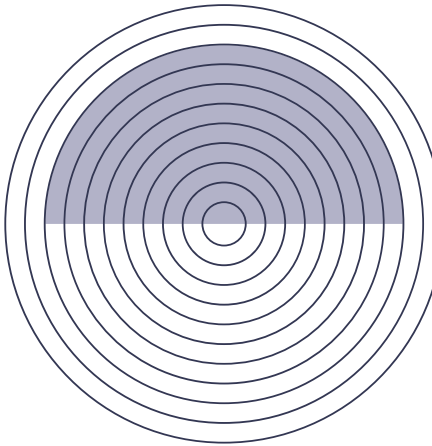
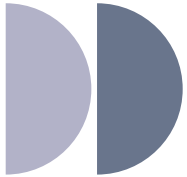
Driving While Under the Influence of Alcohol

Rhythm Osan

Table of Contents

Introduction





Introduction

- Driving while under the influence is a common cause of accidents and in some cases even death, that law enforcement has worked to reduce since the 1980s.
    - “Every day, about 37 people in the United States die in drunk-driving crashes - that’s one person about every 39 minutes.” (NHTSA)
- Although many schools teach about the dangers of driving while under the influence, statistics show that many people still don’t understand the severity of this risky decision.
- **This project will analyze the monetary risk associated with getting into a car accident after driving while under the influence and the risk of a potential fatality given a car accident**

Background information

Drunk Driving Background Information

- Any amount of alcohol in the bloodstream can impair one's decision making and driving abilities [1]
  - It can cause a **slow reaction time** making accidents incredibly likely
  - It can cause a **lack of coordination** between the feet, eyes and hands- a crucial element to driving
  - It **affects concentration** which can cloud someone's ability to adequately pay attention to their surroundings
  - It can **decrease or cause a blurred vision** thus affecting depth perception and ability to gauge relativity to pedestrians or other cars on the road.

