Gifty A. Arthur

BU-ISYS 623 Project, Process, Persuasive Communication

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Individual Project – PA Accidents

Introduction

In the pursuit of fostering healthier, more sustainable communities, cities across the nation have increasingly turned to initiatives to improve the quality of life for their residents by promoting cycling as a means of transportation. Commitment to such initiatives is evident through the substantial investments in bike lanes, designated bike zones, and traffic calming measures, which aim to reduce environmental impact.

However, despite the noble intentions behind these measures, their outcomes have only sometimes been positive. According to the article Enjuris titled *Pennsylvania Bicycle Accidents: Bike Laws & Lawsuits*, while overall traffic fatalities in the United States have declined, cyclist fatalities have increased by 25% since 2010. This alarming trend underscores the urgent need for a deeper examination of cycling safety measures and their effectiveness in mitigating risks on our roadways.

Pennsylvania, often lauded as the 11th most bike-friendly state by the League of American Bicyclists, stands at the forefront of this project, which is currently the central figure of an ongoing national discussion. With influential local organizations advocating for even more bike-friendly policies, the number of cyclists is increasing. Consequently, bike accidents are anticipated to continue rising.

Against this backdrop, this project aims to analyze the landscape of bicycle accidents utilizing crash data sourced from the PennDOT Open Data Portal of the Pennsylvania Department of Transportation, supplemented by some of the state's legal requirements. Focusing primarily on crash reports from Philadelphia County, this project will aim to shed light on the causes of these incidents and some of the legal implications. Pennsylvania's legal framework mandates bicyclists adhere to the same rules and regulations as motor vehicles. This underscores the shared responsibility for road safety, including compliance with traffic signals and stop signs, and emphasizes the need for mutual respect and caution among all road users.

Personal injury claims from bicycle accidents typically hinge on establishing negligence in motor vehicle drivers. Proving negligence entails demonstrating the driver's breach of duty to exercise reasonable care and establishing the causal link between their actions and the resulting damages suffered by the cyclist.

Navigating the realm of insurance coverage adds another layer of complexity to the aftermath of bike accidents in Pennsylvania. Whether compensation is sought from the insurer of the at-fault motorist or one's own auto insurance provider hinges on various factors, including fault determination and the type of insurance coverage.

In essence, this report endeavors to delve into the intricacies of bicycle collisions, offering insights into their causes gleaned from data analysis and legal implications gathered from existing literature and avenues for recourse within the Pennsylvania context. By doing so, this analysis aims to contribute to a deeper understanding of cycling safety and advocacy efforts in our communities.

Data Overview

The data for this project was downloaded in *.CSV* format from the PennDOT crash data site, which has data by county or the entire state from 2003 to 2022. The analysis relies on the data sourced exclusively from Philadelphia County for the year 2022. This dataset has comprehensive details about bicycle-related collisions within the county. This dataset encompasses a range of relevant variables for the analysis, such as collision type, number of bicycles involved, injury severity, and other pertinent factors.

To facilitate the analysis, the data dictionary available on the PennDOT crash data site has been referenced in the Appendix section of the report. It provides clear definitions and descriptions of each variable included in the dataset. This ensures transparency and accuracy in interpreting the data, enabling meaningful insights into the factors influencing bicycle collisions within Philadelphia County.

