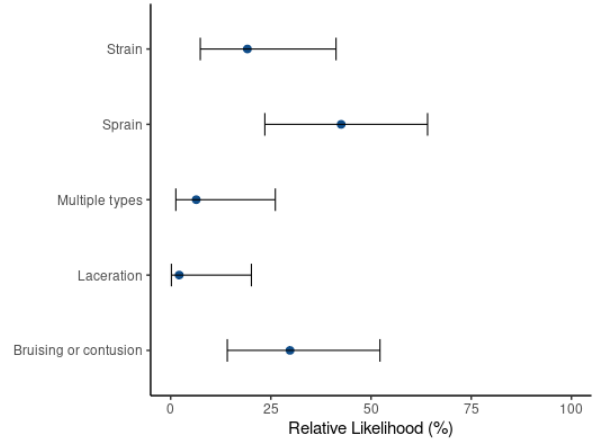
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Uneven surface / Object on ground / Loss of balance



Injury Type	Relative Likelihood (%)
Sprain	42.55
Bruising or contusion	29.79
Strain	19.15
Multiple types	6.38
Laceration	2.13
None	0.00
Discomfort and pain	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Sprain	42.55	23.50	64.11
Bruising or contusion	29.79	14.13	52.23
Strain	19.15	7.39	41.27
Multiple types	6.38	1.30	26.12
Laceration	2.13	0.19	20.15

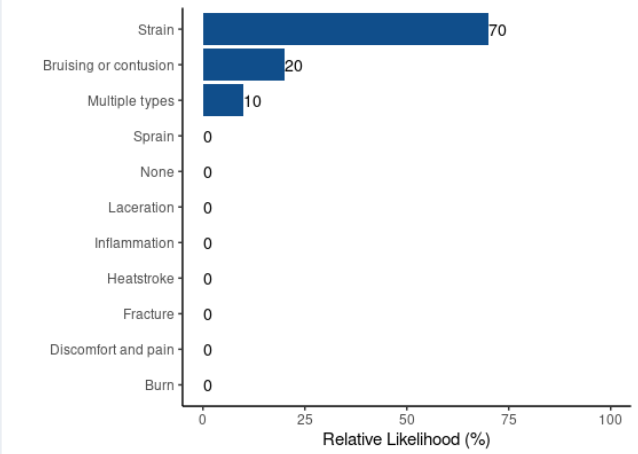
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

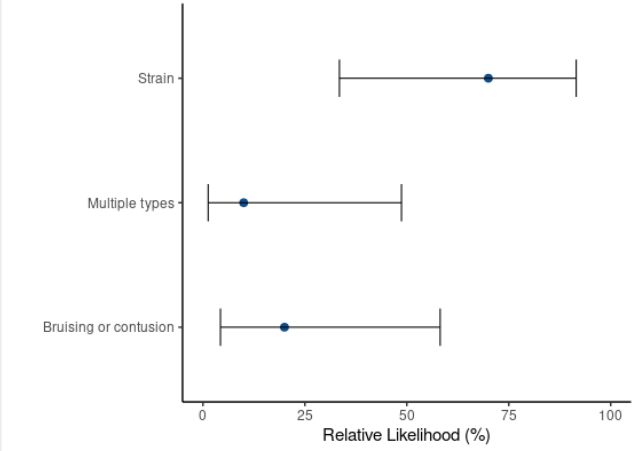
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Speeding



Injury Type	Relative Likelihood (%)
Strain	70.00
Bruising or contusion	20.00
Multiple types	10.00
Sprain	0.00
None	0.00
Laceration	0.00
Discomfort and pain	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	70.00	33.47	91.54
Bruising or contusion	20.00	4.30	58.18
Multiple types	10.00	1.28	48.69

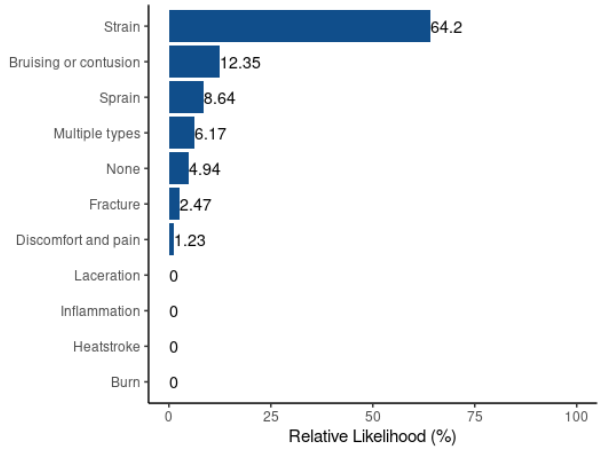
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

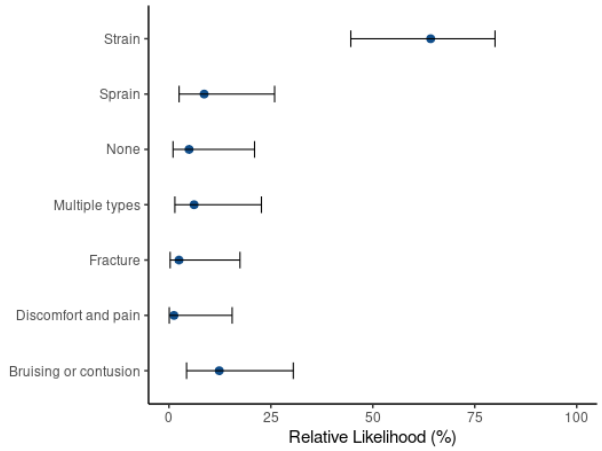
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to maintain control of vehicle



Injury Type	Relative Likelihood (%)
Strain	64.20
Bruising or contusion	12.35
Sprain	8.64
Multiple types	6.17
None	4.94
Fracture	2.47
Discomfort and pain	1.23
Laceration	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	64.20	44.60	79.98
Bruising or contusion	12.35	4.33	30.50
Sprain	8.64	2.49	25.92
Multiple types	6.17	1.45	22.68
None	4.94	1.01	21.00
Fracture	2.47	0.30	17.42
Discomfort and pain	1.23	0.09	15.51

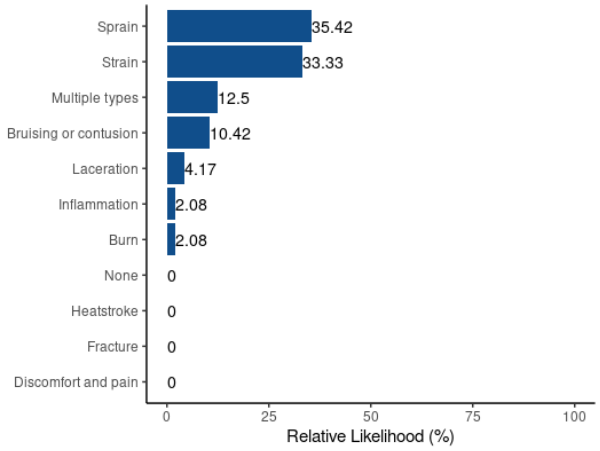
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

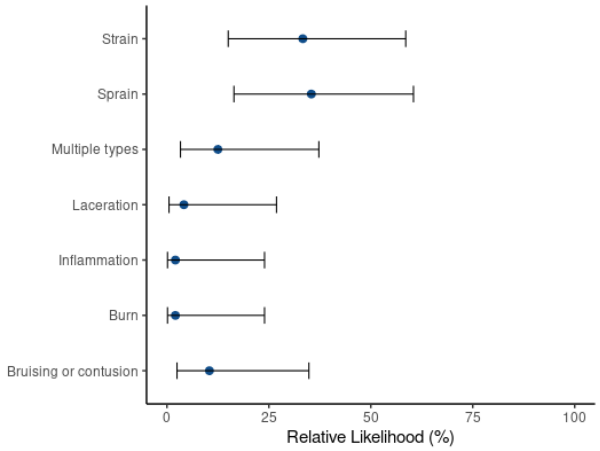
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Exiting the vehicle



Injury Type	Relative Likelihood (%)
Sprain	35.42
Strain	33.33
Multiple types	12.50
Bruising or contusion	10.42
Laceration	4.17
Burn	2.08
Inflammation	2.08
None	0.00
Discomfort and pain	0.00
Fracture	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Sprain	35.42	16.44	60.46
Strain	33.33	15.03	58.56
Multiple types	12.50	3.32	37.26
Bruising or contusion	10.42	2.47	34.82
Laceration	4.17	0.51	26.87
Burn	2.08	0.14	23.94
Inflammation	2.08	0.14	23.94

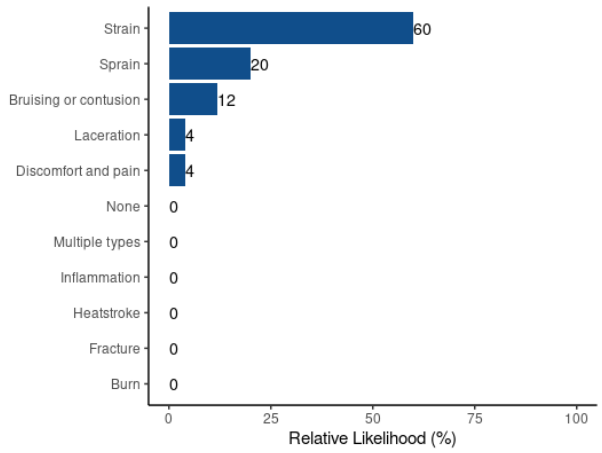
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

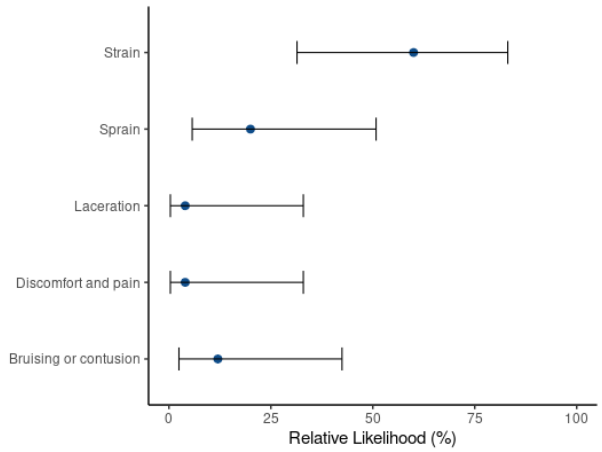
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Entering the vehicle



Injury Type	Relative Likelihood (%)
Strain	60.00
Sprain	20.00
Bruising or contusion	12.00
Laceration	4.00
Discomfort and pain	4.00
None	0.00
Multiple types	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	60.00	31.41	83.09
Sprain	20.00	5.71	50.80
Bruising or contusion	12.00	2.46	42.45
Discomfort and pain	4.00	0.35	32.96
Laceration	4.00	0.35	32.96

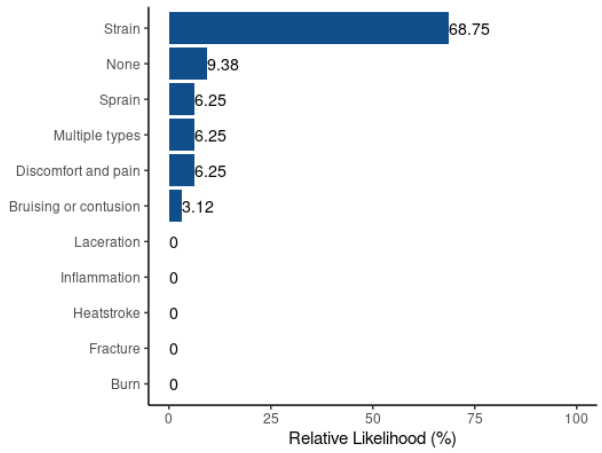
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

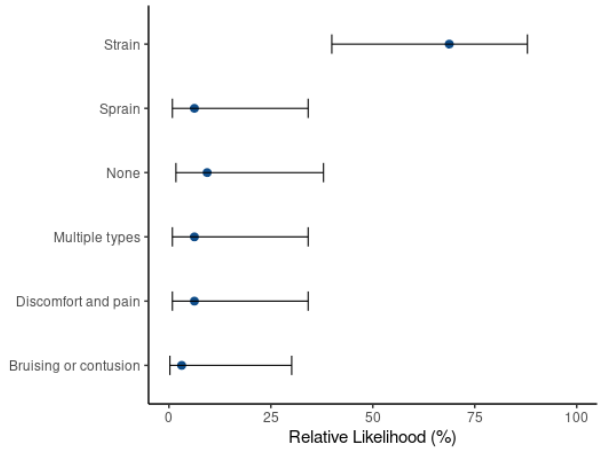
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt acceleration



Injury Type	Relative Likelihood (%)
Strain	68.75
None	9.38
Sprain	6.25
Multiple types	6.25
Discomfort and pain	6.25
Bruising or contusion	3.12
Laceration	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	68.75	39.94	87.92
None	9.38	1.72	37.91
Discomfort and pain	6.25	0.85	34.14
Multiple types	6.25	0.85	34.14
Sprain	6.25	0.85	34.14
Bruising or contusion	3.12	0.24	30.11

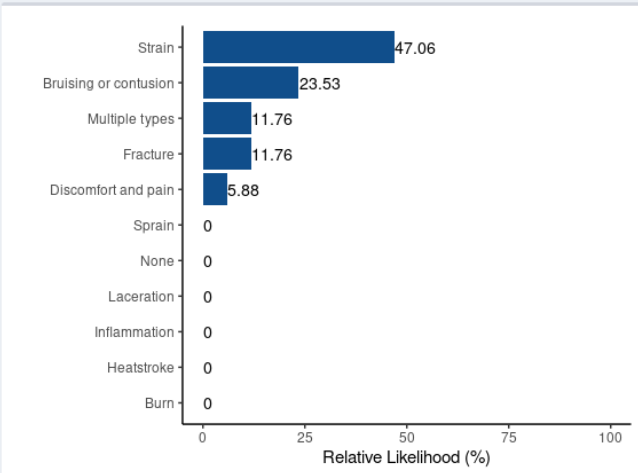
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

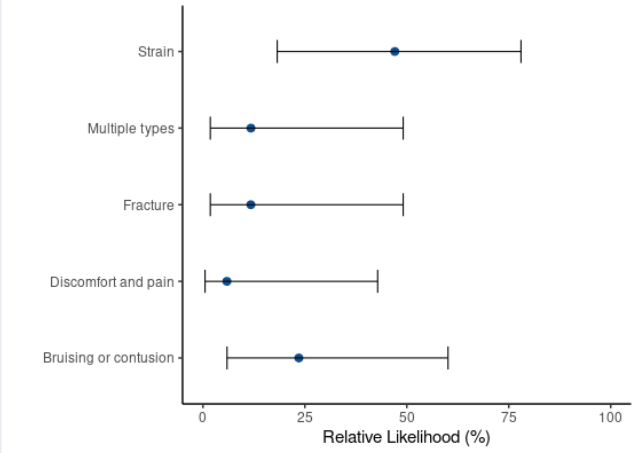
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to yield right of way



Injury Type	Relative Likelihood (%)
Strain	47.06
Bruising or contusion	23.53
Multiple types	11.76
Fracture	11.76
Discomfort and pain	5.88
Sprain	0.00
None	0.00
Laceration	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	47.06	18.22	78.00
Bruising or contusion	23.53	5.91	60.11
Fracture	11.76	1.81	49.11
Multiple types	11.76	1.81	49.11
Discomfort and pain	5.88	0.52	42.85

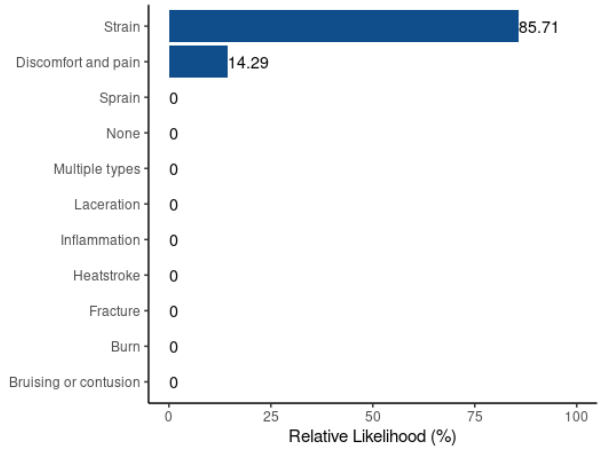
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

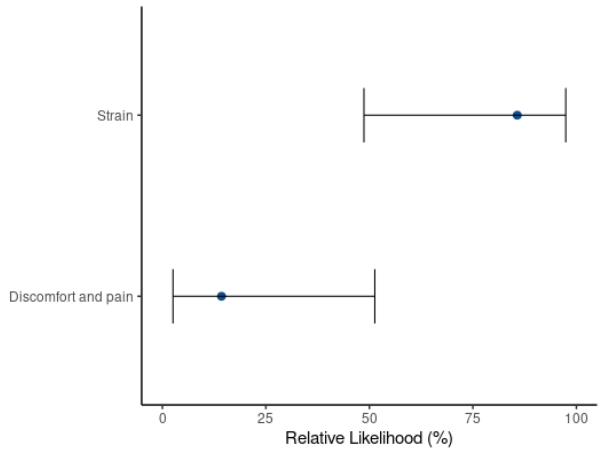
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to stop at stop sign or red light



Injury Type	Relative Likelihood (%)
Strain	85.71
Discomfort and pain	14.29
Sprain	0.00
None	0.00
Multiple types	0.00
Bruising or contusion	0.00
Laceration	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	85.71	48.69	97.43
Discomfort and pain	14.29	2.57	51.31

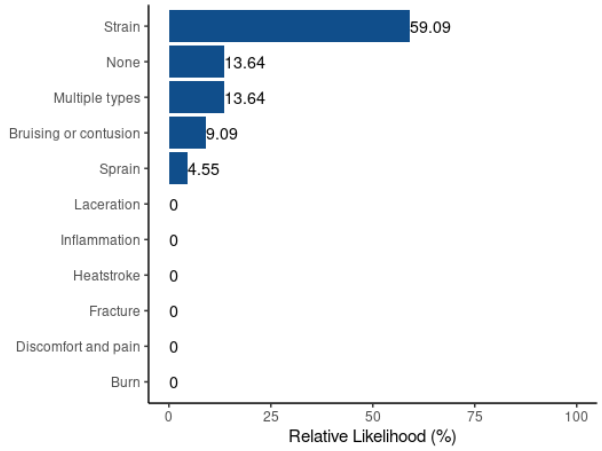
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