Methods

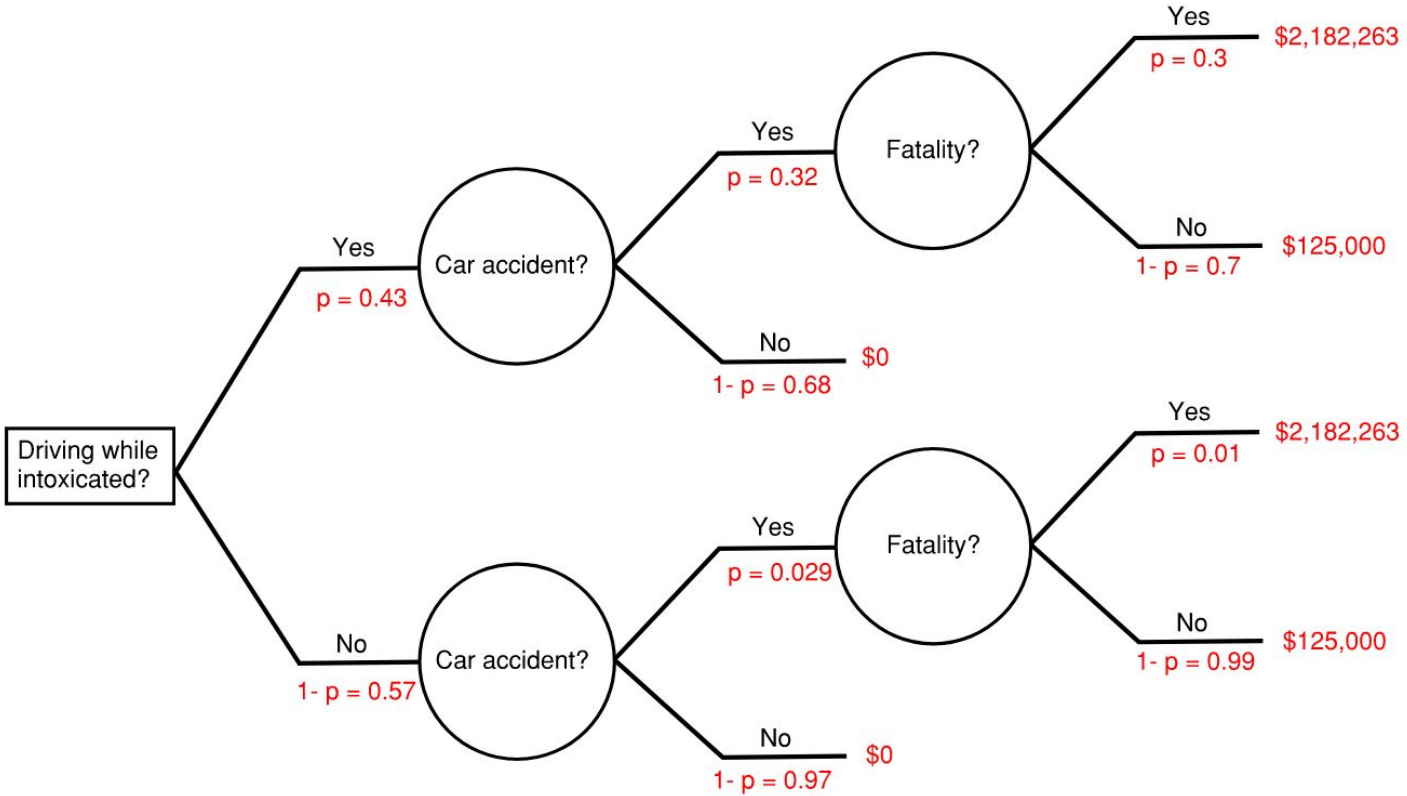
Methodology

- This issue was tackled by (1) creating a decision tree, (2) calculating expected value costs and (3) completing a one way sensitivity analysis to answer the question - **should you drive while under the influence?**
    - The process of **calculating expected value** involves multiplying the probability of an event by the monetary value and adding the variable nodes
- There is a possibility of getting into a car accident whether you are intoxicated or sober- however the likelihood of getting into a car accident intoxicated is much higher than getting into a car accident sober.
    - **To come to a conclusive answer, the expected value cost of a drunk car accident is compared to the expected value cost of a sober car accident.**
- Cullen [8] analyzes the statistics of how much more likely a drunk driver is to get into an accident than a sober driver depending on different Blood Alcohol Content (BAC) levels, but for the purpose of this analysis, I chose to analyze only a **BAC of 0.05-0.09** to demonstrate that even a little amount of alcohol above the legal limit can lead to fatalities

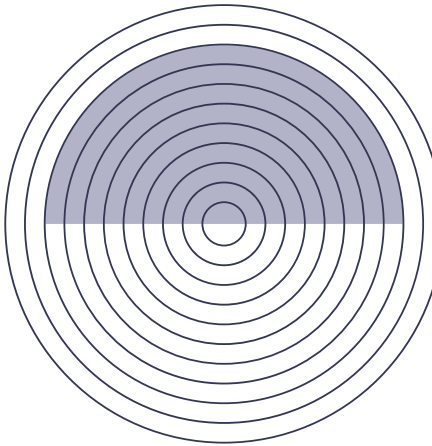
Input Table

Parameter	Value	Source
Probability of driving after getting intoxicated	43%	Hurst, 2021 [3]
Probability of getting into a car accident while intoxicated (assumed 0.05-0.09 BAC level)	32%	NHTSA [2], [4]
Probability of death from a car accident while intoxicated (assumed 0.05-0.09 BAC level)	30%	Kister 2018 [5], NHTSA [4]
Probability of getting into a car accident sober	2.9%	Cullen [8]
Probability of death from a car accident sober	1%	Steinger, 2024 [9]
Estimated monetary cost of death	$2,182,263	Peterson, 2021 [6]
Estimated cost of drunk driving accident settlement	$125,000	Foy [7]