TABLES: CYCLE, PERSON, CRASH, FLAG

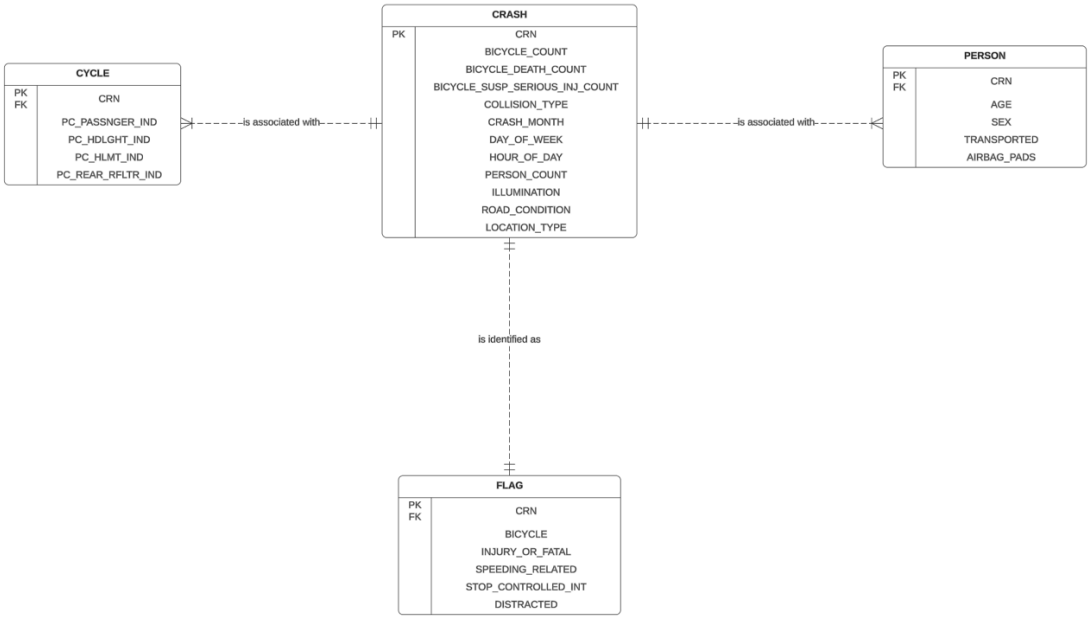


Fig. 1 Entity-Relationship (ER) Diagram: Relationships between Tables in Bicycle Collision Data Analysis

- The CRASH table is the central hub for recording information about each bicycle-related collision incident.
- Each record in the CRASH table is uniquely identified by a Crash Record Number (CRN), which acts as the primary key.

- The CRN from the CRASH (8751 rows) table is utilized as a foreign key in the FLAG, PERSON, and CYCLE tables to establish relationships between these tables.
- These relationships allow for the linkage of additional details, such as flag indicators, individual involvement, and bicycle-specific information, to the corresponding crash incidents recorded in the CRASH table.