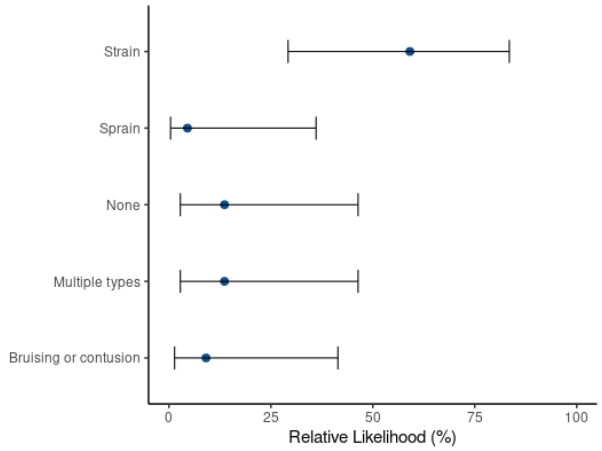
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Backing vehicle from parking space



Injury Type	Relative Likelihood (%)
Strain	59.09
None	13.64
Multiple types	13.64
Bruising or contusion	9.09
Sprain	4.55
Laceration	0.00
Discomfort and pain	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	59.09	29.22	83.48
Multiple types	13.64	2.80	46.39
None	13.64	2.80	46.39
Bruising or contusion	9.09	1.39	41.44
Sprain	4.55	0.40	36.08

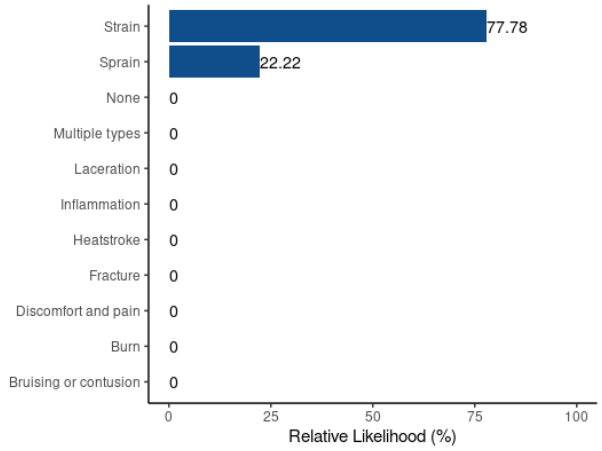
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

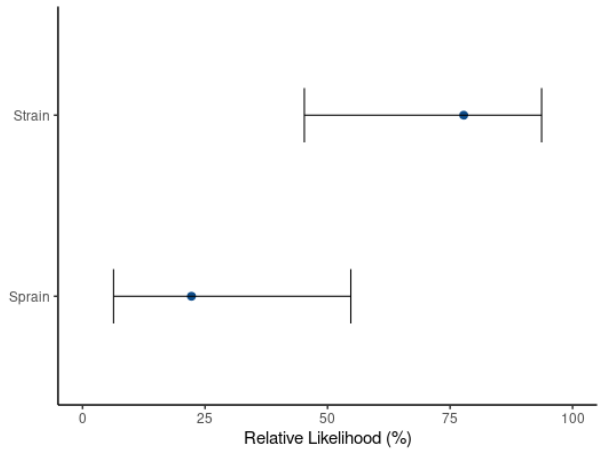
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt postural change / Poor posture



Injury Type	Relative Likelihood (%)
Strain	77.78
Sprain	22.22
None	0.00
Multiple types	0.00
Bruising or contusion	0.00
Laceration	0.00
Discomfort and pain	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	77.78	45.26	93.68
Sprain	22.22	6.32	54.74

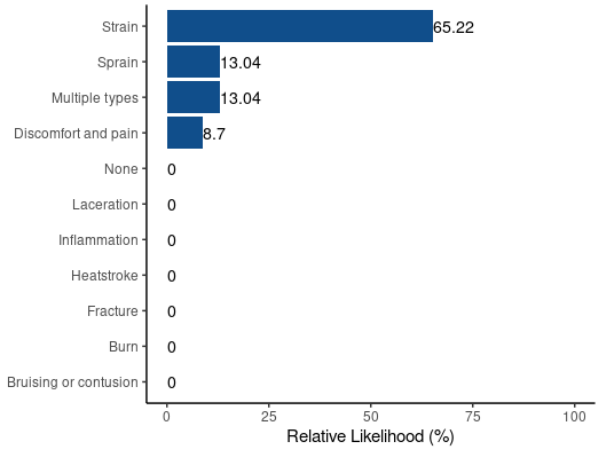
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

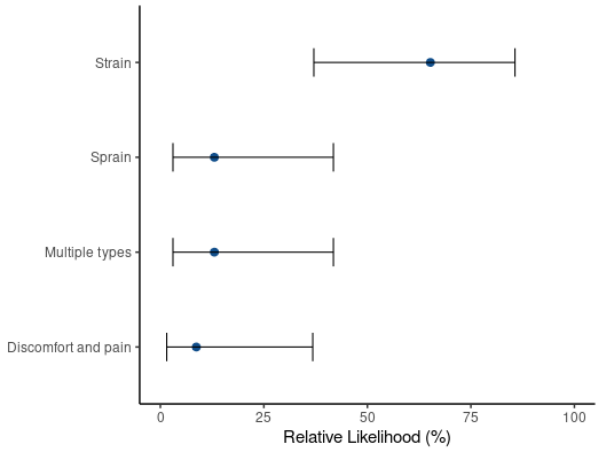
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt braking



Injury Type	Relative Likelihood (%)
Strain	65.22
Sprain	13.04
Multiple types	13.04
Discomfort and pain	8.70
None	0.00
Bruising or contusion	0.00
Laceration	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	65.22	37.06	85.65
Multiple types	13.04	3.04	41.79
Sprain	13.04	3.04	41.79
Discomfort and pain	8.70	1.53	36.81

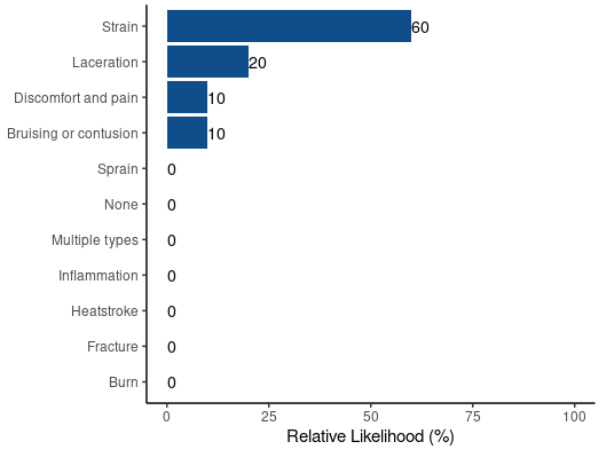
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

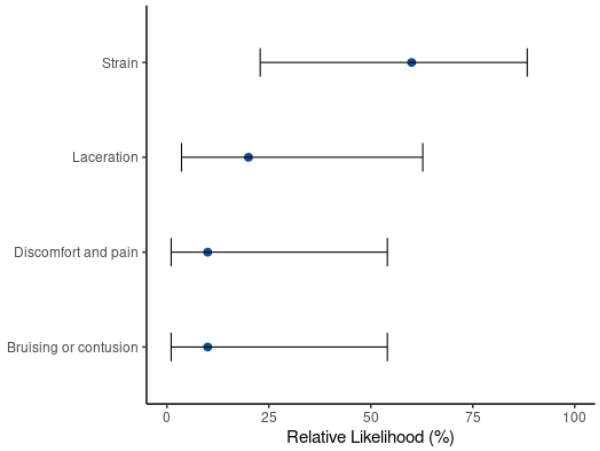
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Manual handling / Lifting



Injury Type	Relative Likelihood (%)
Strain	60.00
Laceration	20.00
Bruising or contusion	10.00
Discomfort and pain	10.00
Sprain	0.00
None	0.00
Multiple types	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	60.00	22.87	88.36
Laceration	20.00	3.58	62.74
Bruising or contusion	10.00	1.04	54.05
Discomfort and pain	10.00	1.04	54.05

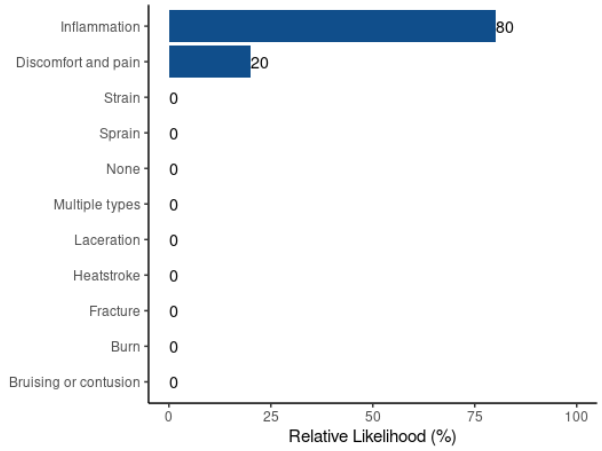
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

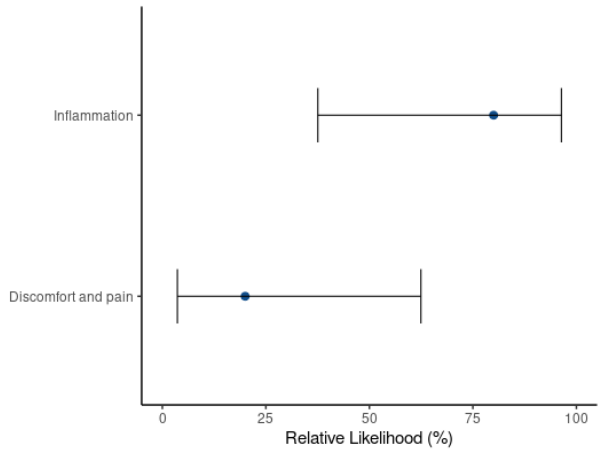
Predicted Variable: Injury Type

Given Variable: Contributing Factor

Attribute for Given Variable: Animal / Insect



Injury Type	Relative Likelihood (%)
Inflammation	80.00
Discomfort and pain	20.00
Sprain	0.00
Strain	0.00
None	0.00
Multiple types	0.00
Bruising or contusion	0.00
Laceration	0.00
Fracture	0.00
Burn	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Inflammation	80.00	37.55	96.38
Discomfort and pain	20.00	3.62	62.45

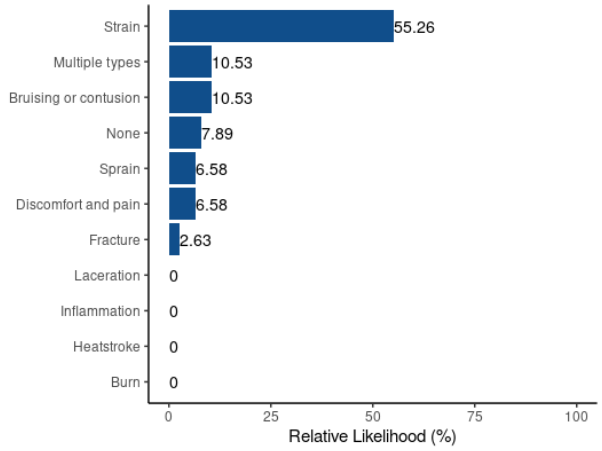
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

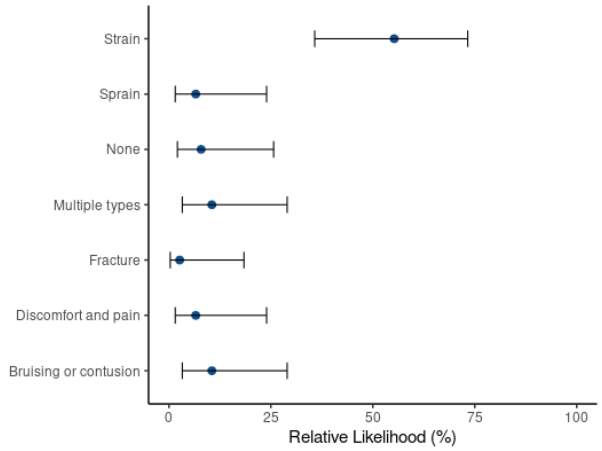
Predicted Variable: Injury Type

Given Variable: Event Type

Attribute for Given Variable: Collision with another vechicle



Injury Type	Relative Likelihood (%)
Strain	55.26
Multiple types	10.53
Bruising or contusion	10.53
None	7.89
Sprain	6.58
Discomfort and pain	6.58
Fracture	2.63
Laceration	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	55.26	35.75	73.28
Bruising or contusion	10.53	3.28	29.00
Multiple types	10.53	3.28	29.00
None	7.89	2.08	25.68
Discomfort and pain	6.58	1.55	23.95
Sprain	6.58	1.55	23.95
Fracture	2.63	0.32	18.41

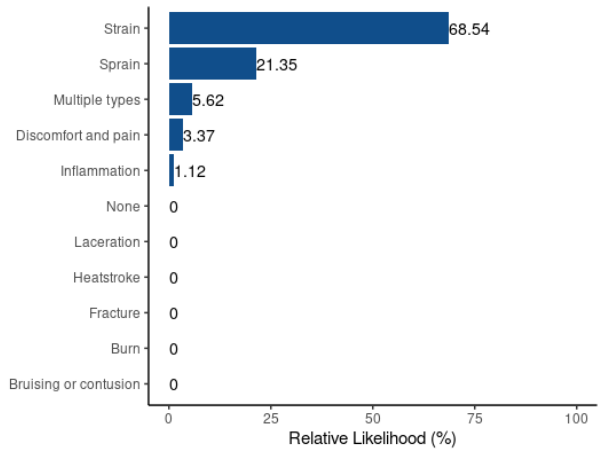
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

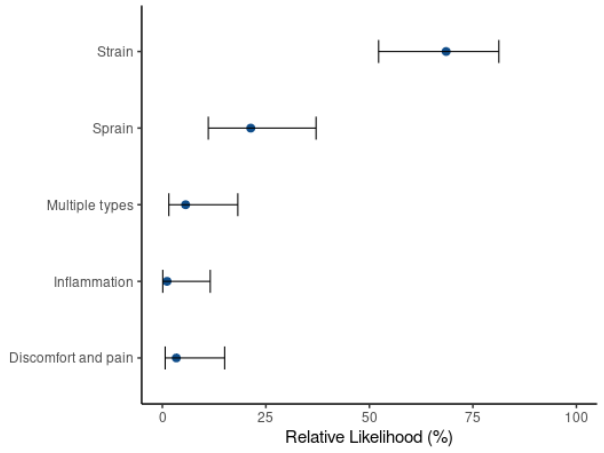
Predicted Variable: Injury Type

Given Variable: Event Type

Attribute for Given Variable: Overexertion and physical bodily reaction



Injury Type	Relative Likelihood (%)
Strain	68.54
Sprain	21.35
Multiple types	5.62
Discomfort and pain	3.37
Inflammation	1.12
None	0.00
Bruising or contusion	0.00
Laceration	0.00
Fracture	0.00
Burn	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	68.54	52.23	81.28
Sprain	21.35	11.09	37.12
Multiple types	5.62	1.57	18.22
Discomfort and pain	3.37	0.68	15.04
Inflammation	1.12	0.10	11.57

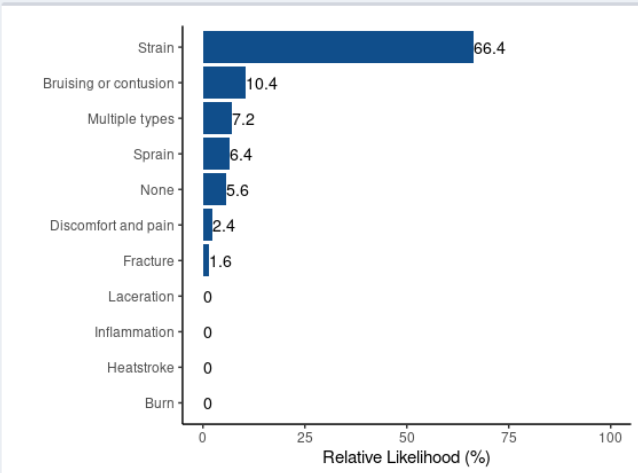
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

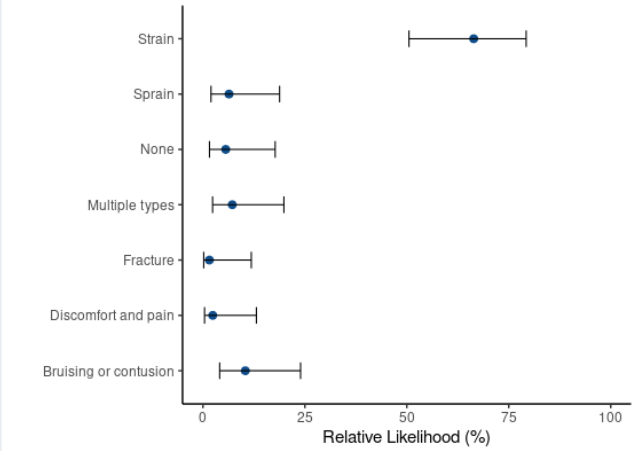
Predicted Variable: Injury Type

Given Variable: Event Type

Attribute for Given Variable: Collision with fixed object



Injury Type	Relative Likelihood (%)
Strain	66.40
Bruising or contusion	10.40
Multiple types	7.20
Sprain	6.40
None	5.60
Discomfort and pain	2.40
Fracture	1.60
Laceration	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Strain	66.40	50.53	79.27
Bruising or contusion	10.40	4.10	23.94
Multiple types	7.20	2.37	19.86
Sprain	6.40	1.98	18.80
None	5.60	1.61	17.72
Discomfort and pain	2.40	0.40	13.11
Fracture	1.60	0.20	11.86

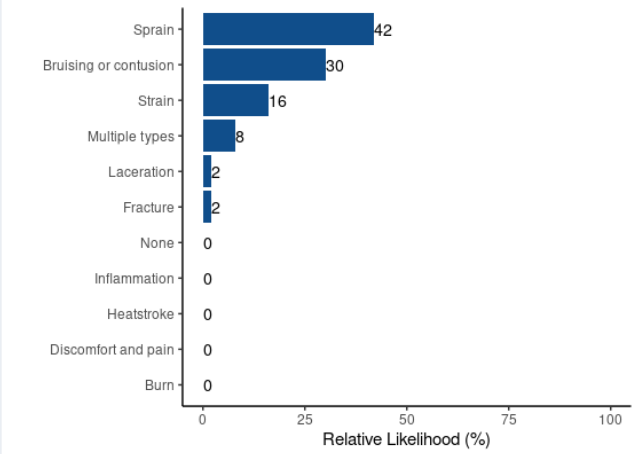
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