Decision Tree



Scope of Work



Scope of Work

- The methodology stated above describes the factors I took into account for this analysis, however this research topic is vast and dependant on various factors. This analysis does not take all factors affecting car accident fatalities into account. It is important to note that the scope of this works:
  - Has statistics from 2018 onwards
  - **Does not discriminate** based on age, gender, race or other factors that some studies have analyzed
  - **Does not take time of year into account,** as some studies have researched.
    - This is because taking time of year into account reveals more accidents occurring around the holidays or weekends which makes sense as more people go out to drink and can be in situations where they drive under the influence.
  - **Does not take time of day into account**, as some studies have researched.
    - People driving at night are more likely to get into an accident than people driving in the day due to visibility issues.
    - Additionally, people are more likely to drink at night or go to places where one can obtain drinks (bars, clubs, etc) at night

Scope of Work Cont.

- Some statistics here are based on **what people have admitted** to (how many people have admitted to driving while under the influence) so the actual number could be much higher
- The **main distraction causing a fatality** in this analysis is **alcohol** but could also be other factors such as other passengers in the car, texting while driving, etc
- This analysis also **assumes that the person who dies in the car accident was the drunk driver** but for a more in depth future analysis, other possibilities should also be considered and distinguished such as:
  - Fatalities of passengers in the car other than the drunk driver
  - Fatalities of pedestrians who get hit by drunk drivers

Results

Expected Values

Fatality Expected Values

EV[Fatality in drunk car accident]= (0.3)($2,182,263)= $654,679
EV[No fatality in drunk car accident]= (0.7)($125,000)= $87,500
EV[Drunk car accident]= $742,179

EV[Fatality in sober car accident]=(0.01)($2,182,263)=$21,823
EV[No fatality in sober car accident]=(0.99)($125,000)=$123,750
EV[Sober car accident]=$145,573

Drunk Driving vs Sober Driving Expected Values

Nominal EV [drunk driving]: 0.43 x {(0.68 * $0) + (0.32 x [(0.3 x $2,182,263) + (0.7 x $125,0000)])} = $102,123
Nominal EV [sober driving]: 0.57 x {(0.97 x $0) + (0.029 x [(0.01 x $2,182,263) + (0.99 x $125,000)])} = $2,406

Interpretation

Interpretation

- Confirming the science behind alcohol consumption and driving, the **expected value cost of driving while under the influence is roughly $600,000 more than the expected value cost of driving while sober.**
- Since this analysis works for the assumed BAC level of 0.05-0.09, it can be **assumed that this analysis will also work for any BAC level higher than 0.09** as well, as the likelihood of getting into an accident is higher.
- Although much research and statistics have been done to analyze this effect, people still make the decision to drink and drive every day due to a variety of factors such as:
    - Not thinking they were incapable of driving
    - Having consumed alcohol with meals
    - Because they're traveling a short distance [3].

Sensitivity Analysis

Sensitivity Analysis Introduction

- A **sensitivity analysis** takes the **uncertainty of a risk assessment into account**. Given the variability of this issue dependant on the various factors outlined in “Scope of Work”, this analysis can be incredibly beneficial to properly understand this issue.
- In order to get the different bounds into account, I took data from other sources or from a different year to account for some differences in recorded statistics.
- Even after doing this, there is still room for error due to the **credibility** of the different sources and for **outliers** in certain years (for example, COVID preventing the same amount of the population from going out and thus being in situations where they would drink and drive).