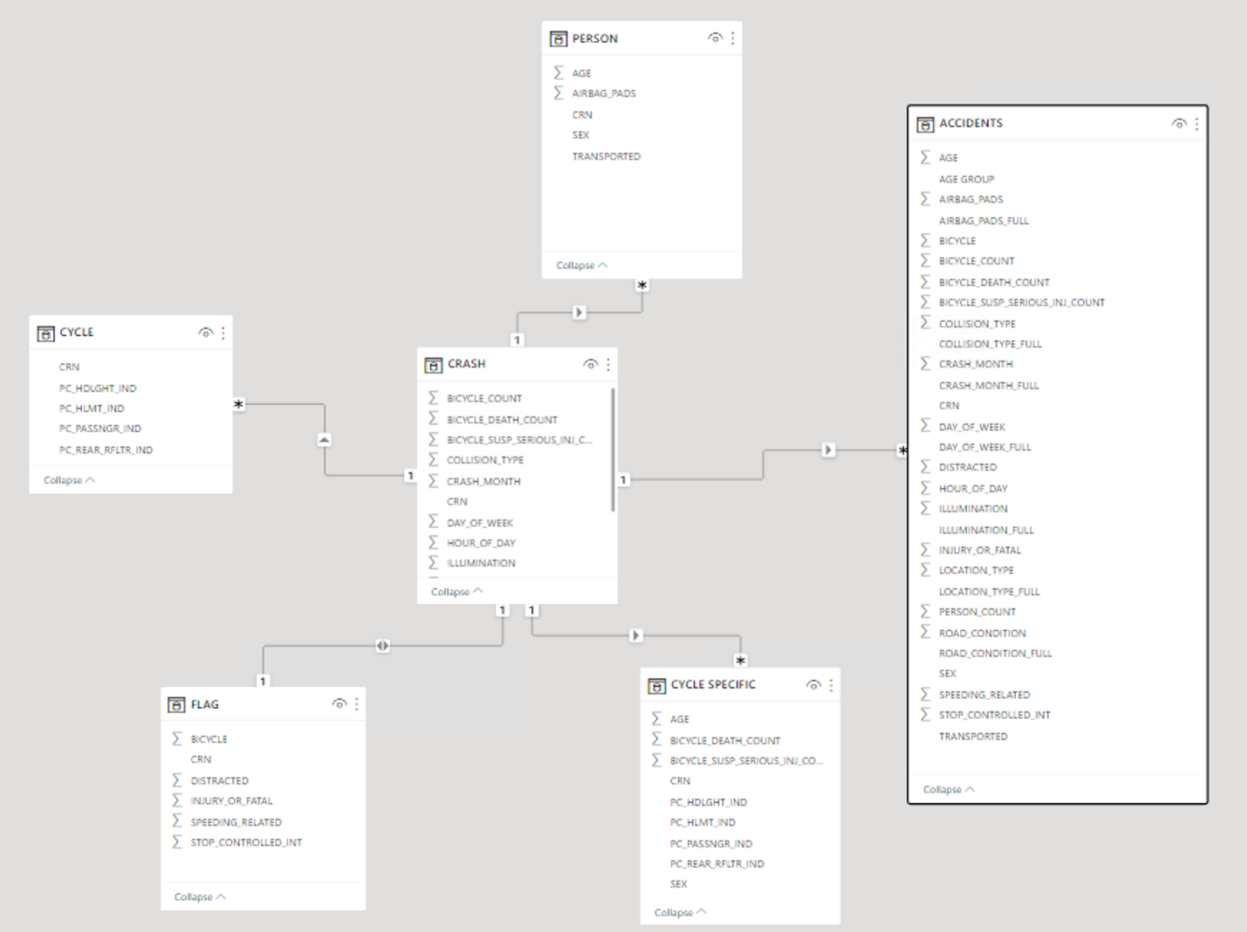
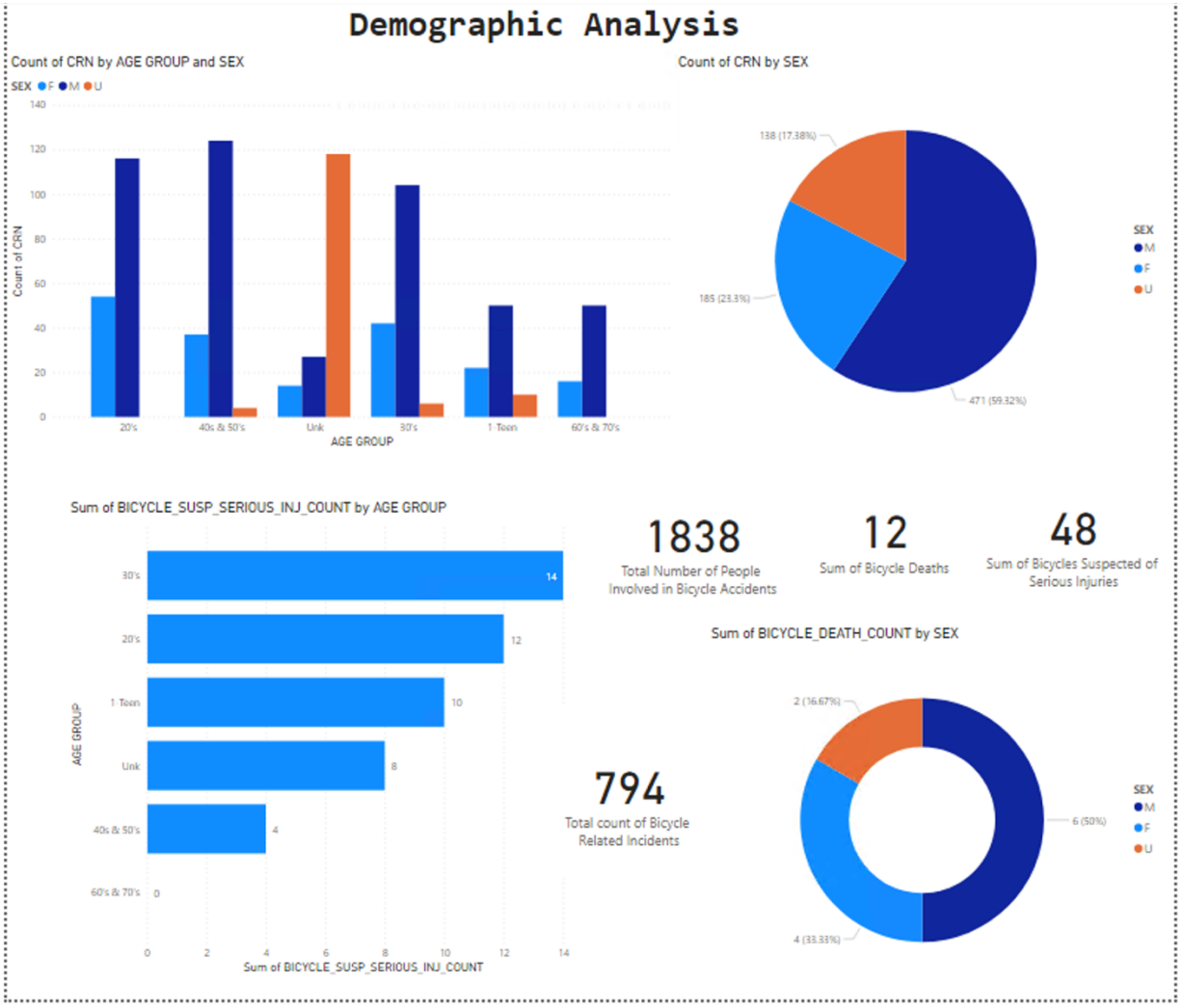


Fig. 1 Entity-Relationship (ER) Model View as Displayed in Power BI

- New tables were created in Power BI using the 'merge' function to combine data for analysis.
- The ACCIDENTS (44,307 rows) table was created by combining the CRASH, FLAG, and PERSON tables. The attributes were selected based on the bicycle incidents and data profiles of the persons involved in the crash.
- A CYCLE SPECIFIC (2,044 rows) table was created to gather data about bicycles and other pedal cycle-related vehicles.