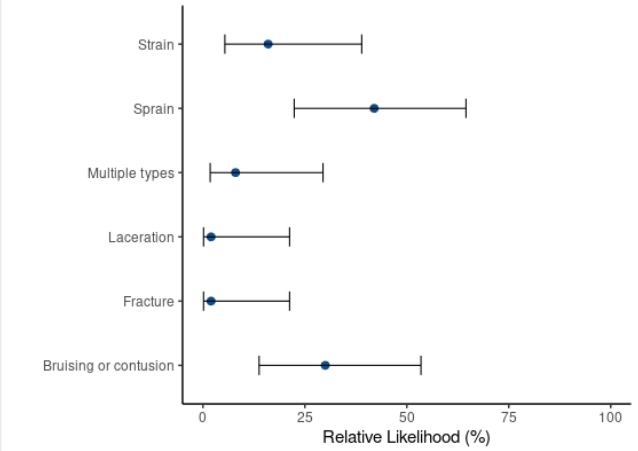
Predicted Variable: Injury Type

Given Variable: Event Type

Attribute for Given Variable: Fall on the same level



Injury Type	Relative Likelihood (%)
Sprain	42.00
Bruising or contusion	30.00
Strain	16.00
Multiple types	8.00
Laceration	2.00
Fracture	2.00
None	0.00
Discomfort and pain	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Sprain	42.00	22.39	64.51
Bruising or contusion	30.00	13.78	53.47
Strain	16.00	5.38	38.94
Multiple types	8.00	1.78	29.45
Fracture	2.00	0.15	21.25
Laceration	2.00	0.15	21.25

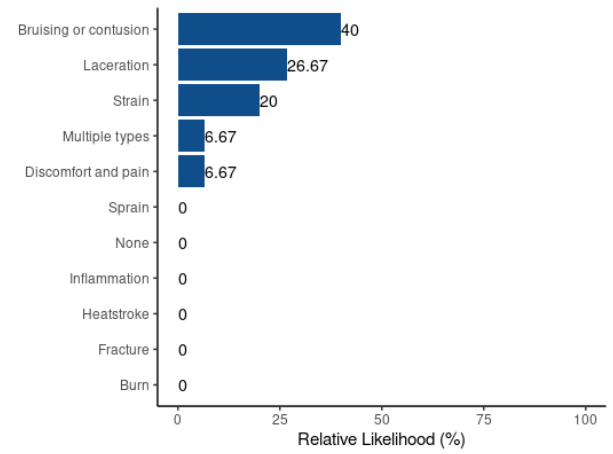
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

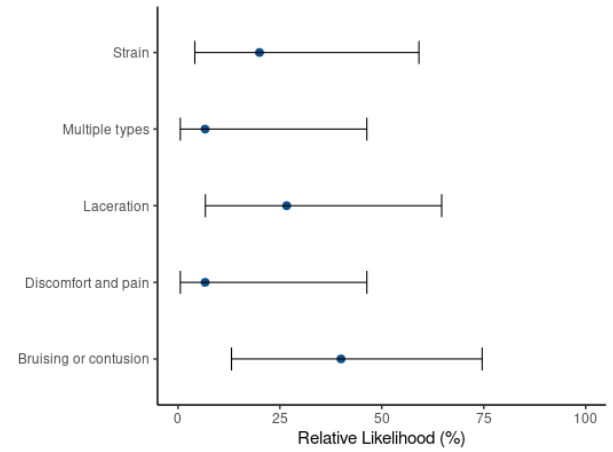
Predicted Variable: Injury Type

Given Variable: Event Type

Attribute for Given Variable: Struck-by or against



Injury Type	Relative Likelihood (%)
Bruising or contusion	40.00
Laceration	26.67
Strain	20.00
Multiple types	6.67
Discomfort and pain	6.67
Sprain	0.00
None	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Bruising or contusion	40.00	13.14	74.61
Laceration	26.67	6.73	64.68
Strain	20.00	4.15	59.10
Discomfort and pain	6.67	0.59	46.32
Multiple types	6.67	0.59	46.32

Safety Incidents Prediction Tool

About

Overall Probability

Condit. Prob. (One Variable)

Predicted Variable

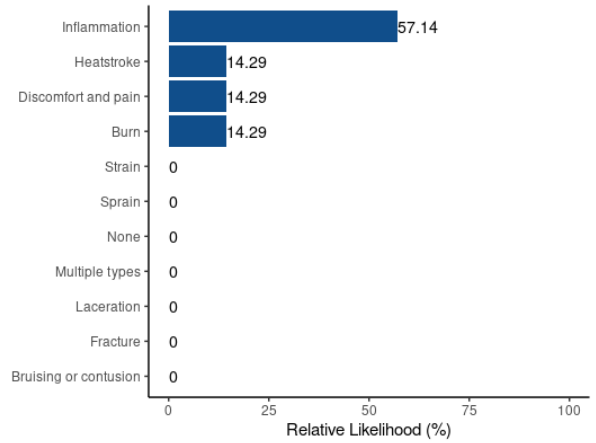
Injury Type

Given Variable

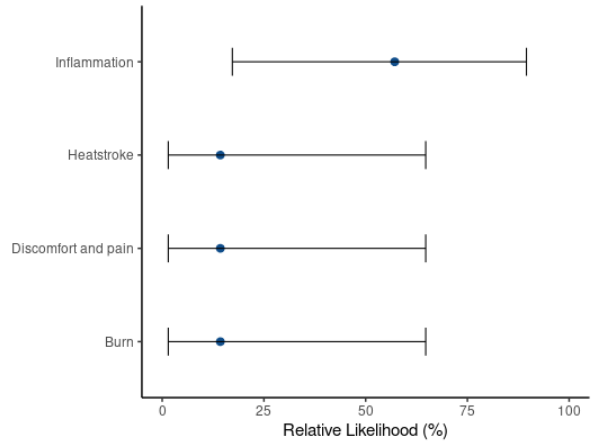
Event Type

Attribute for Given Variable

Exposure to harmful substances, surfaces, or environments



Injury Type	Relative Likelihood (%)
Inflammation	57.14
Discomfort and pain	14.29
Burn	14.29
Heatstroke	14.29
Sprain	0.00
Strain	0.00
None	0.00
Multiple types	0.00
Bruising or contusion	0.00
Laceration	0.00
Fracture	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Inflammation	57.14	17.24	89.51
Burn	14.29	1.49	64.76
Discomfort and pain	14.29	1.49	64.76
Heatstroke	14.29	1.49	64.76

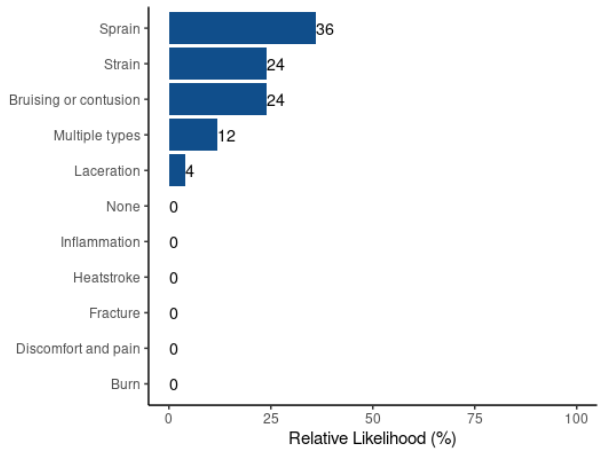
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

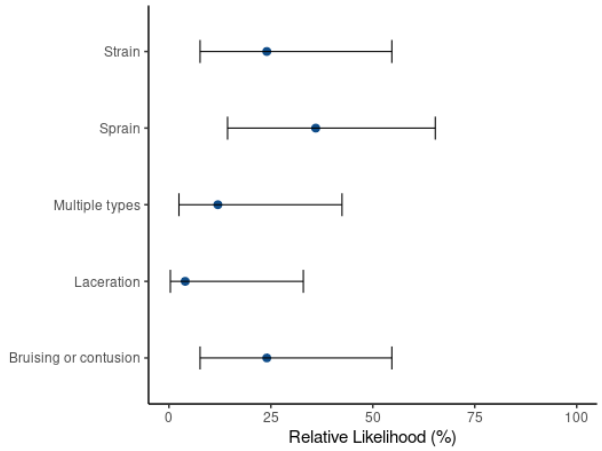
Predicted Variable: Injury Type

Given Variable: Event Type

Attribute for Given Variable: Fall to lower level



Injury Type	Relative Likelihood (%)
Sprain	36.00
Strain	24.00
Bruising or contusion	24.00
Multiple types	12.00
Laceration	4.00
None	0.00
Discomfort and pain	0.00
Fracture	0.00
Burn	0.00
Inflammation	0.00
Heatstroke	0.00



Injury Type	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Sprain	36.00	14.38	65.32
Bruising or contusion	24.00	7.64	54.67
Strain	24.00	7.64	54.67
Multiple types	12.00	2.46	42.45
Laceration	4.00	0.35	32.96

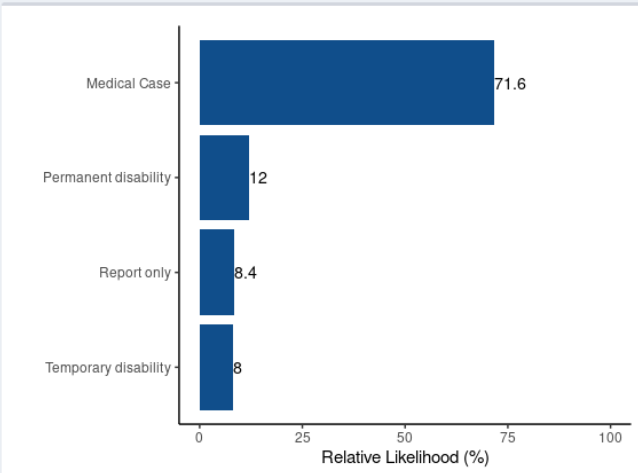
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

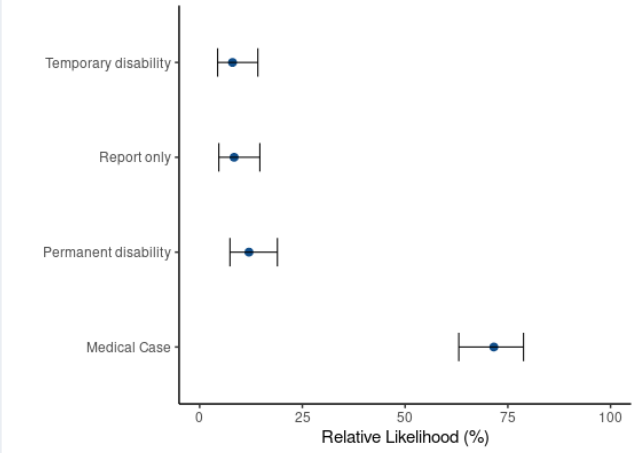
Predicted Variable: Injury Outcome

Given Variable: Driving Test Stage

Attribute for Given Variable: During



Injury Outcome	Relative Likelihood (%)
Medical Case	71.60
Permanent disability	12.00
Report only	8.40
Temporary disability	8.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	71.60	63.07	78.82
Permanent disability	12.00	7.38	18.93
Report only	8.40	4.67	14.65
Temporary disability	8.00	4.38	14.16

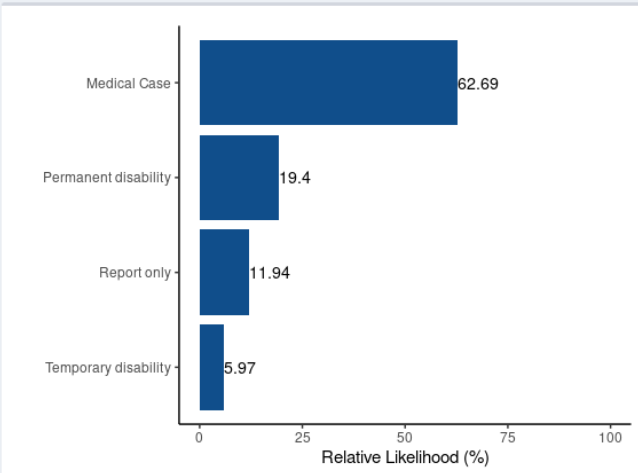
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

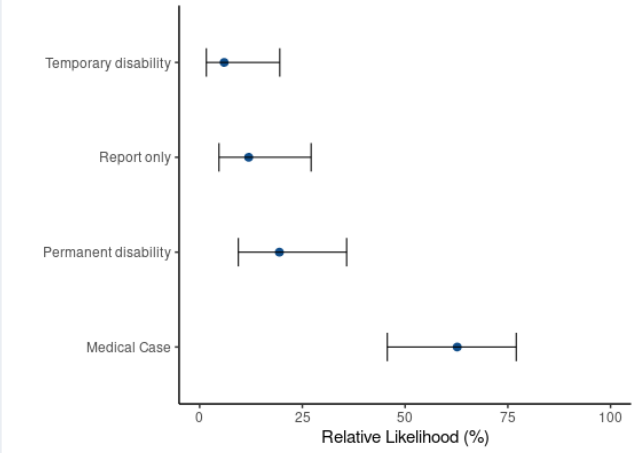
Predicted Variable: Injury Outcome

Given Variable: Driving Test Stage

Attribute for Given Variable: After



Injury Outcome	Relative Likelihood (%)
Medical Case	62.69
Permanent disability	19.40
Report only	11.94
Temporary disability	5.97



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	62.69	45.67	77.05
Permanent disability	19.40	9.42	35.77
Report only	11.94	4.71	27.12
Temporary disability	5.97	1.64	19.50

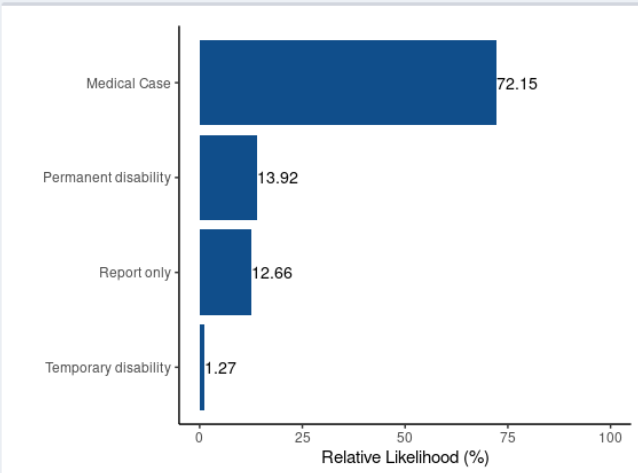
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

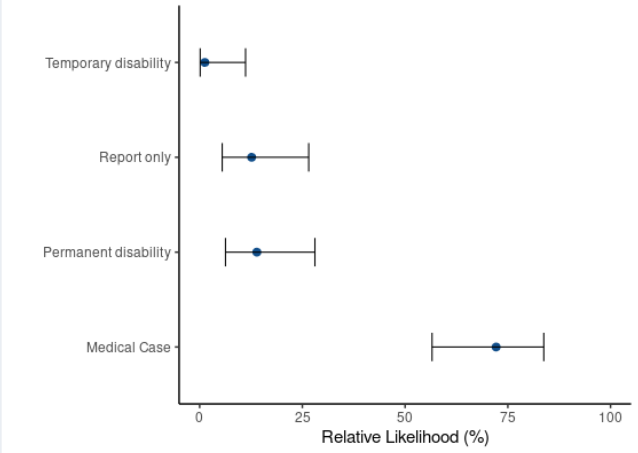
Predicted Variable: Injury Outcome

Given Variable: Driving Test Stage

Attribute for Given Variable: Before



Injury Outcome	Relative Likelihood (%)
Medical Case	72.15
Permanent disability	13.92
Report only	12.66
Temporary disability	1.27



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	72.15	56.56	83.75
Permanent disability	13.92	6.29	28.05
Report only	12.66	5.49	26.55
Temporary disability	1.27	0.13	11.17

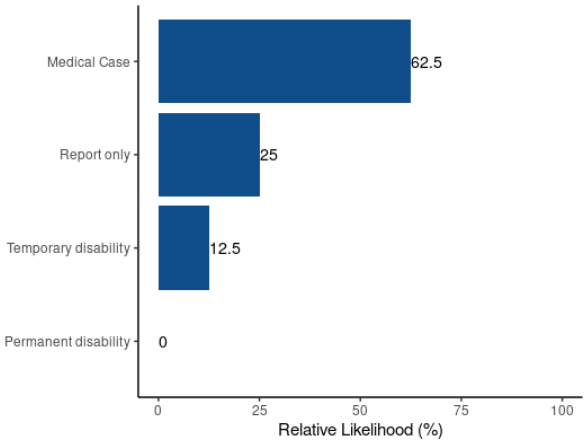
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

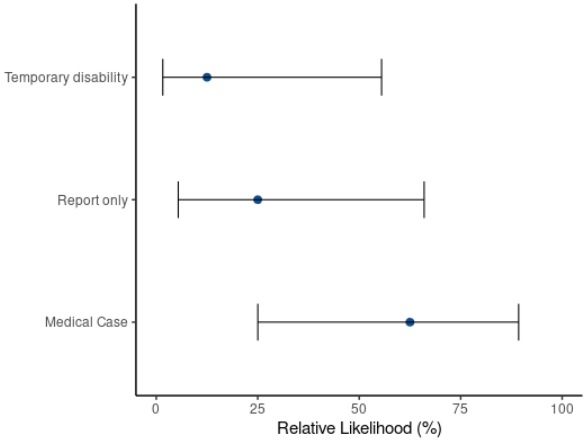
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Unsafe lane change / Oversteering / Overcorrecting



Injury Outcome	Relative Likelihood (%)
Medical Case	62.50
Report only	25.00
Temporary disability	12.50
Permanent disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	62.50	25.02	89.28
Report only	25.00	5.41	66.00
Temporary disability	12.50	1.61	55.51

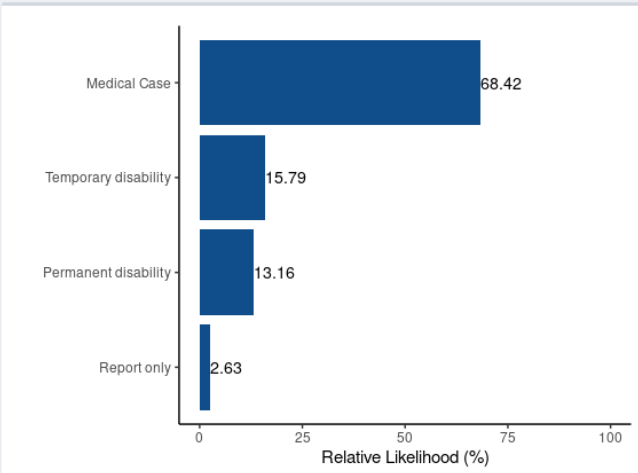
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