Methods

Methodology

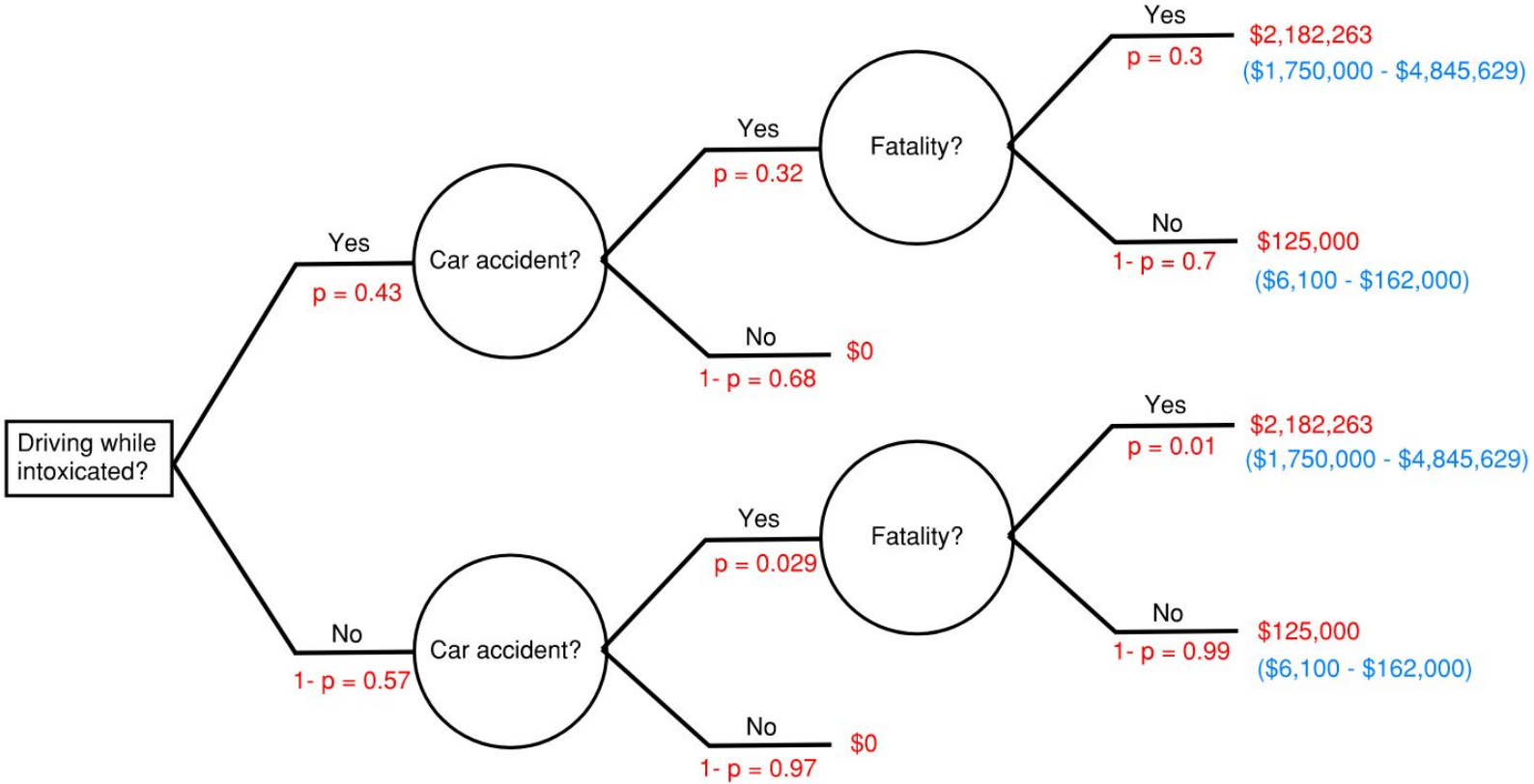
- The following methodology follows a **similar approach of taking the expected value** as outlined previously, but instead, it is an iterative approach where one variable is held at a nominal value except one where the lower and upper bound is calculated. This process is then repeated with all variables- in this assessment there are four variables:
    - **Fatality in a drunk driving accident**
    - **No fatality in a drunk driving accident**
    - **Fatality in a sober driving accident**
    - **No fatality in a sober driving accident**
- Previously, the monetary costs associated with a fatality vs no fatality was a single concrete value taken from an article. For the sensitivity analysis, it is now a range (highlighted in orange)