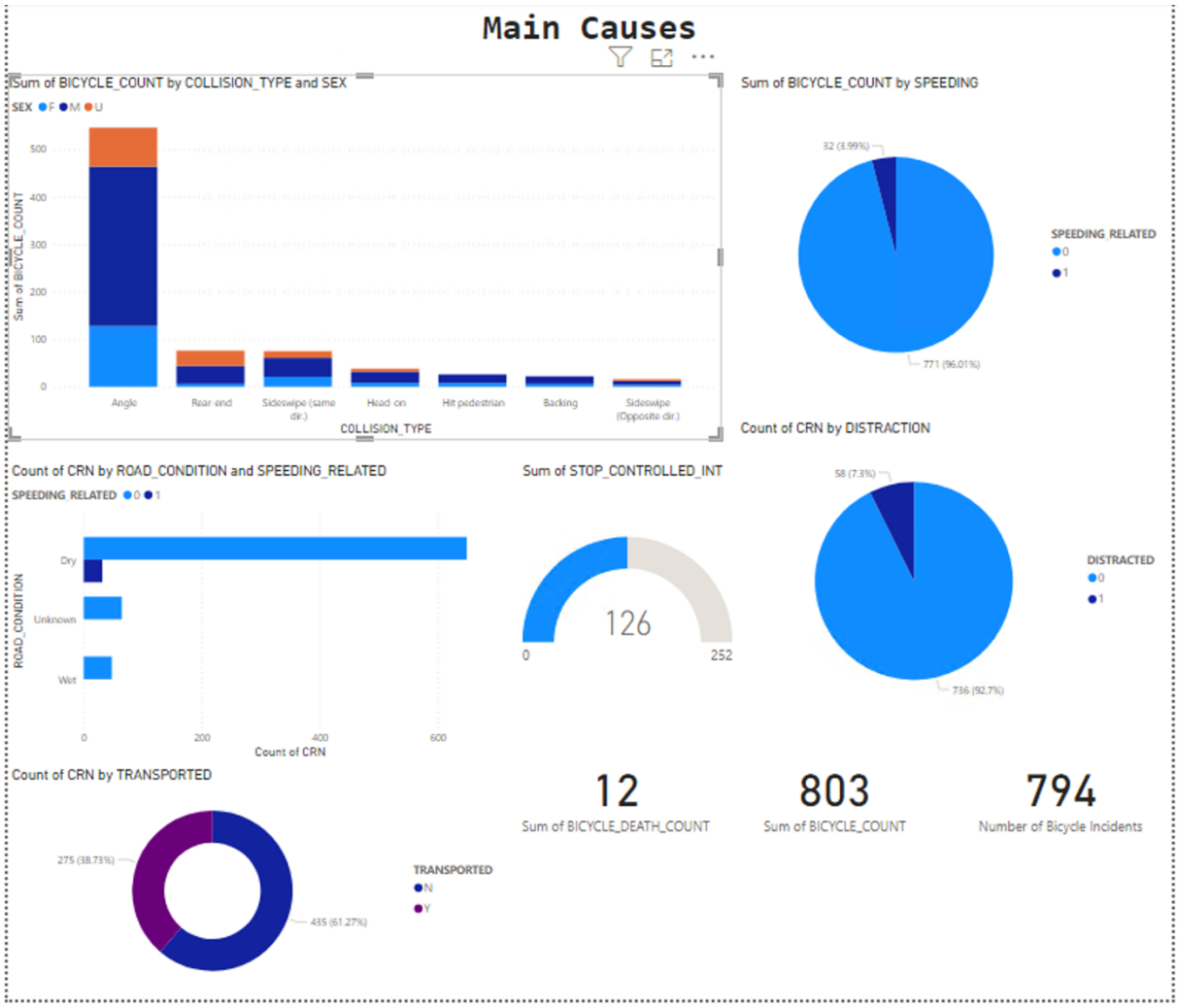
Visualization & Analysis

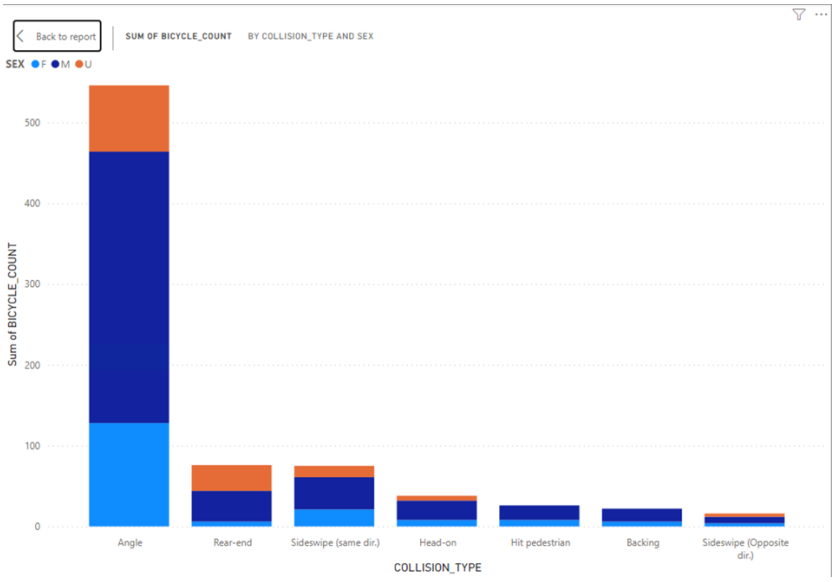
Total Bicycle Collisions by Demography



- The total number of bicycle-related collisions recorded was 784 for 2022 alone.
- Most of these cyclists were people in the 30's, 40's, and 50's age group.
- About 50% of the incidents involved male cyclists, whereas 33% were female, and the rest were unaccounted for in the records.
- Including the at-fault cyclist, the total number of persons involved in bicycle-related incidents, some as passengers, was 1838.
- 12 people died from these incidents, and 48 sustained serious injuries.
- Overall, this data confirms the thriving activities of the cycling community in Philadelphia County for the year 2022 alone, and participation is projected to increase in the upcoming years.