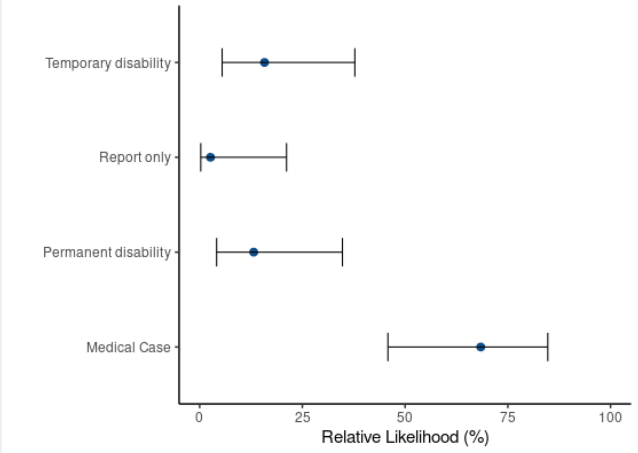
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Fault of other Driver



Injury Outcome	Relative Likelihood (%)
Medical Case	68.42
Temporary disability	15.79
Permanent disability	13.16
Report only	2.63



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	68.42	45.83	84.73
Temporary disability	15.79	5.47	37.78
Permanent disability	13.16	4.13	34.75
Report only	2.63	0.27	21.15

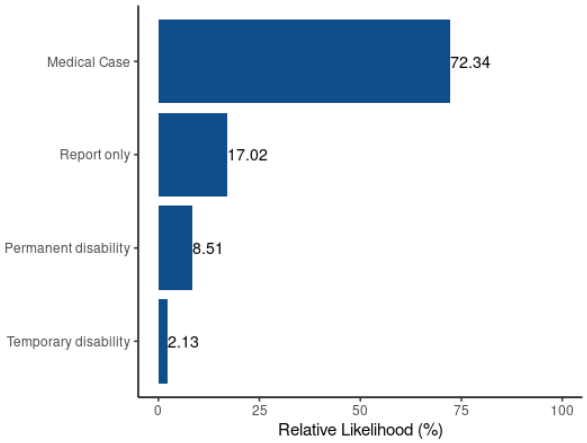
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

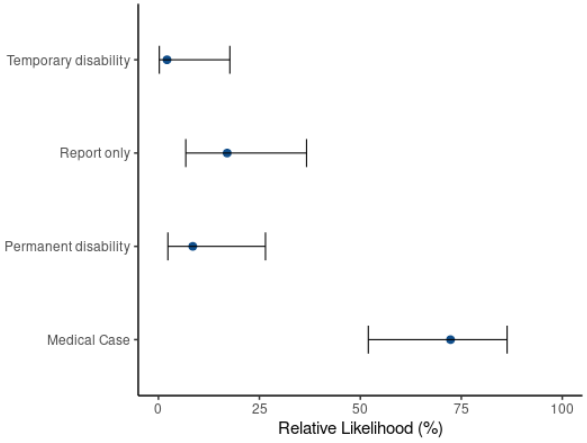
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Uneven surface / Object on ground / Loss of balance



Injury Outcome	Relative Likelihood (%)
Medical Case	72.34
Report only	17.02
Permanent disability	8.51
Temporary disability	2.13



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	72.34	51.97	86.34
Report only	17.02	6.77	36.67
Permanent disability	8.51	2.34	26.51
Temporary disability	2.13	0.22	17.69

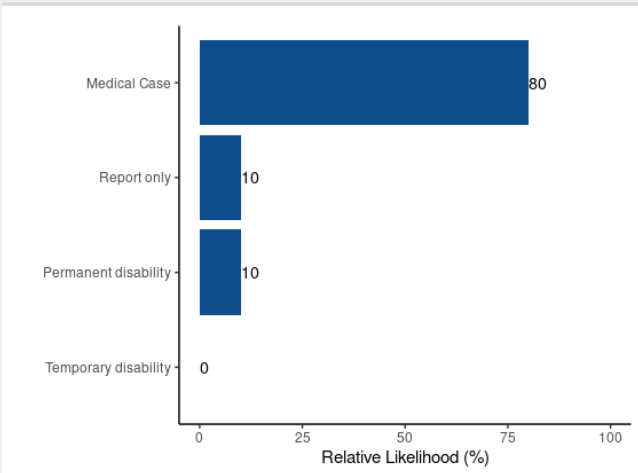
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

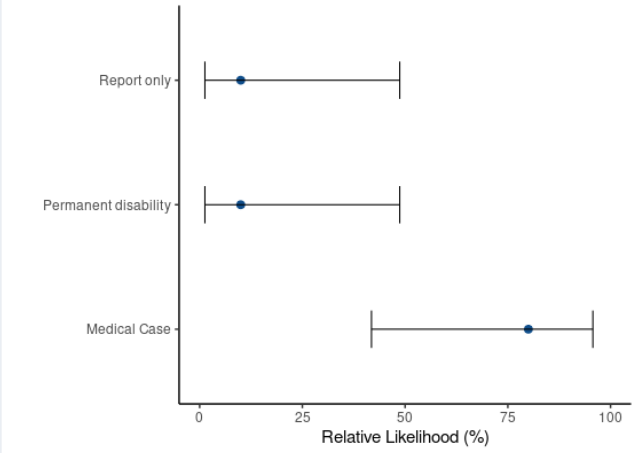
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Speeding



Injury Outcome	Relative Likelihood (%)
Medical Case	80.00
Report only	10.00
Permanent disability	10.00
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	80.00	41.82	95.70
Permanent disability	10.00	1.28	48.69
Report only	10.00	1.28	48.69

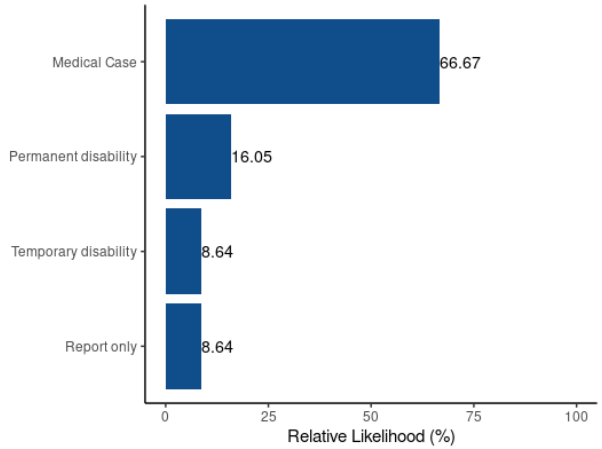
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

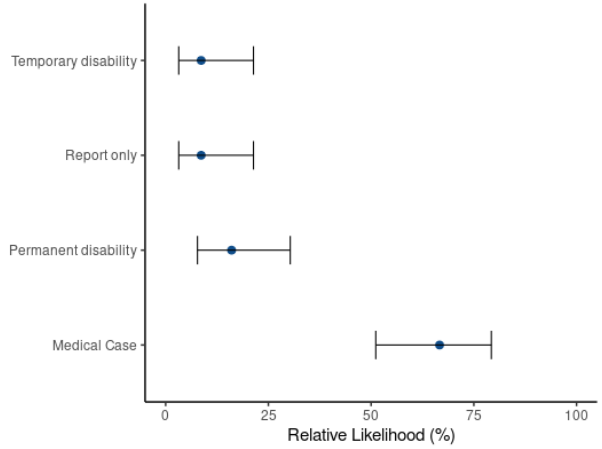
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to maintain control of vehicle



Injury Outcome	Relative Likelihood (%)
Medical Case	66.67
Permanent disability	16.05
Report only	8.64
Temporary disability	8.64



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	66.67	51.14	79.26
Permanent disability	16.05	7.75	30.33
Report only	8.64	3.19	21.38
Temporary disability	8.64	3.19	21.38

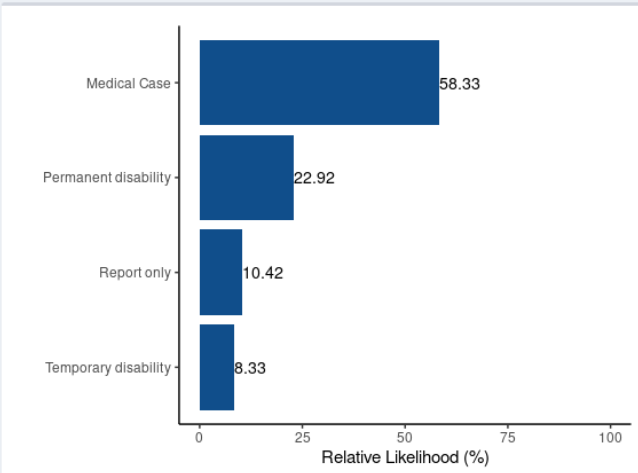
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

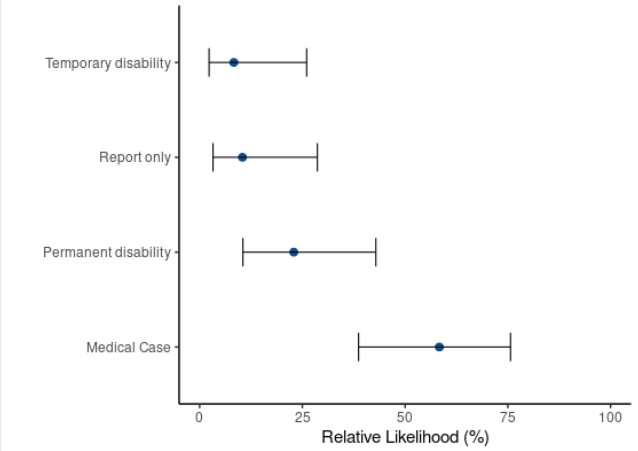
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Exiting the vehicle



Injury Outcome	Relative Likelihood (%)
Medical Case	58.33
Permanent disability	22.92
Report only	10.42
Temporary disability	8.33



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	58.33	38.68	75.65
Permanent disability	22.92	10.53	42.89
Report only	10.42	3.26	28.66
Temporary disability	8.33	2.29	26.04

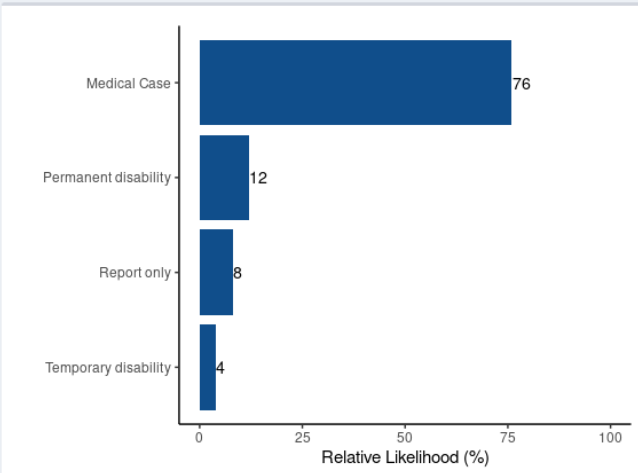
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

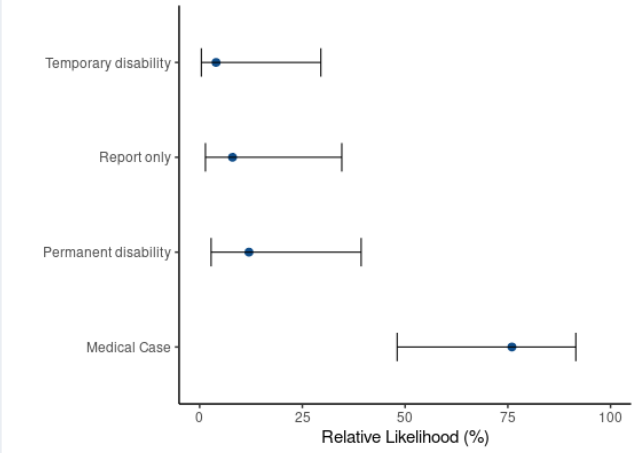
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Entering the vehicle



Injury Outcome	Relative Likelihood (%)
Medical Case	76.00
Permanent disability	12.00
Report only	8.00
Temporary disability	4.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	76.00	48.07	91.55
Permanent disability	12.00	2.79	39.31
Report only	8.00	1.41	34.59
Temporary disability	4.00	0.41	29.50

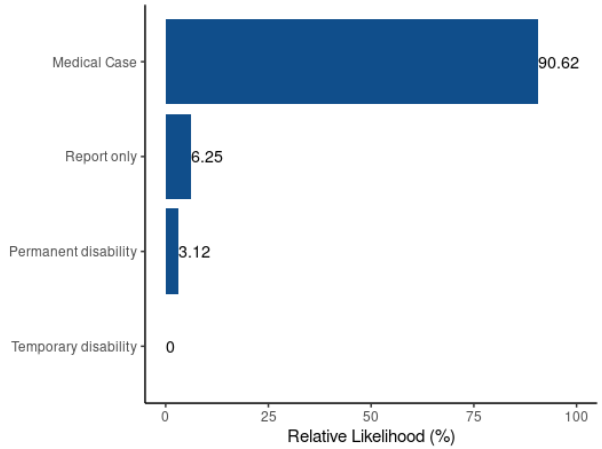
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

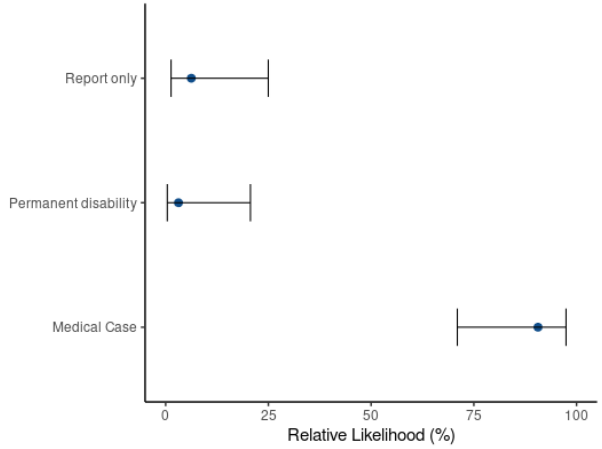
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt acceleration



Injury Outcome	Relative Likelihood (%)
Medical Case	90.62
Report only	6.25
Permanent disability	3.12
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	90.62	70.99	97.45
Report only	6.25	1.32	24.98
Permanent disability	3.12	0.40	20.64

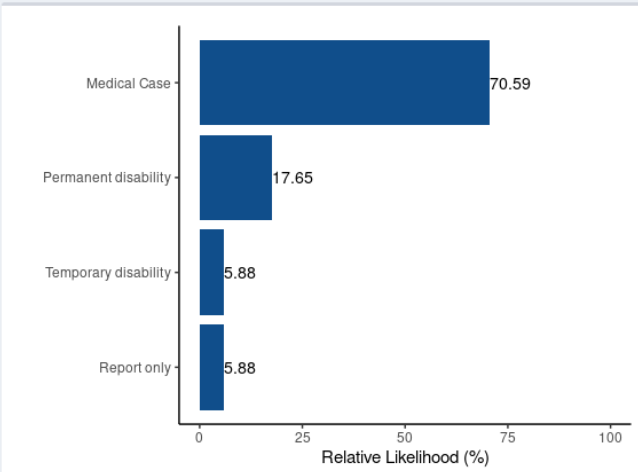
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

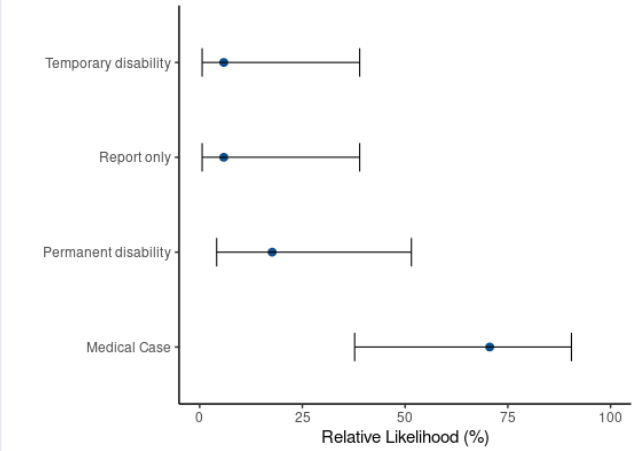
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to yield right of way



Injury Outcome	Relative Likelihood (%)
Medical Case	70.59
Permanent disability	17.65
Report only	5.88
Temporary disability	5.88



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	70.59	37.73	90.48
Permanent disability	17.65	4.14	51.53
Report only	5.88	0.61	38.94
Temporary disability	5.88	0.61	38.94

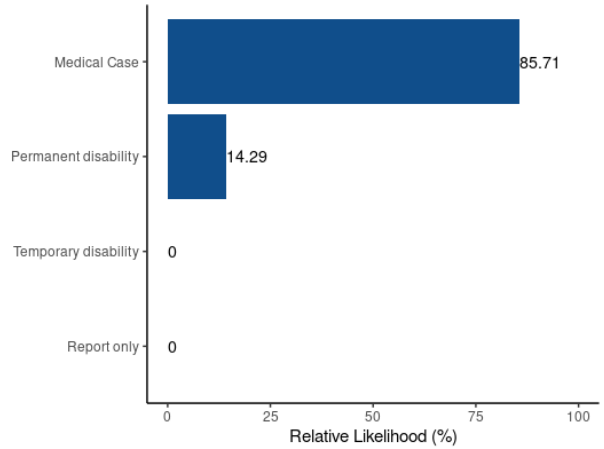
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

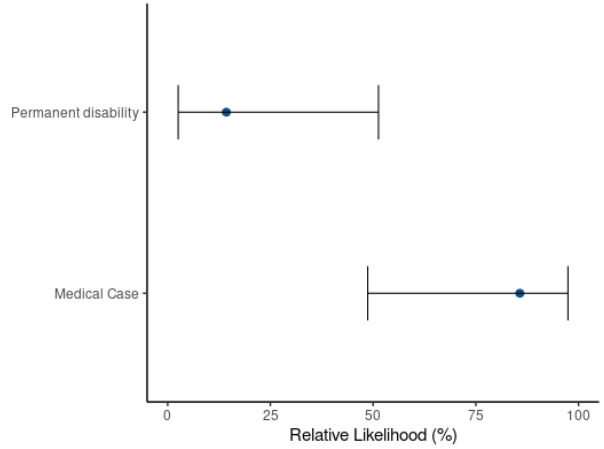
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Failure to stop at stop sign or red light



Injury Outcome	Relative Likelihood (%)
Medical Case	85.71
Permanent disability	14.29
Report only	0.00
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	85.71	48.69	97.43
Permanent disability	14.29	2.57	51.31