Input Table

Parameter	Value	Source
Probability of driving after getting intoxicated	43%	Hurst, 2021 [3]
Probability of getting into a car accident while intoxicated (assumed 0.05-0.09 BAC level)	32%	NHTSA [2], [4]
Probability of death from a car accident while intoxicated (assumed 0.05-0.09 BAC level)	30%	Kister 2018 [5], NHTSA [4]
Probability of getting into a car accident sober	2.9%	Cullen [8]
Probability of death from a car accident sober	1%	Steinger, 2024 [9]
Estimated monetary cost of death	**($1,750,000 - $4,845,629)**	HANDER, 2022 [10], NHTSA [11]
Estimated cost of drunk driving accident	**($6,100 - $162,000)**	NSC, 2022 [12]

Results

Decision Tree Revised



Sensitivity Analysis

Nominal EV[drunk driving fatality]: 0.43 x {(0.68 x $0) + (0.32 x [(0.3 x $2,182,263) + (0.7 x $125,000)])} = $102,123
Lower bound[fatality]= 0.43 x {(0.68 x $0) + (0.32 x [(0.3 x $1,750,000) + (0.7 x $125,000)])} = $84,280
Upper bound[fatality]= 0.43 x {(0.68 x $0) + (0.32 x [(0.3 x $4,845,629) + (0.7 x $125,000)])} = $212,068

Nominal EV[drunk driving no fatality]: 0.43 x {(0.68 x $0) + (0.32 x [(0.3 x $2,182,263) + (0.7 x $125,000)])} = $102,123
Lower bound[no fatality]= 0.43 x {(0.68 x $0) + (0.32 x [(0.3 x $2,182,263) + (0.7 x $6,100)])} = $90,671
Upper bound[no fatality]= 0.43 x {(0.68 x $0) + (0.32 x [(0.3 x $2,182,263) + (0.7 x $162,000)])} = $105,687