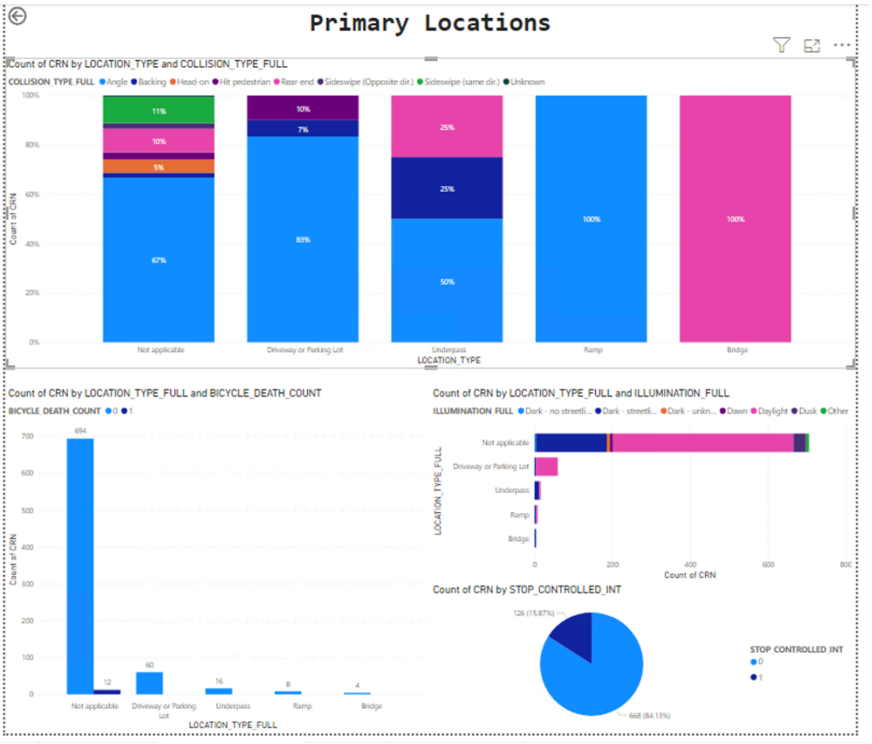
Primary Causes of Bicycle Collisions

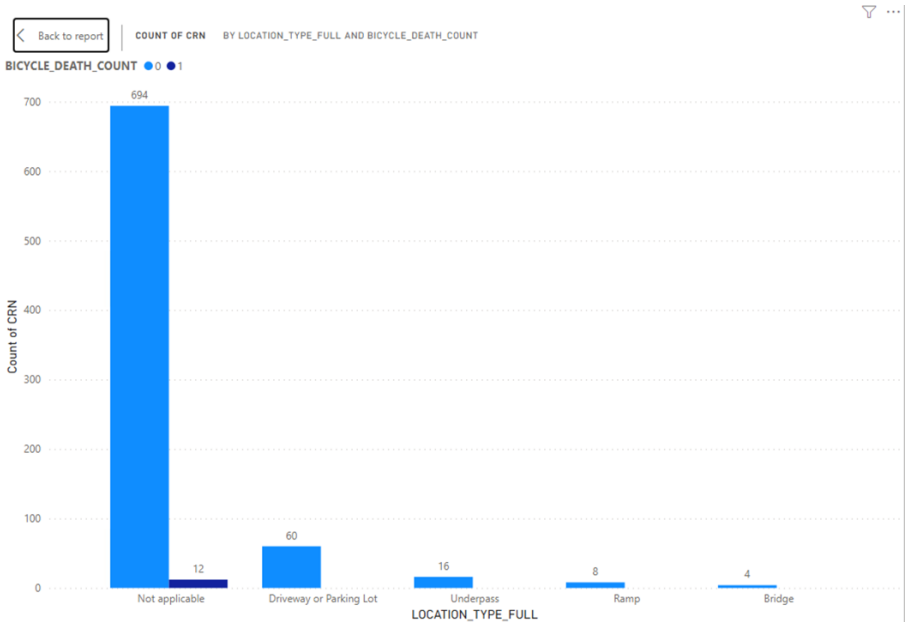




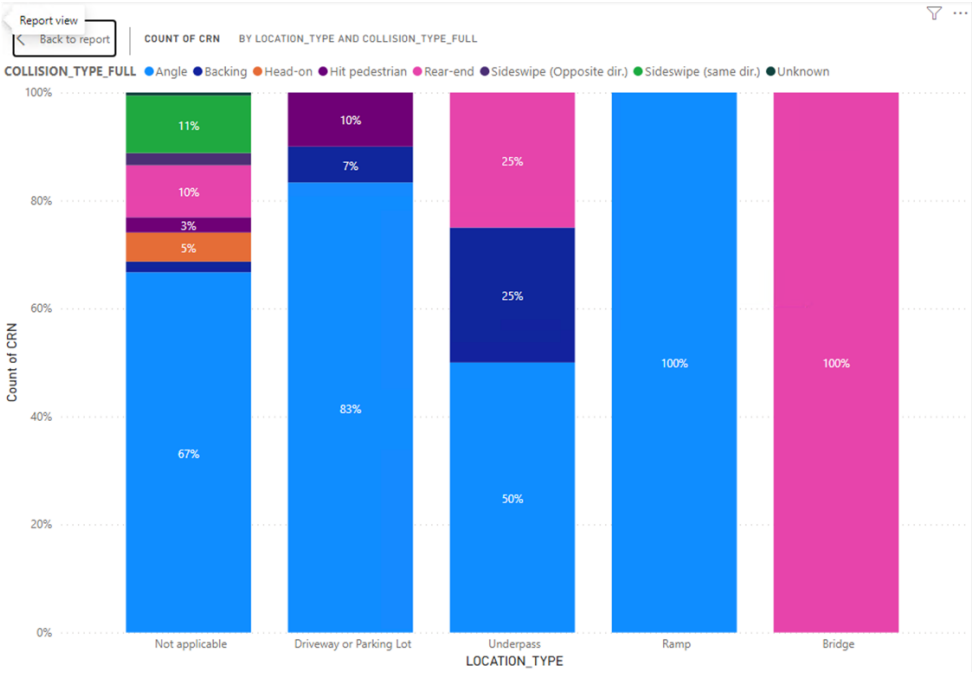
- Analysis of the primary causes of bicycle collisions based on the COLLISION_TYPE shows that most of these incidents were 'angle-collisions' or 'T-bone collisions,' where the front of one vehicle collides with the side of another vehicle, forming a 'T-shape.'
- This often happens at intersections when one vehicle fails to yield the right of way or runs a red light, resulting in a perpendicular impact with another vehicle crossing through the intersection.
- The dashboard above offers specific data about incidents also occurring at stop-controlled intersections.
- A 'stop-controlled intersection' refers to an intersection where one or more approaches have stop signs or other traffic control devices requiring drivers to come to a complete stop before proceeding.
- The next type of collision is the rear end, with the most minor occurrence being the sideswipe from opposite directions.
- From the data, very few (about 10%) of the total bicycle-related incidents were caused by speeding or distraction.
- Most cycling activities happen during dry seasons compared to wet seasons, leading to more incidents.
- The severity of bicycle collisions is also captured in the BICYCLE_DEATH_COUNT and BICYCLE_SUSP_SERIOUS_INJ_COUNT fields, bringing the total count of bicycles involved in collisions to 803.