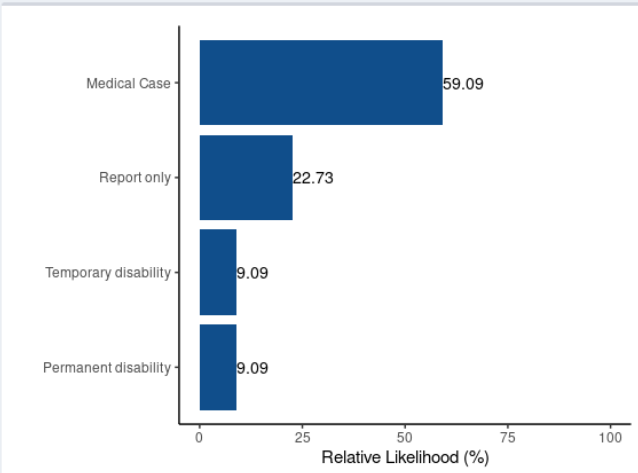
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

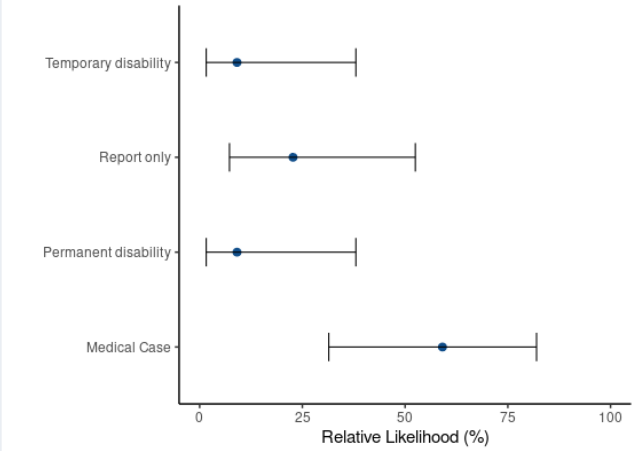
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Backing vehicle from parking space



Injury Outcome	Relative Likelihood (%)
Medical Case	59.09
Report only	22.73
Temporary disability	9.09
Permanent disability	9.09



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	59.09	31.42	81.99
Report only	22.73	7.26	52.49
Permanent disability	9.09	1.60	38.02
Temporary disability	9.09	1.60	38.02

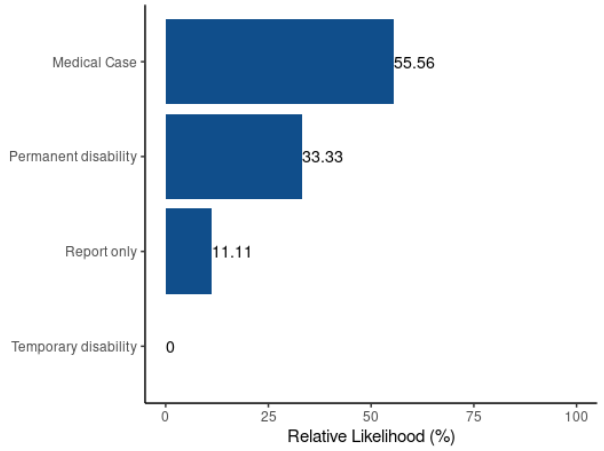
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

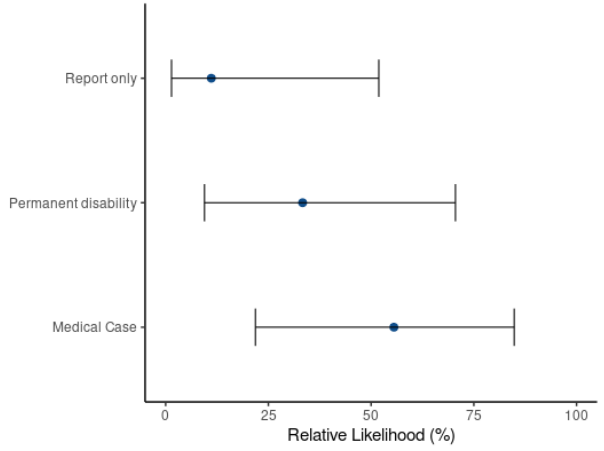
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt postural change / Poor posture



Injury Outcome	Relative Likelihood (%)
Medical Case	55.56
Permanent disability	33.33
Report only	11.11
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	55.56	21.84	84.83
Permanent disability	33.33	9.46	70.53
Report only	11.11	1.43	51.88

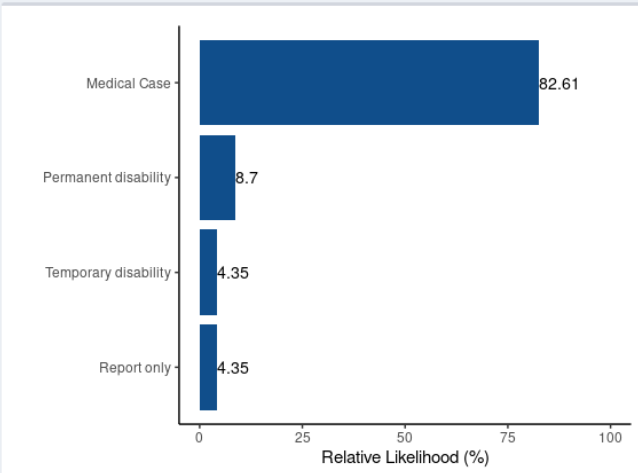
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

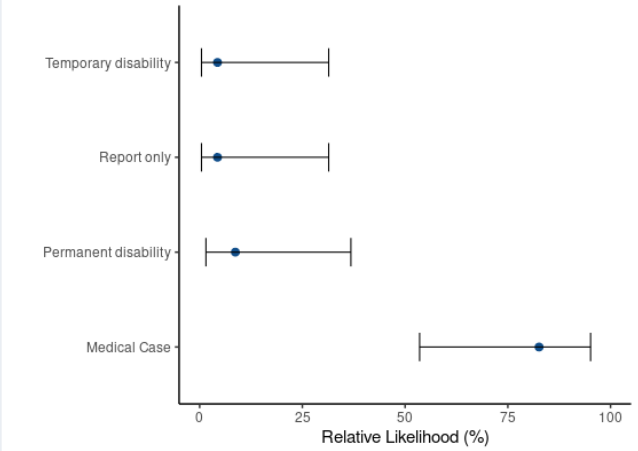
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Abrupt braking



Injury Outcome	Relative Likelihood (%)
Medical Case	82.61
Permanent disability	8.70
Report only	4.35
Temporary disability	4.35



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	82.61	53.54	95.14
Permanent disability	8.70	1.53	36.81
Report only	4.35	0.45	31.40
Temporary disability	4.35	0.45	31.40

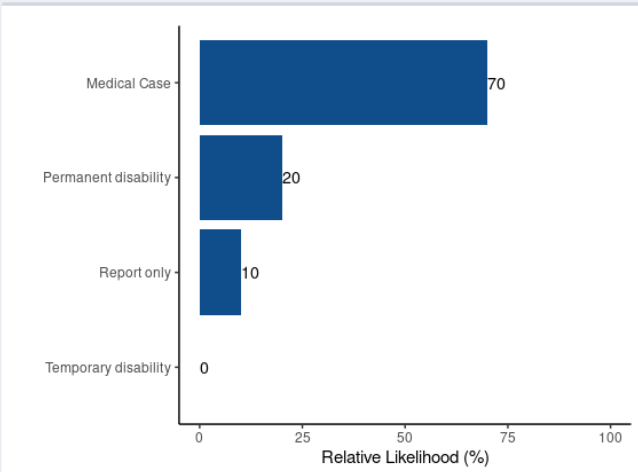
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

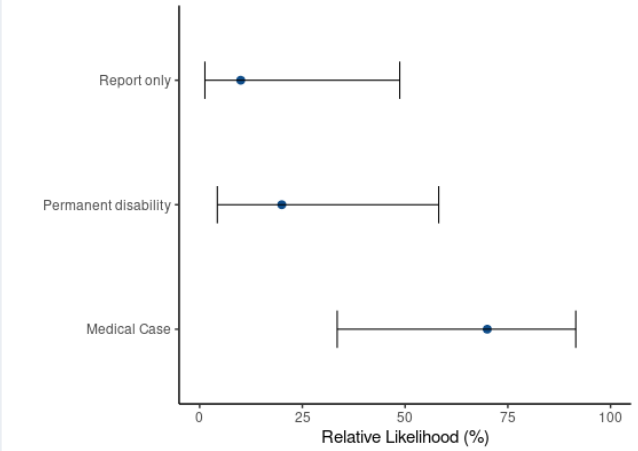
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Manual handling / Lifting



Injury Outcome	Relative Likelihood (%)
Medical Case	70.00
Permanent disability	20.00
Report only	10.00
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	70.00	33.47	91.54
Permanent disability	20.00	4.30	58.18
Report only	10.00	1.28	48.69

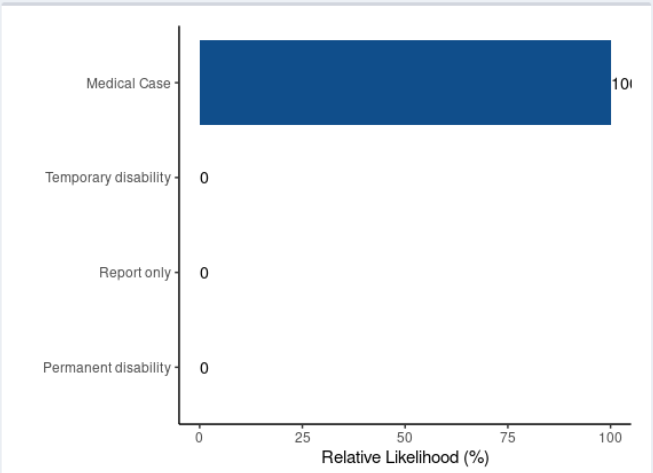
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

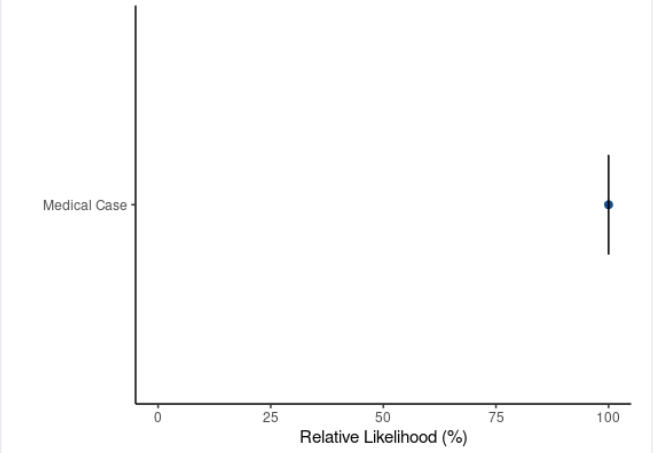
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Animal / Insect



Injury Outcome	Relative Likelihood (%)
Medical Case	100.00
Report only	0.00
Temporary disability	0.00
Permanent disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	100.00	100.00	100.00

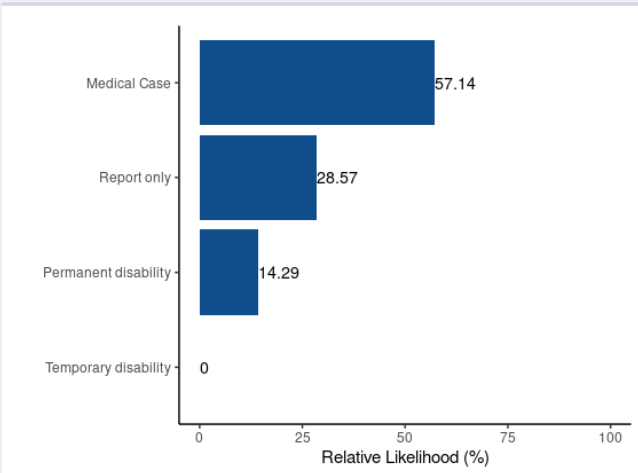
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

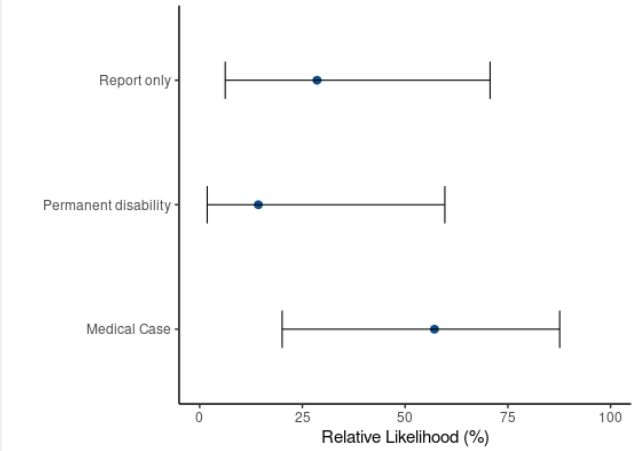
Predicted Variable: Injury Outcome

Given Variable: Contributing Factor

Attribute for Given Variable: Weather conditions



Injury Outcome	Relative Likelihood (%)
Medical Case	57.14
Report only	28.57
Permanent disability	14.29
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	57.14	20.08	87.62
Report only	28.57	6.22	70.69
Permanent disability	14.29	1.84	59.67

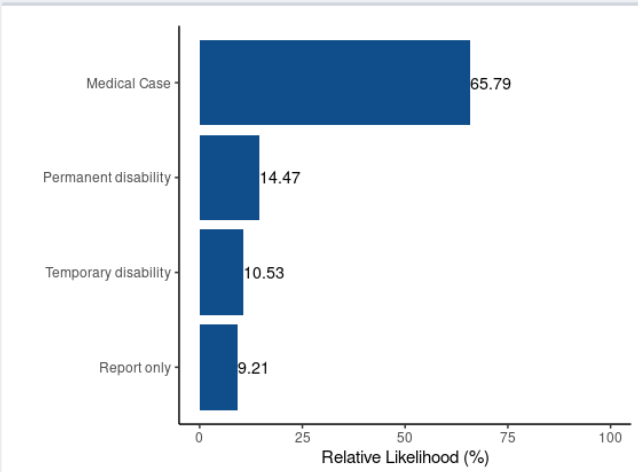
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

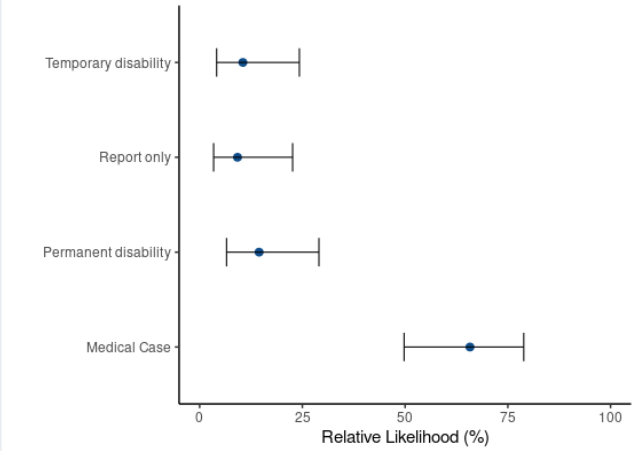
Predicted Variable: Injury Outcome

Given Variable: Event Type

Attribute for Given Variable: Collision with another vechicle



Injury Outcome	Relative Likelihood (%)
Medical Case	65.79
Permanent disability	14.47
Temporary disability	10.53
Report only	9.21



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	65.79	49.76	78.88
Permanent disability	14.47	6.54	29.03
Temporary disability	10.53	4.14	24.27
Report only	9.21	3.40	22.63

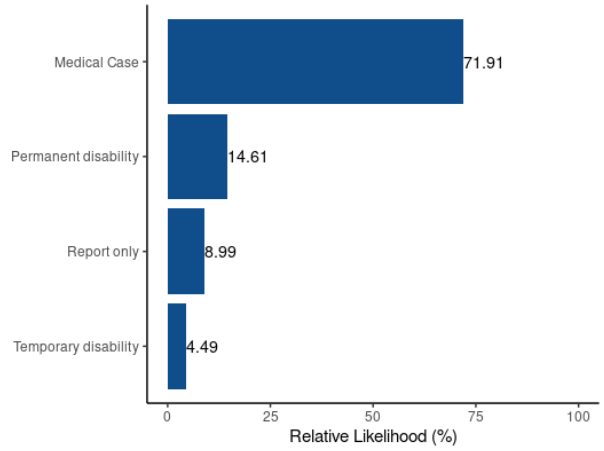
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

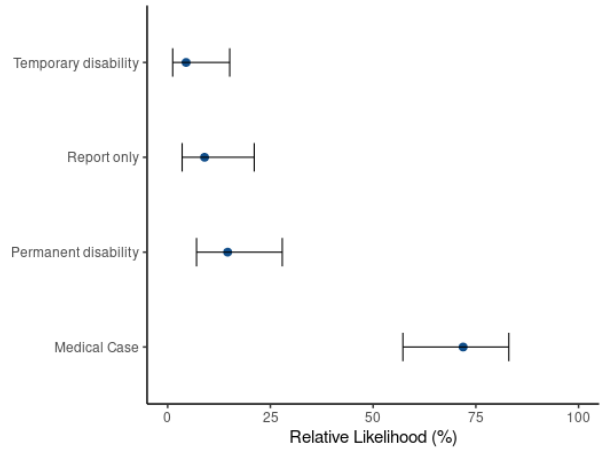
Predicted Variable: Injury Outcome

Given Variable: Event Type

Attribute for Given Variable: Overexertion and physical bodily reaction



Injury Outcome	Relative Likelihood (%)
Medical Case	71.91
Permanent disability	14.61
Report only	8.99
Temporary disability	4.49



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	71.91	57.25	83.03
Permanent disability	14.61	7.03	27.90
Report only	8.99	3.52	21.07
Temporary disability	4.49	1.23	15.11

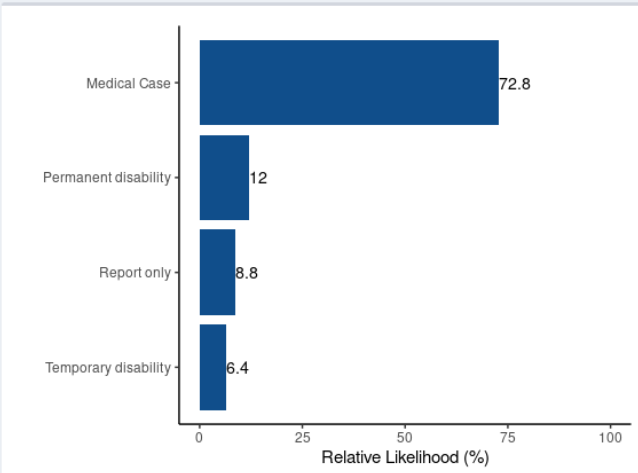
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