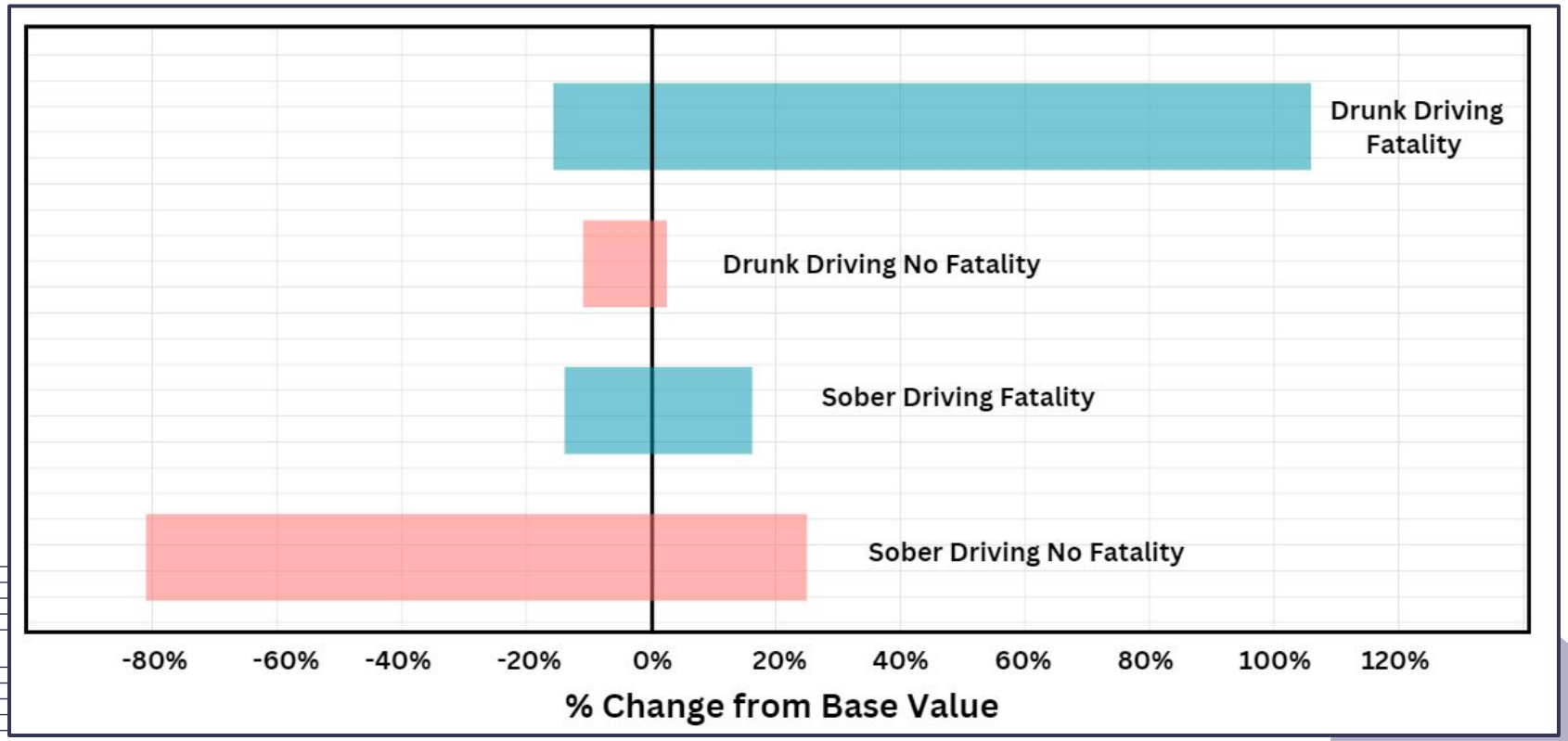
Nominal EV[sober driving fatality]: 0.57 x {(0.97 x $0) + (0.029 x [(0.01 x $2,182,263) + (0.99 x $125,000)])} = $2406
Lower bound[fatality]= 0.57 x {(0.97 x $0) + (0.029 x [(0.01 x $1,750,000) + (0.99 x $125,000)])} = $2,074
Upper bound[fatality]= 0.57 x {(0.97 x $0) + (0.029 x [(0.01 x $4,845,629) + (0.99 x $125,000)])} = $2,846

Nominal EV[sober driving no fatality]: 0.57 x {(0.97 x $0) + (0.029 x [(0.01 x $2,182,263) + (0.99 x $125,000)])} = $2406
Lower bound[no fatality]= 0.57 x {(0.97 x $0) + (0.029 x [(0.01 x $2,182,263) + (0.99 x $6,100)])} = $460
Upper bound[no fatality]= 0.57 x {(0.97 x $0) + (0.029 x [(0.01 x $2,182,263) + (0.99 x $162,000)])} = $3011

Sensitivity Analysis

Drunk Driving Fatality			
84280	0.83	-0.17	-17
102123	1.00	0.00	0
212068	2.08	1.08	108
Drunk Driving No Fatality			
90671	0.89	-0.11	-11
102123	1.00	0.00	0
105687	1.03	0.03	3
Sober Driving Fatality			
2074	0.86	-0.14	-14
2406	1.00	0.00	0
2846	1.18	0.18	18
Sober Driving No Fatality			
460	0.19	-0.81	-81
2406	1.00	0.00	0
3011	1.25	0.25	25

Tornado Diagram



Revised Analysis

How much more a drunk driving accident "costs" than a sober driving accident

Revised Analysis:
Nominal EV [drunk driving with fatality - sober driving with fatality] = $99,717
Lower bound [drunk driving with fatality - sober driving with fatality] = $82,206
Upper bound [drunk driving with fatality - sober driving with fatality] = $209,222

Revised Analysis:
Nominal EV [drunk driving with no fatality - sober driving with no fatality] = $99,717
Lower bound [drunk driving with no fatality - sober driving with no fatality] = $90,211
Upper bound [drunk driving with no fatality - sober driving with no fatality] = $102,676