Spatial Analysis



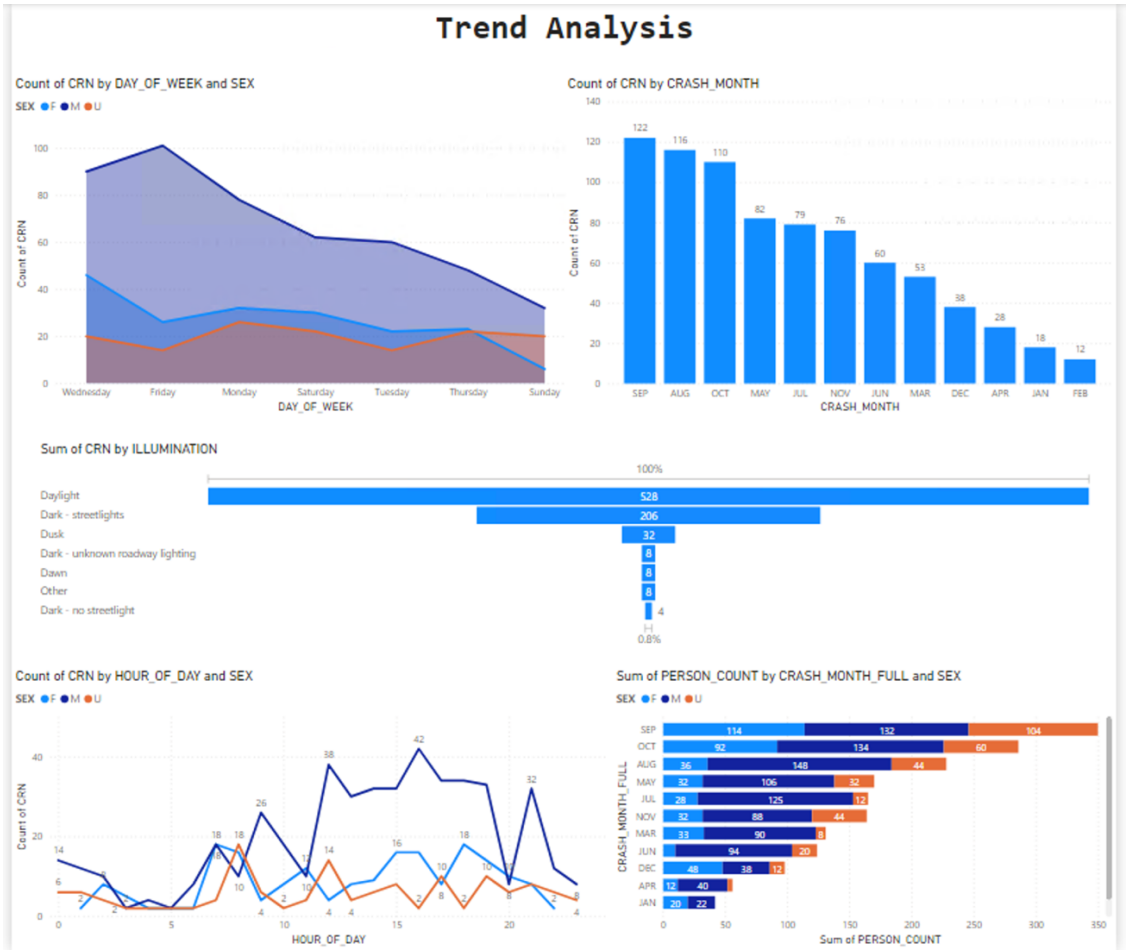


- The data shows specific locations or road types where bicycle collisions are more common.
- Not applicable was maintained as 'unknown' or 'unrecorded' to maintain count and data integrity.
- The most common location was the Driveway or Parking Lot, with the least being at Bridges.
- However, the only locations with death records are still coded as unknown or not applicable in the dataset.



- The primary locations were color-coded by their collision type to provide more information and help recreate the incidents and how they occurred.
- Rear-end collisions mainly occurred at bridges; all ramp incidents were angle collisions.

Trend Analysis



- Assessment of the incident trend by DAY_OF_WEEK shows that most incidents start during the midweek, peak on Fridays, and enter the weekend.
- The trend is consistent with male and female incidents recorded during the week.
- September had the most occurrences by month, which can be explained by the frequent outdoor activities during summer and fall from June to October.
- The trendline by hour of the day indicates that most occurrences happened around 16:00, which is also 4 PM, and around 21:00 or 9:00 PM.
- 528 incidents out of 794 occurred during Daylight, and 206 were during the Dark when streetlights were available.

Clothing and Safety Gear Analysis

- The types of clothing worn by individuals involved in bicycle collisions show that most cyclists did not have helmets.
- Cyclists were worn on the elbow, knee, or other pads as protective clothing, with the least being motorcycle eye protection.
- However, it has been recorded that some of the airbags or pads were not deployed during the incident.
- Using safety gear, such as a reflector indicator, showed a distinct correlation with collision severity.
- Cyclists without safety gear had the most occurrences, with 383 recorded, and the highest severity, with about four deaths.
- Bicycles and other Pedal Cycles owners also had headlights, and most participants in safety gear were men, which is consistent with the gender count.
- Unknown gear may have other proactive gear known today, like neon jackets or reflective clothing.

Bike Laws from the Pennsylvania Vehicle Code

Chapter 35 of the Pennsylvania Vehicle Code (Title 75) encompasses laws and regulations regarding the operation of bicycles on public roads and highways within the state. Cyclists and motorists must clearly understand the regulations outlined in the bicycle-specific law code to ensure safe and lawful cycling practices on Pennsylvania's public roads and highways.