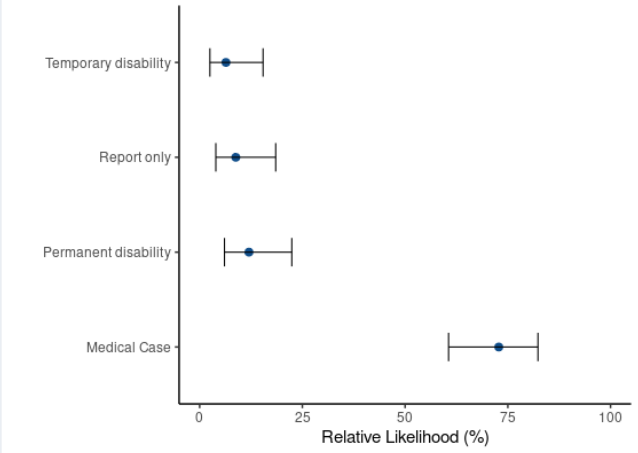
Predicted Variable: Injury Outcome

Given Variable: Event Type

Attribute for Given Variable: Collision with fixed object



Injury Outcome	Relative Likelihood (%)
Medical Case	72.80
Permanent disability	12.00
Report only	8.80
Temporary disability	6.40



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	72.80	60.58	82.34
Permanent disability	12.00	6.04	22.43
Report only	8.80	3.94	18.51
Temporary disability	6.40	2.50	15.43

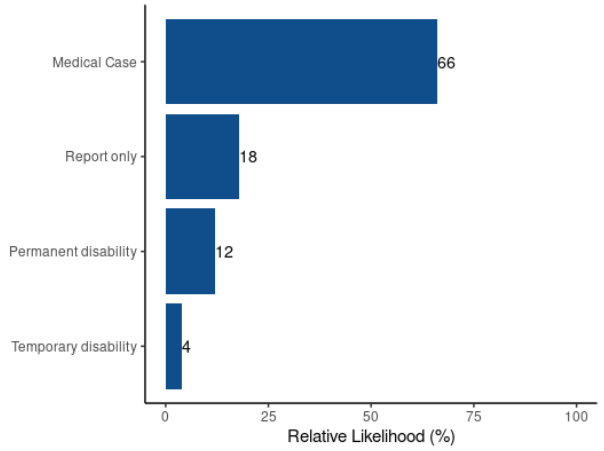
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

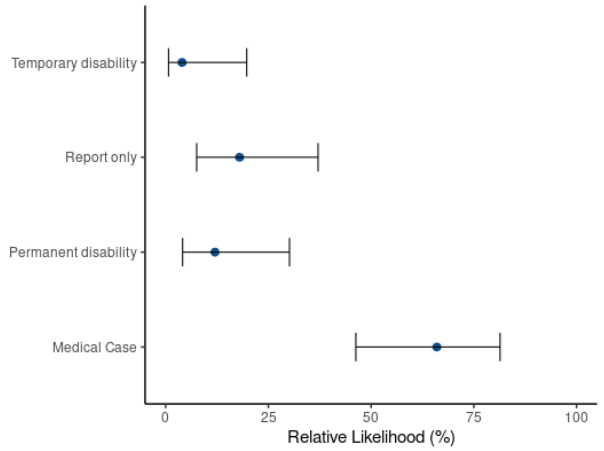
Predicted Variable: Injury Outcome

Given Variable: Event Type

Attribute for Given Variable: Fall on the same level



Injury Outcome	Relative Likelihood (%)
Medical Case	66.00
Report only	18.00
Permanent disability	12.00
Temporary disability	4.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	66.00	46.29	81.39
Report only	18.00	7.55	37.10
Permanent disability	12.00	4.13	30.14
Temporary disability	4.00	0.70	19.73

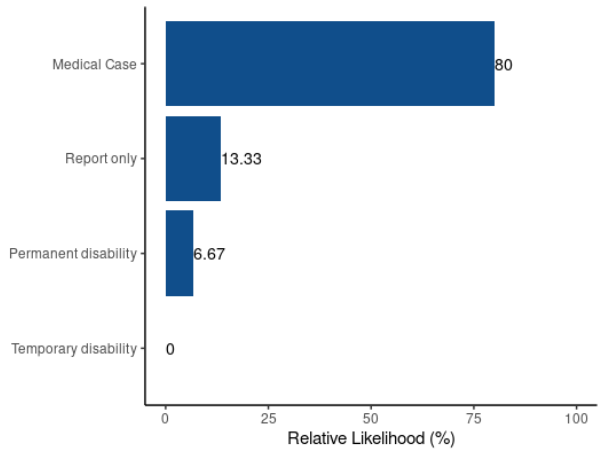
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

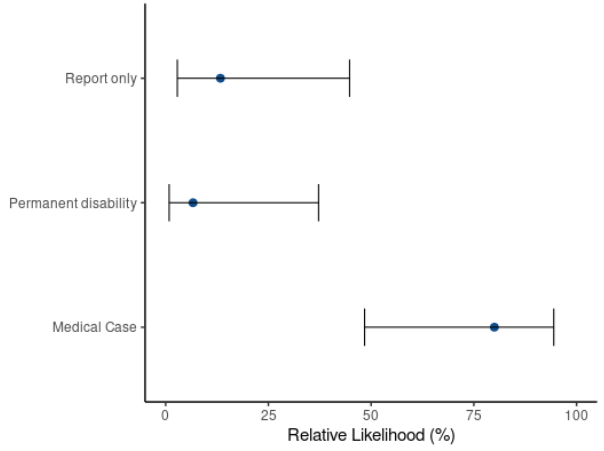
Predicted Variable: Injury Outcome

Given Variable: Event Type

Attribute for Given Variable: Struck-by or against



Injury Outcome	Relative Likelihood (%)
Medical Case	80.00
Report only	13.33
Permanent disability	6.67
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	80.00	48.42	94.46
Report only	13.33	2.84	44.76
Permanent disability	6.67	0.85	37.22

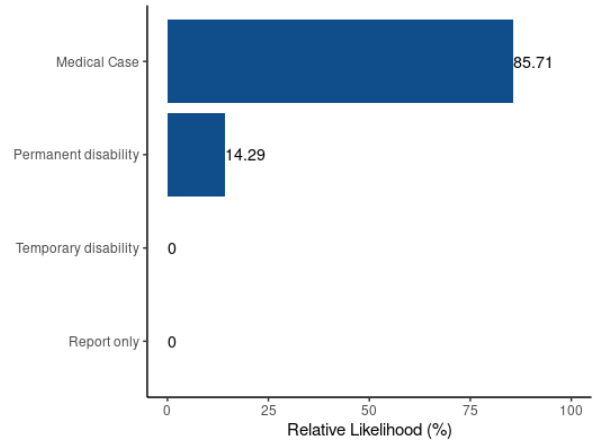
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

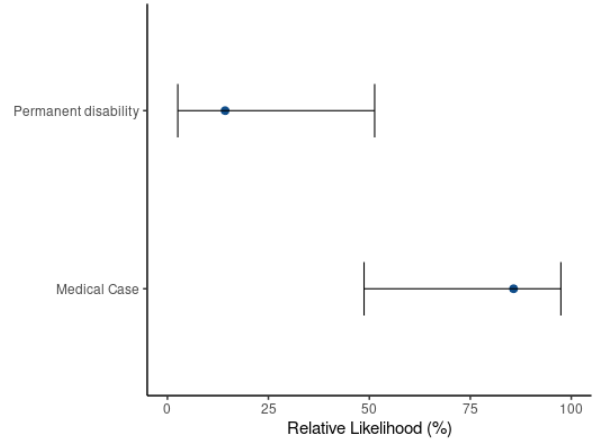
Predicted Variable: Injury Outcome

Given Variable: Event Type

Attribute for Given Variable: Exposure to harmful substances, surfaces, or environments



Injury Outcome	Relative Likelihood (%)
Medical Case	85.71
Permanent disability	14.29
Report only	0.00
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	85.71	48.69	97.43
Permanent disability	14.29	2.57	51.31

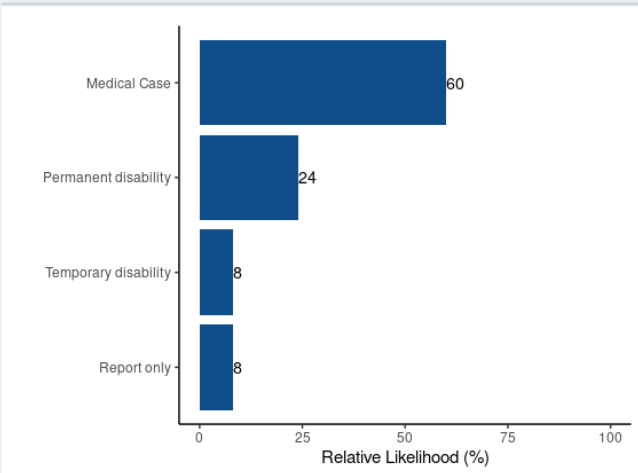
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

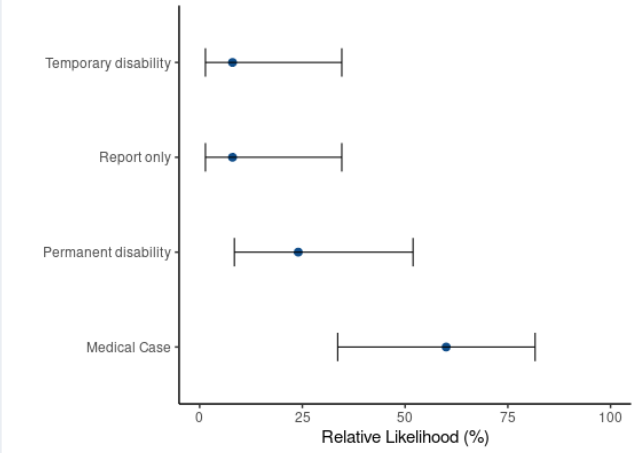
Predicted Variable: Injury Outcome

Given Variable: Event Type

Attribute for Given Variable: Fall to lower level



Injury Outcome	Relative Likelihood (%)
Medical Case	60.00
Permanent disability	24.00
Report only	8.00
Temporary disability	8.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	60.00	33.59	81.64
Permanent disability	24.00	8.45	51.93
Report only	8.00	1.41	34.59
Temporary disability	8.00	1.41	34.59

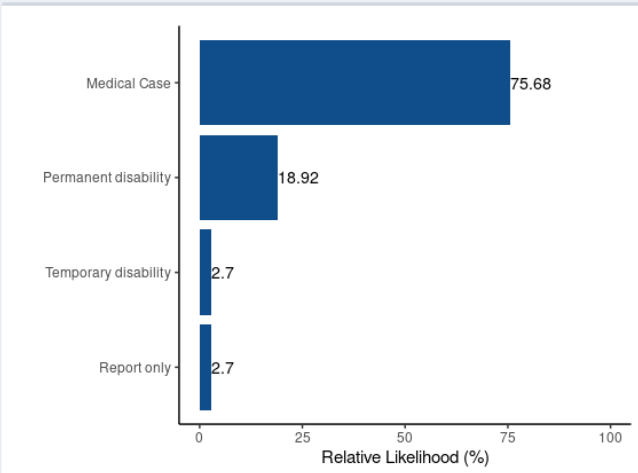
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

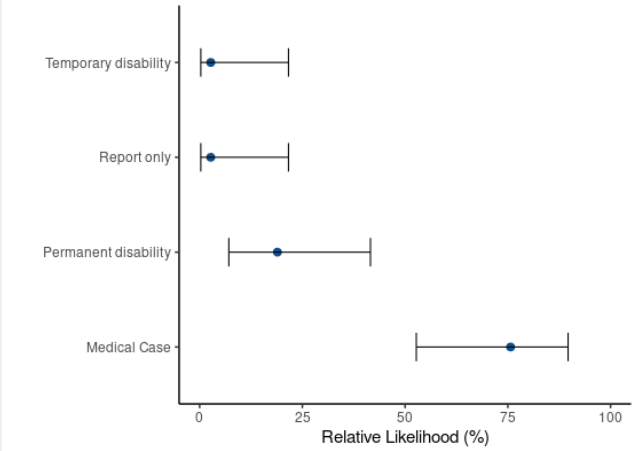
Predicted Variable: Injury Outcome

Given Variable: Injured Body Part

Attribute for Given Variable: Neck



Injury Outcome	Relative Likelihood (%)
Medical Case	75.68
Permanent disability	18.92
Report only	2.70
Temporary disability	2.70



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	75.68	52.73	89.67
Permanent disability	18.92	7.11	41.57
Report only	2.70	0.28	21.62
Temporary disability	2.70	0.28	21.62

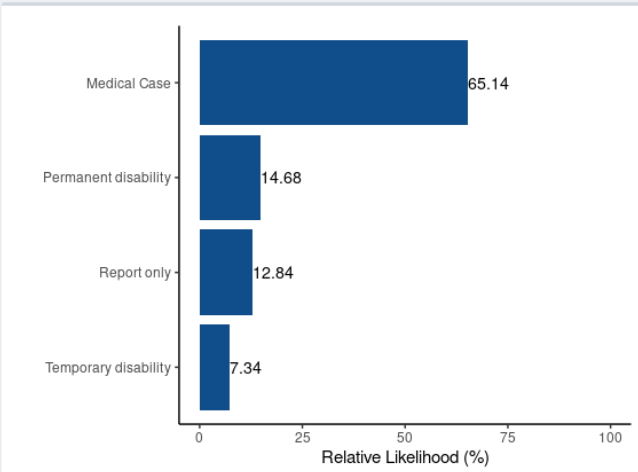
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

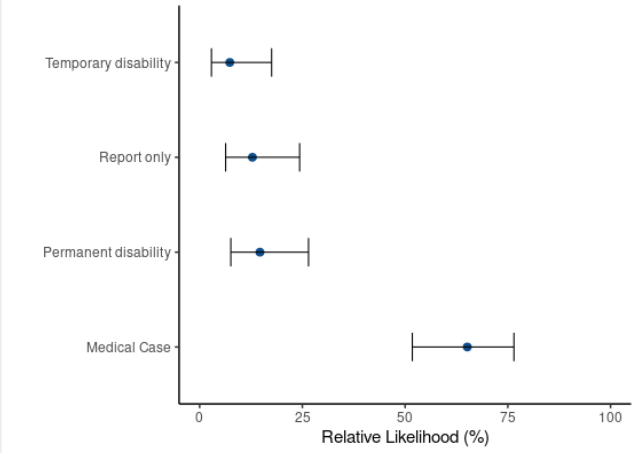
Predicted Variable: Injury Outcome

Given Variable: Injured Body Part

Attribute for Given Variable: Multiple body parts



Injury Outcome	Relative Likelihood (%)
Medical Case	65.14
Permanent disability	14.68
Report only	12.84
Temporary disability	7.34



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	65.14	51.76	76.49
Permanent disability	14.68	7.59	26.50
Report only	12.84	6.33	24.33
Temporary disability	7.34	2.87	17.52

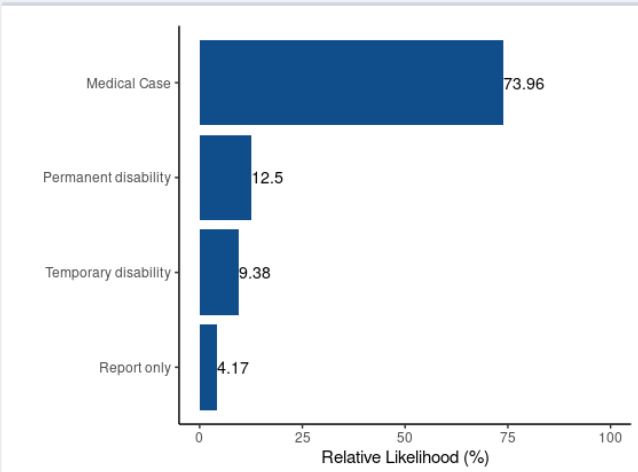
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

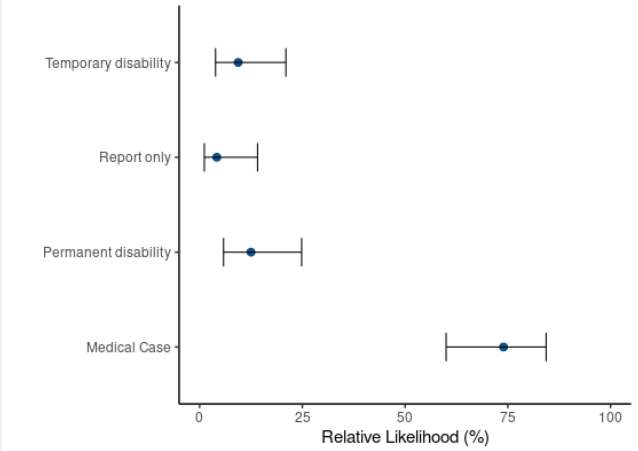
Predicted Variable: Injury Outcome

Given Variable: Injured Body Part

Attribute for Given Variable: Back



Injury Outcome	Relative Likelihood (%)
Medical Case	73.96
Permanent disability	12.50
Temporary disability	9.38
Report only	4.17



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	73.96	59.98	84.33
Permanent disability	12.50	5.82	24.83
Temporary disability	9.38	3.87	21.00
Report only	4.17	1.14	14.09

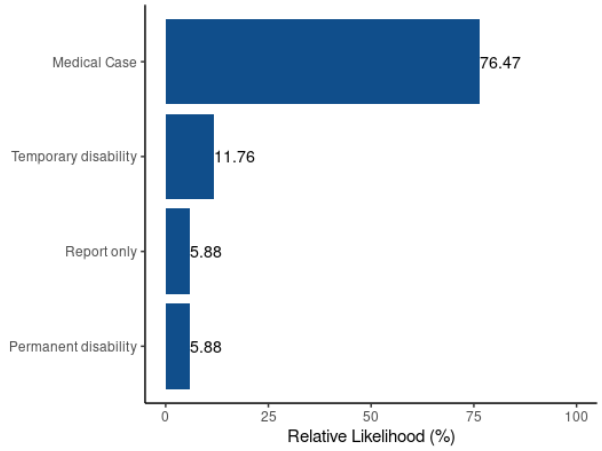
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