Interpretation

- The **tornado diagram** indicates that a drunk driving fatality has the most uncertainty on the higher or more expensive end while a sober accident with no fatality has the most uncertainty on the lower or less expensive side.
- The **revised analysis** indicates that being in drunk driving accident yields more uncertainty than a sober driving accident due to the variables affecting it.
    - The fatality "cost" of a drunk driving accident with a fatality over a sober driving accident with a fatality ranges from $82,206-$209,222
    - The fatality "cost" of a drunk driving accident without a fatality over a sober driving accident without a fatality ranges from $90,211-$102,676
- Hopefully the drastic difference in costs of being intoxicated while driving influences people's decisions in the future.

References

References

[1]Admin. “5 Ways Drunk Driving Increases the Likelihood of a Car Accident.” *Herrling Clark Law Firm*, 29 July 2022, https://herrlingclark.com/5-ways-drunk-driving-increases-the-likelihood-of-a-car-accident/
[2]“Drunk Driving.” *NHTSA*, https://www.nhtsa.gov/risky-driving/drunk-driving#:~:text=Overview,These%20deaths%20were%20all%20 preventable.
[3] *43% of Americans — and 56% of Men — Admit to Drinking and Driving - Valuepenguin*; Hurst, 04 January 2021 https://www.valuepenguin.com/drinking-habits-survey#:~:text=Key%20findings,%2C%20versus%2029%25%20of%20women
[4]“Drunk Driving Fatality Statistics.” *Responsibility.Org*, www.responsibility.org/alcohol-statistics/drunk-driving-statistics/drunk-driving-fatality-statistics/.

References

[5]Administrator, Site. “Speeding and Drunk Driving: Which Is Worse? - Paul Kistler.” *Kistler Law Firm, APC.*, 27 Apr. 2018, www.kistlerlawfirm.com/speeding-and-drunk-driving-do-you-know-which-is-worse/#:~:text=NTSB%20Speeding%2DRelated%20Crash%20Study&text=The%20report%20found%20that%20between,than%20those%20caused%20by%20speeding

[6] “Economic Cost of Injury - United States, 2019.” *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 2 Dec. 2021, https://www.cdc.gov/mmwr/volumes/70/wr/mm7048a1.htm#T1_down

[7]“What Is the Average Settlement for a Drunk Driving Accident.” *John Foy & Associates*, 18 Feb. 2023, www.johnfoy.com/faqs/what-is-the-average-settlement-for-a-drunk-driving-accident/#:~:text=Average%20settlements%20for%20drunk%20driving,to%20consider%20when%20calculating%20damages.

References

[8]“Which Driver Is More Likely to Get into an Accident?” *Cullen & Hemphill, PLC*, www.cullen-hemphill.com/blog/which-driver-is-more-likely-to-get-into-an-accident-.cfm#:~:text=A%20driver’s%20intoxication%20level%20is,to%20a%20normal%20sober%20driver.
[9] Steinger, Michael. “What Are the Odds of Dying in a Car Crash?” *Steinger, Greene & Feiner*, 29 Jan. 2024, www.injurylawyers.com/blog/the-odds-of-dying-in-a-car-crash/ .
[10] “What Is the Average Settlement for a Pennsylvania Car Accident?” *Handler Henning & Rosenberg LLP*, 13 Oct. 2022, www.hhrlaw.com/blog/2022/october/what-is-the-average-settlement-for-a-pennsylvani/#:~:text=As%20of%202020%2C%20the%20NSC,per%20evident%20or%20visible%20injury.
[11] “2021 Data - Alcohol-Impaired Driving - Crashstats - NHTSA.” *NHTSA*, U.S. Department of Transportation, June 2023, crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813450.pdf.
[12] “Costs of Motor-Vehicle Crashes.” *Injury Facts*, 25 Apr. 2024, injuryfacts.nsc.org/all-injuries/costs/guide-to-calculating-costs/data-details/.