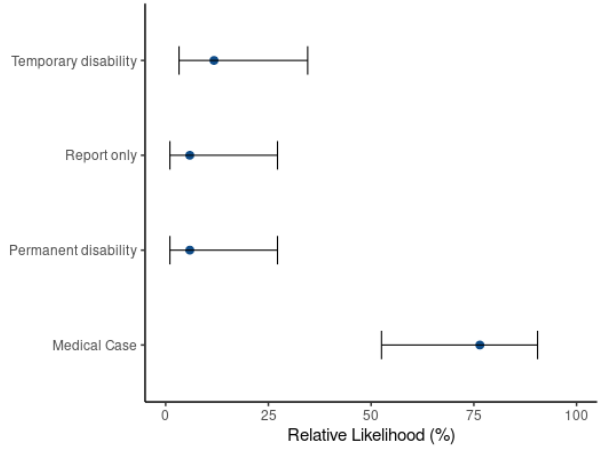
Predicted Variable: Injury Outcome

Given Variable: Injured Body Part

Attribute for Given Variable: Arm and shoulder



Injury Outcome	Relative Likelihood (%)
Medical Case	76.47
Temporary disability	11.76
Report only	5.88
Permanent disability	5.88



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	76.47	52.53	90.52
Temporary disability	11.76	3.26	34.57
Permanent disability	5.88	1.03	27.22
Report only	5.88	1.03	27.22

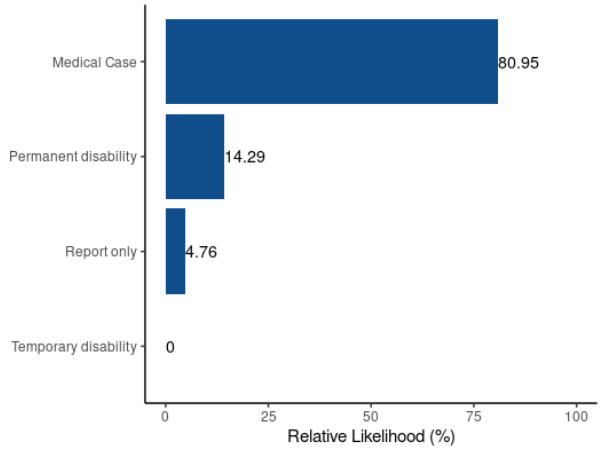
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

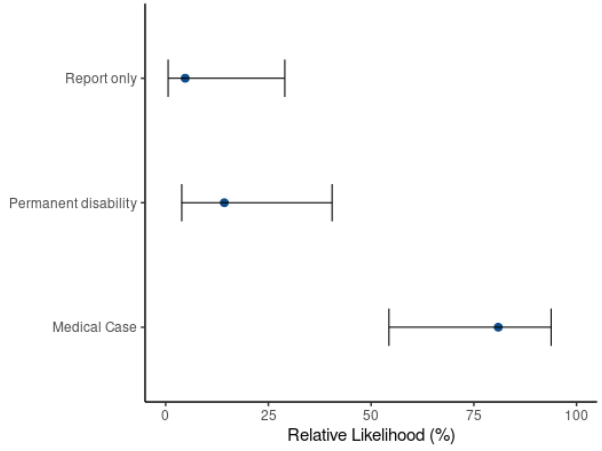
Predicted Variable: Injury Outcome

Given Variable: Injured Body Part

Attribute for Given Variable: Hand



Injury Outcome	Relative Likelihood (%)
Medical Case	80.95
Permanent disability	14.29
Report only	4.76
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	80.95	54.35	93.82
Permanent disability	14.29	3.92	40.51
Report only	4.76	0.61	29.00

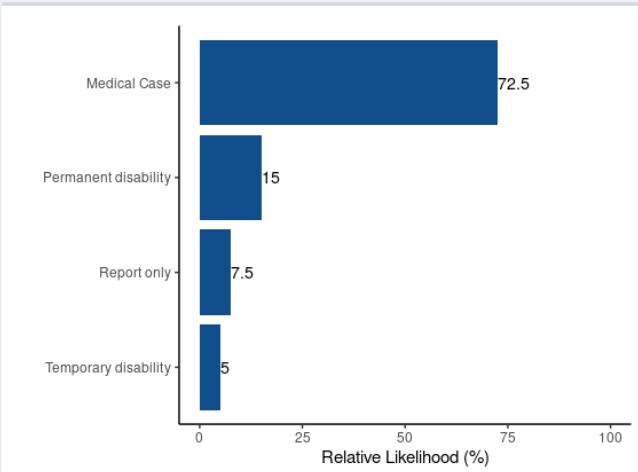
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

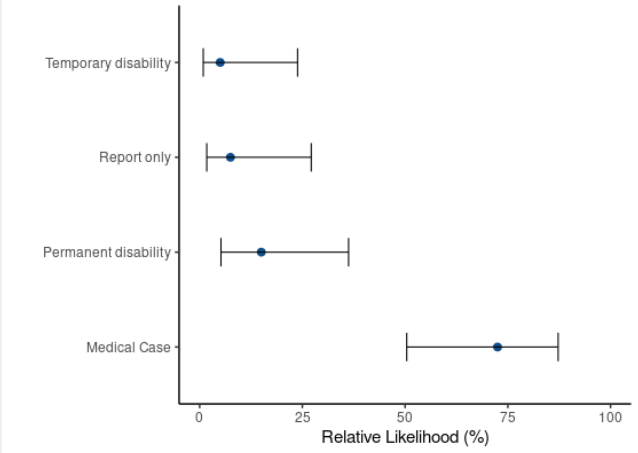
Predicted Variable: Injury Outcome

Given Variable: Injured Body Part

Attribute for Given Variable: Leg



Injury Outcome	Relative Likelihood (%)
Medical Case	72.50
Permanent disability	15.00
Report only	7.50
Temporary disability	5.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	72.50	50.40	87.24
Permanent disability	15.00	5.19	36.25
Report only	7.50	1.73	27.16
Temporary disability	5.00	0.88	23.83

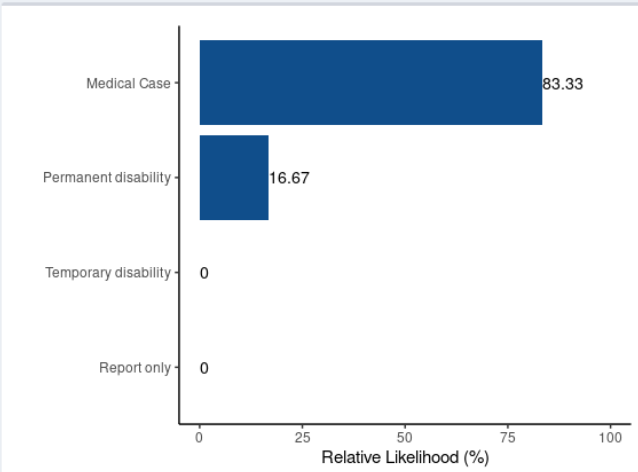
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

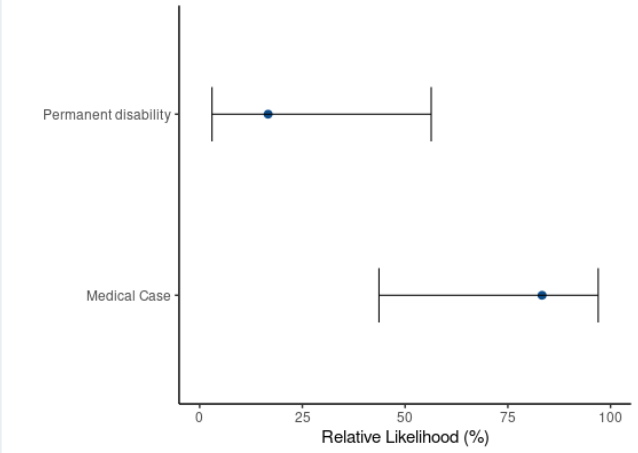
Predicted Variable: Injury Outcome

Given Variable: Injured Body Part

Attribute for Given Variable: Chest



Injury Outcome	Relative Likelihood (%)
Medical Case	83.33
Permanent disability	16.67
Report only	0.00
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	83.33	43.65	96.99
Permanent disability	16.67	3.01	56.35

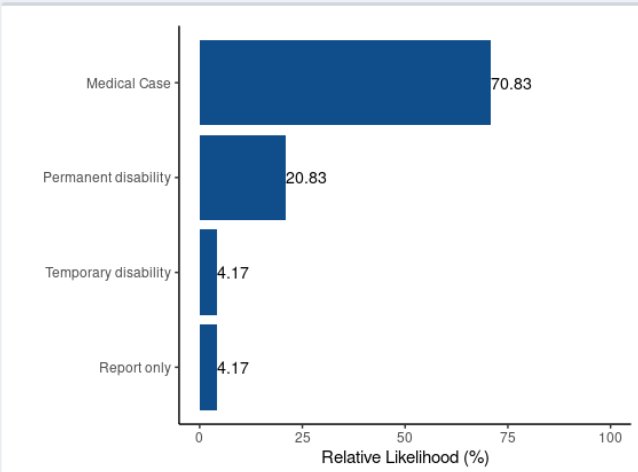
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

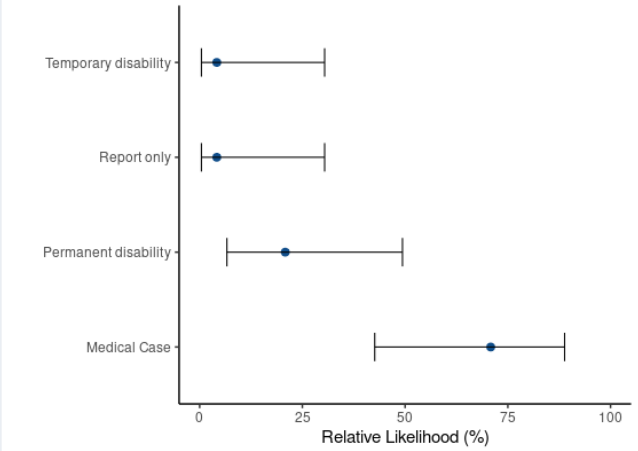
Predicted Variable: Injury Outcome

Given Variable: Injured Body Part

Attribute for Given Variable: Knee



Injury Outcome	Relative Likelihood (%)
Medical Case	70.83
Permanent disability	20.83
Report only	4.17
Temporary disability	4.17



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	70.83	42.61	88.82
Permanent disability	20.83	6.63	49.36
Report only	4.17	0.43	30.42
Temporary disability	4.17	0.43	30.42

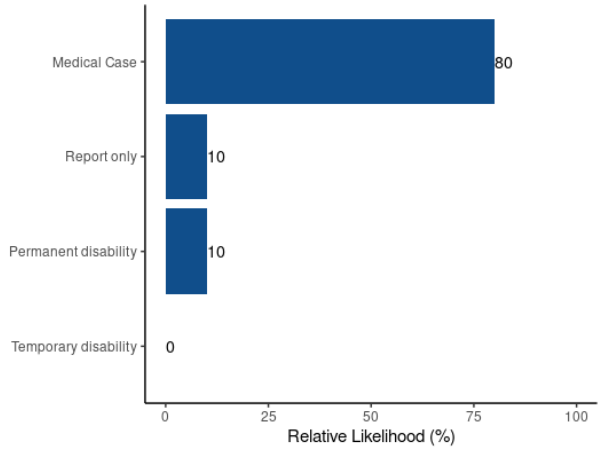
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

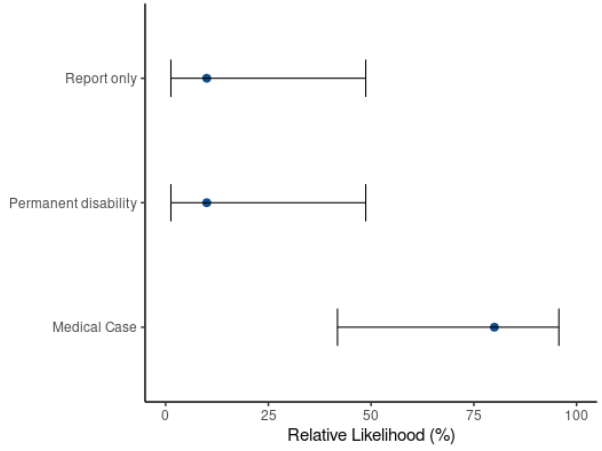
Predicted Variable: Injury Outcome

Given Variable: Injured Body Part

Attribute for Given Variable: Head



Injury Outcome	Relative Likelihood (%)
Medical Case	80.00
Report only	10.00
Permanent disability	10.00
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	80.00	41.82	95.70
Permanent disability	10.00	1.28	48.69
Report only	10.00	1.28	48.69

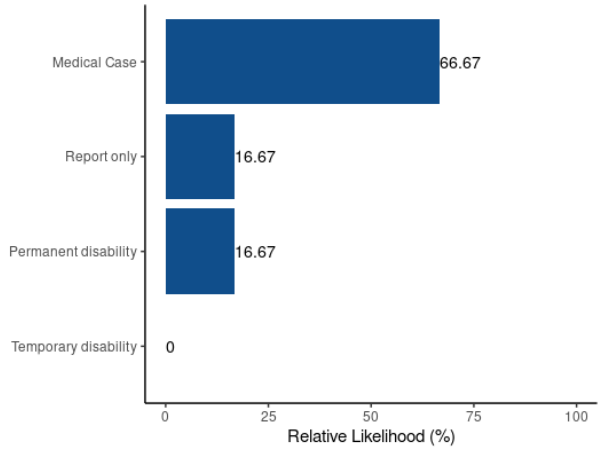
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

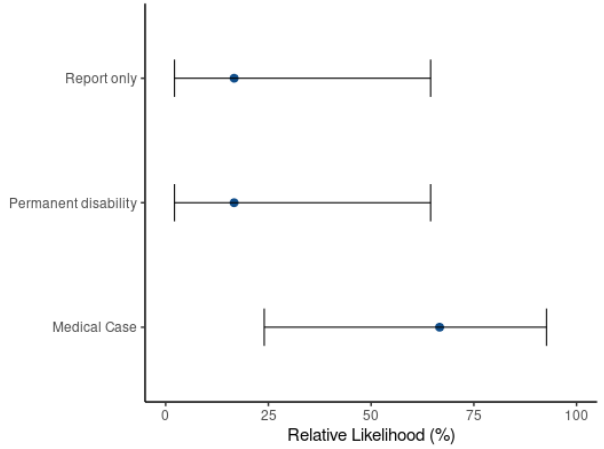
Predicted Variable: Injury Outcome

Given Variable: Injured Body Part

Attribute for Given Variable: Abdomen and hip



Injury Outcome	Relative Likelihood (%)
Medical Case	66.67
Report only	16.67
Permanent disability	16.67
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	66.67	23.99	92.69
Permanent disability	16.67	2.16	64.49
Report only	16.67	2.16	64.49

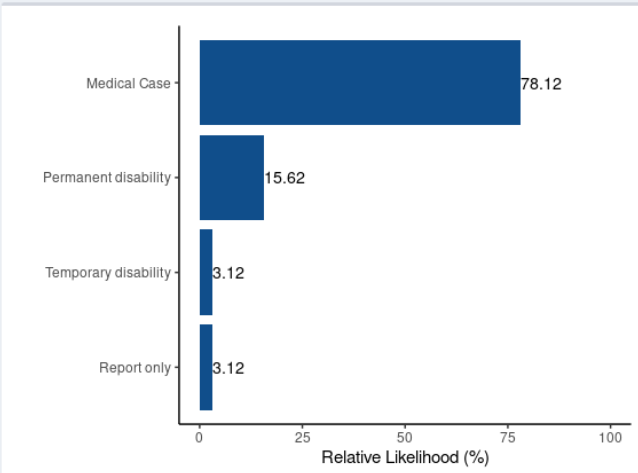
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

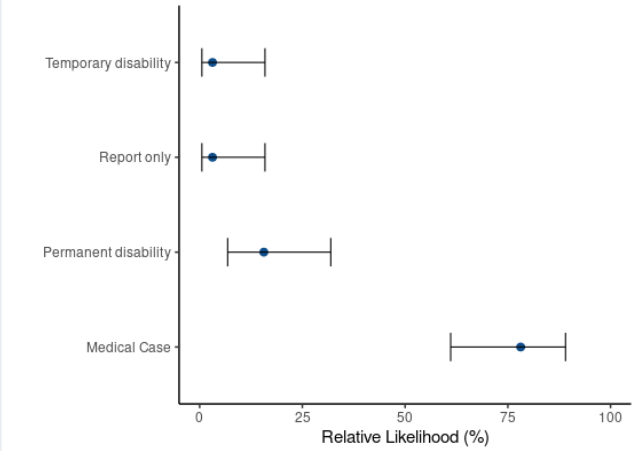
Predicted Variable: Injury Outcome

Given Variable: Injury Type

Attribute for Given Variable: Sprain



Injury Outcome	Relative Likelihood (%)
Medical Case	78.12
Permanent disability	15.62
Report only	3.12
Temporary disability	3.12



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	78.12	61.09	89.04
Permanent disability	15.62	6.82	31.91
Report only	3.12	0.55	15.90
Temporary disability	3.12	0.55	15.90

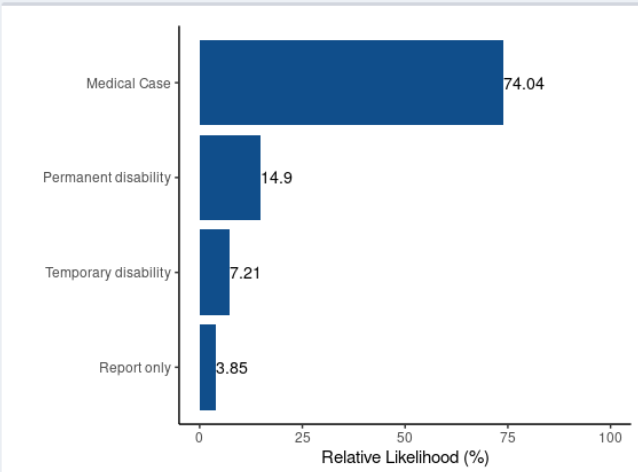
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

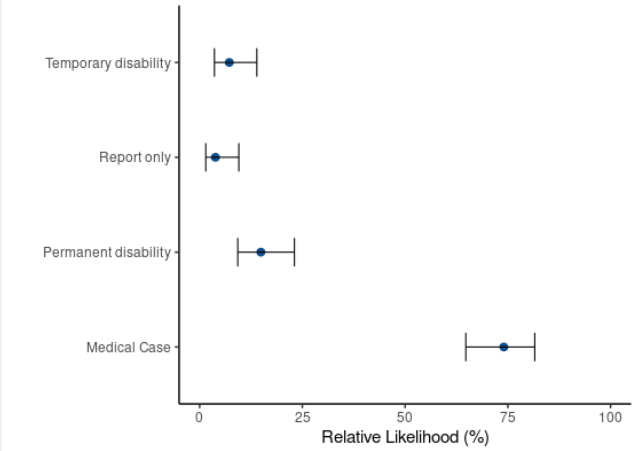
Predicted Variable: Injury Outcome

Given Variable: Injury Type

Attribute for Given Variable: Strain



Injury Outcome	Relative Likelihood (%)
Medical Case	74.04
Permanent disability	14.90
Temporary disability	7.21
Report only	3.85



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	74.04	64.78	81.56
Permanent disability	14.90	9.28	23.07
Temporary disability	7.21	3.60	13.92
Report only	3.85	1.49	9.54

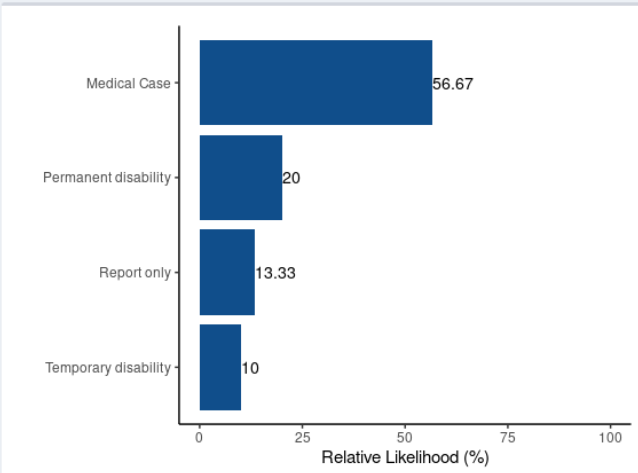
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

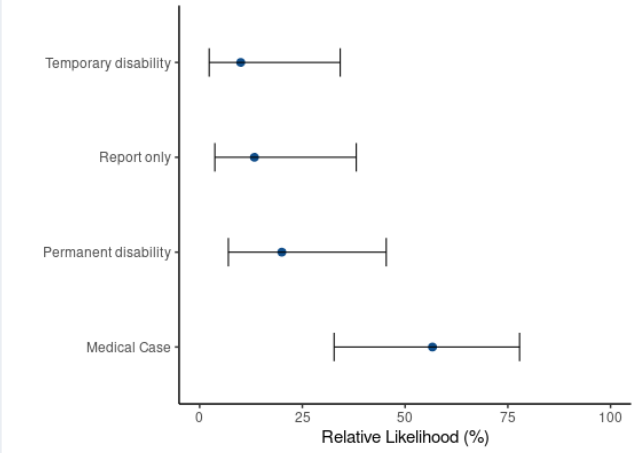
Predicted Variable: Injury Outcome

Given Variable: Injury Type

Attribute for Given Variable: Multiple types



Injury Outcome	Relative Likelihood (%)
Medical Case	56.67
Permanent disability	20.00
Report only	13.33
Temporary disability	10.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	56.67	32.72	77.86
Permanent disability	20.00	6.99	45.41
Report only	13.33	3.70	38.12
Temporary disability	10.00	2.32	34.21

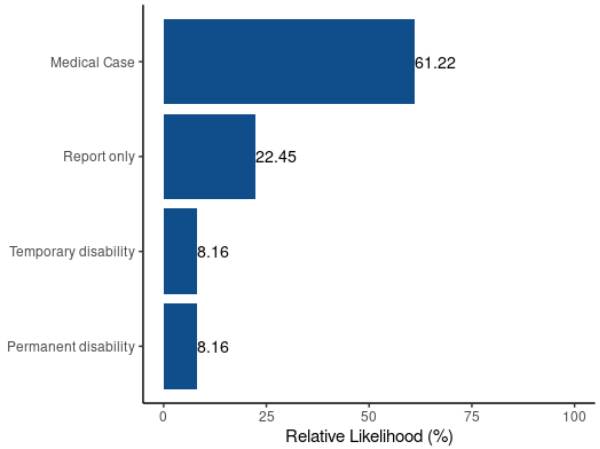
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

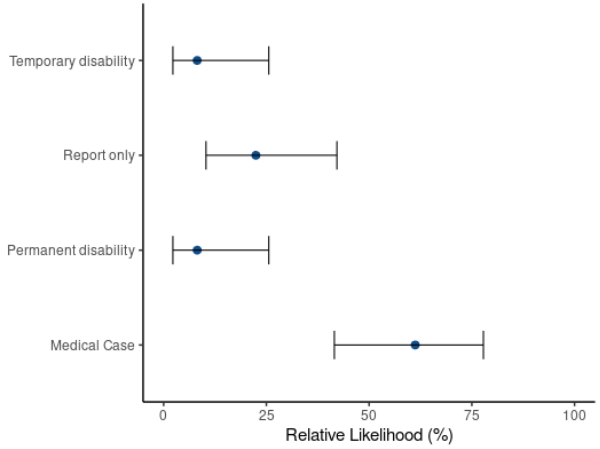
Predicted Variable: Injury Outcome

Given Variable: Injury Type

Attribute for Given Variable: Bruising or contusion



Injury Outcome	Relative Likelihood (%)
Medical Case	61.22
Report only	22.45
Temporary disability	8.16
Permanent disability	8.16



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	61.22	41.54	77.82
Report only	22.45	10.31	42.17
Permanent disability	8.16	2.25	25.59
Temporary disability	8.16	2.25	25.59

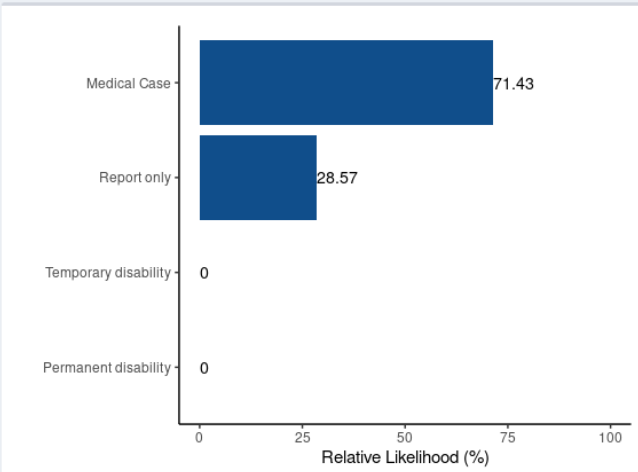
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

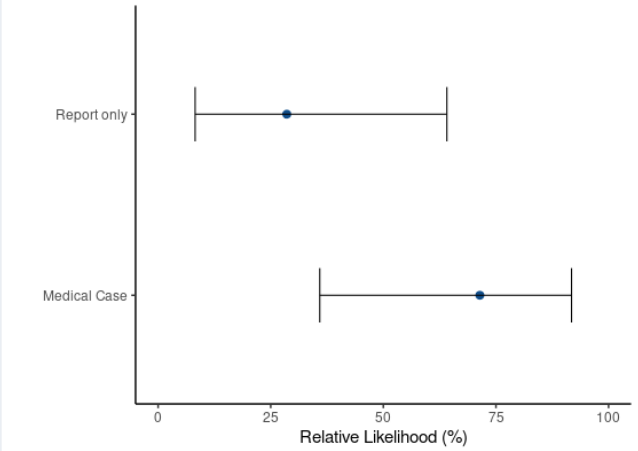
Predicted Variable: Injury Outcome

Given Variable: Injury Type

Attribute for Given Variable: Laceration



Injury Outcome	Relative Likelihood (%)
Medical Case	71.43
Report only	28.57
Temporary disability	0.00
Permanent disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	71.43	35.89	91.78
Report only	28.57	8.22	64.11

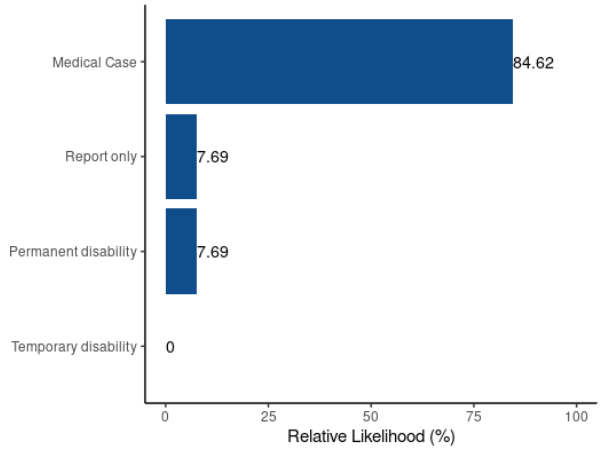
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

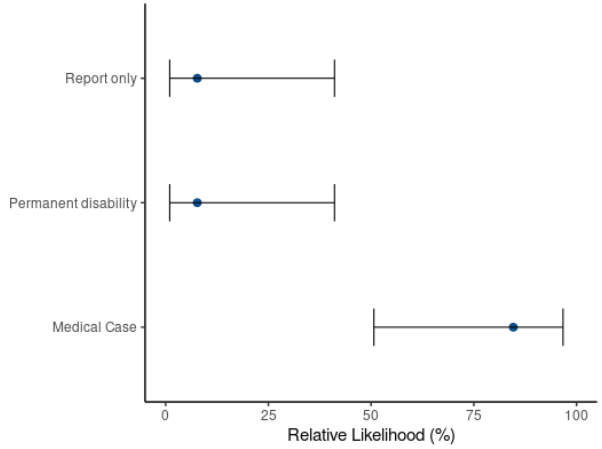
Predicted Variable: Injury Outcome

Given Variable: Injury Type

Attribute for Given Variable: Discomfort and pain



Injury Outcome	Relative Likelihood (%)
Medical Case	84.62
Report only	7.69
Permanent disability	7.69
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	84.62	50.67	96.72
Permanent disability	7.69	0.99	41.09
Report only	7.69	0.99	41.09

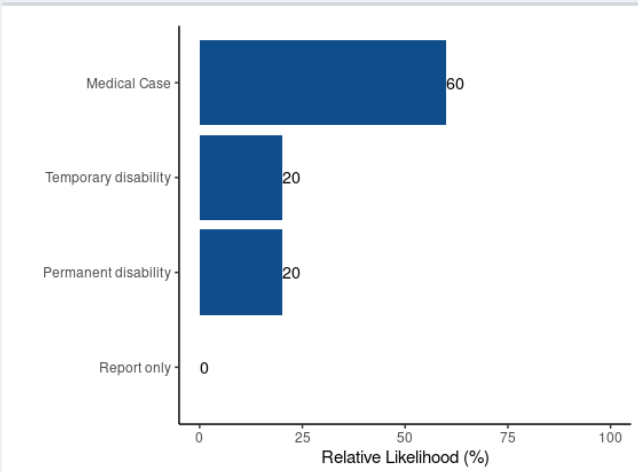
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

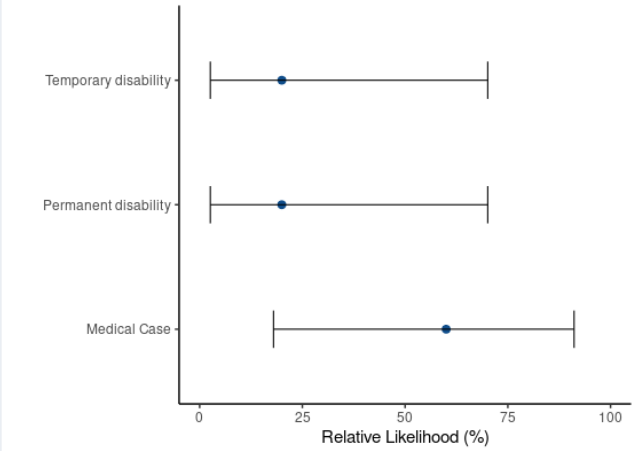
Predicted Variable: Injury Outcome

Given Variable: Injury Type

Attribute for Given Variable: Fracture



Injury Outcome	Relative Likelihood (%)
Medical Case	60.00
Temporary disability	20.00
Permanent disability	20.00
Report only	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	60.00	17.97	91.13
Permanent disability	20.00	2.60	70.11
Temporary disability	20.00	2.60	70.11

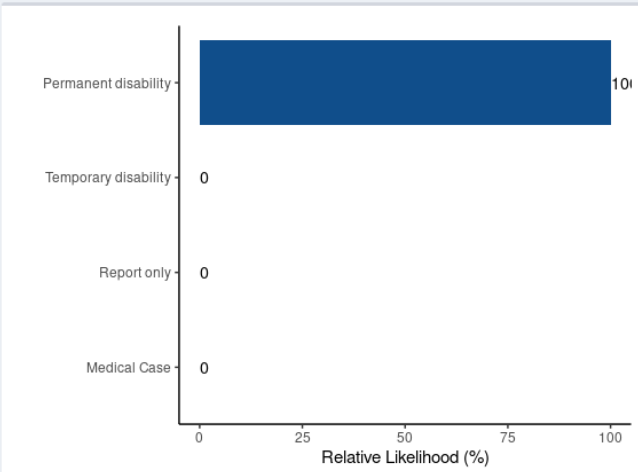
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

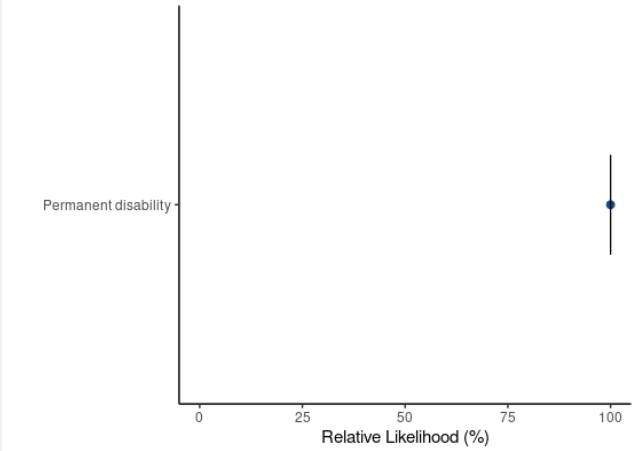
Predicted Variable: Injury Outcome

Given Variable: Injury Type

Attribute for Given Variable: Burn



Injury Outcome	Relative Likelihood (%)
Permanent disability	100.00
Medical Case	0.00
Report only	0.00
Temporary disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Permanent disability	100.00	100.00	100.00

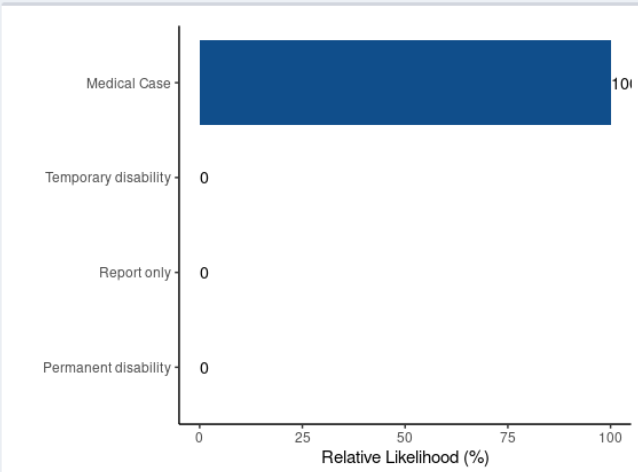
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

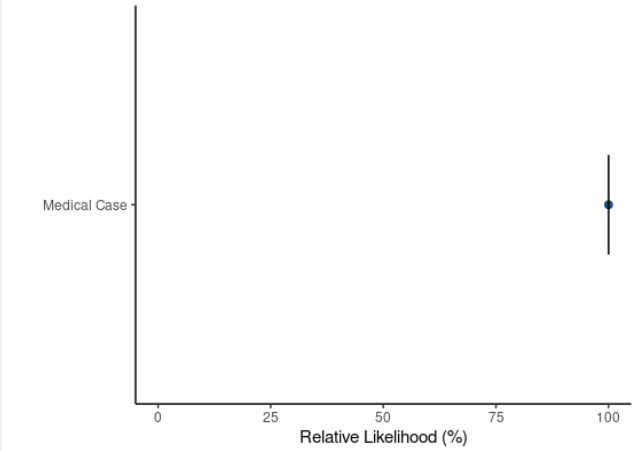
Predicted Variable: Injury Outcome

Given Variable: Injury Type

Attribute for Given Variable: Inflammation



Injury Outcome	Relative Likelihood (%)
Medical Case	100.00
Report only	0.00
Temporary disability	0.00
Permanent disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	100.00	100.00	100.00

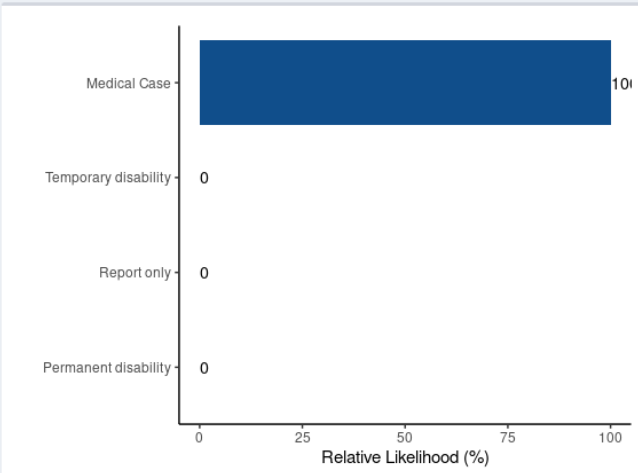
Safety Incidents Prediction Tool

- About
- Overall Probability
- Condit. Prob. (One Variable)

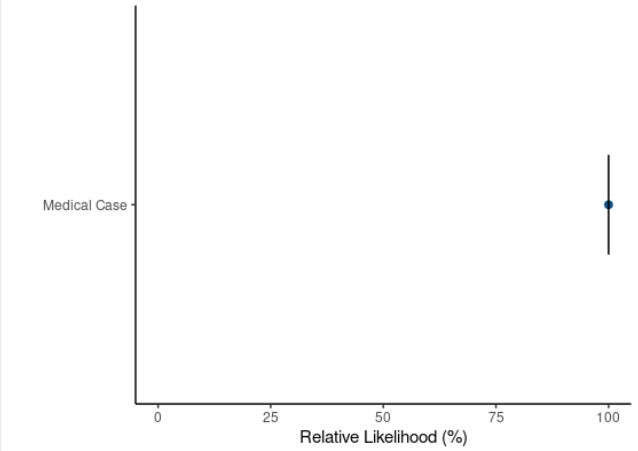
Predicted Variable: Injury Outcome

Given Variable: Injury Type

Attribute for Given Variable: Heatstroke



Injury Outcome	Relative Likelihood (%)
Medical Case	100.00
Report only	0.00
Temporary disability	0.00
Permanent disability	0.00



Injury Outcome	Relative Likelihood (%)	Lower Confidence Limit	Upper Confidence Limit
Medical Case	100.00	100.00	100.00