To provide further clarity on these regulations, below are a series of frequently asked questions (FAQs) addressing common inquiries regarding each specific bike law. By addressing these FAQs, cyclists can confidently navigate the roadways, promoting safer interactions between cyclists and motorists.

- **What traffic laws apply to cyclists in Pennsylvania?**

  Bicycles are considered vehicles under Pennsylvania law and are subject to the same rights and responsibilities as motor vehicles. Cyclists must obey all traffic laws, signs, and signals, including stopping at stop signs and traffic lights.

- **Where should cyclists ride on the road in Pennsylvania?**

  Cyclists are generally required to ride as close to the right-hand curb or edge of the roadway as practicable, except when preparing to turn left, passing a stopped or slower-moving vehicle, or avoiding hazards. Bicycles may use the entire lane when necessary for safety.

- **Are cyclists allowed to ride on sidewalks in Pennsylvania?**

  Pennsylvania law allows local authorities to regulate whether bicycles are permitted on sidewalks. In municipalities where sidewalk-riding is allowed, cyclists must yield the right of way to pedestrians and give an audible signal when passing.

- **Is wearing a helmet mandatory for cyclists in Pennsylvania?**

  Pennsylvania does not have a statewide mandatory helmet law for cyclists. However, individual municipalities may have their own helmet requirements for children under a certain age. Generally, children under the age of 12 are required to wear helmets, whether as bicyclists or passengers.

- **Are there specific lighting requirements for bicycles in Pennsylvania?**

  Bicycles ridden between sunset, and sunrise must be equipped with a front lamp emitting a white light visible from a distance of at least 500 feet and a rear red reflector or lamp visible from 500 feet to the rear. Other safety devices include bikes having working brakes that stop at 15 mph within those exact distances. Some municipalities have also passed regulations that require bikes to be equipped with bells and other safety signal devices.

- **What hand signals are required for cyclists in Pennsylvania?**

  Cyclists are required to use hand signals to indicate turns or stops. The standard hand signals are extending the left arm straight out to indicate a left turn, extending the left arm out and bent downward at the elbow to indicate a right turn, and extending the left arm out and up at a right angle with the hand open to indicate a stop or decrease in speed.

- **How much space must motorists leave when passing cyclists in Pennsylvania?**

  Motor vehicles passing bicycles must allow at least four feet of clearance between the vehicle and the bicycle when passing in the same lane. No person is permitted to open any door on a motor vehicle unless and until it's reasonably safe to do so.

- **Can cyclists ride side by side on roads in Pennsylvania?**

  Cyclists may ride two abreast on roadways, but they must not impede the customary and reasonable traffic movement. They may also ride more than two abreast on a bicycle-only path.

- **Can cyclists ride their bikes across a crosswalk?**

  Cars are not required to yield to bicycles being ridden across a crosswalk because bikes are treated like cars. If cyclists want to use a crosswalk, they must dismount and walk the bike across.

- **Can cyclists access the freeway to reach their destination on their bicycles?**

  Bicycles are permitted on freeways in Pennsylvania with permission from the Pennsylvania Department of Transportation. However, this permission is generally only granted for events like bike races.

Insurance Coverage for Bicycle Injuries and Compensation

In Pennsylvania, car insurance policies typically provide insurance coverage for bicycle injuries. Depending on the type of insurance coverage held by the parties involved, compensation for bicycle accident injuries can be obtained from either the insurer of the at-fault motor vehicle or the cyclist's auto insurance company. Regardless of the insurance coverage type, cyclists are entitled to seek both economic and non-economic damages for their injuries. This entitlement extends beyond what is typically recoverable in car accidents.

Insurance coverage for bicycle accidents caused by bad road conditions or lighting issues may vary depending on the specific circumstances and parties involved. While compensation may still be sought through insurance claims, the liable party may differ from cases involving motor vehicle negligence. In such situations, it is crucial to document the condition of the road and lighting at the time of the accident, gather evidence of any negligence or failure to address known hazards and consult with an experienced attorney specializing in premises liability or municipal law.

General Advice and Recommendations for Cyclists

Considering the information presented, cyclists are urged to prioritize safety and awareness on Pennsylvania's roadways. They must familiarize themselves with bike laws, stay visible and predictable, exercise caution at intersections, and document hazardous conditions.

Navigating insurance matters following a bicycle accident can be complex. Consulting with a knowledgeable attorney is highly recommended to effectively address insurance issues, determine the appropriate course of action, and ensure that all available options, including filing a lawsuit, are considered. By following these recommendations, cyclists can enhance their safety and advocate for their rights while enjoying rides.

Conclusion

In conclusion, this report provides an in-depth analysis of bicycle collisions in Philadelphia County, utilizing data from the Pennsylvania Department of Transportation. It offers insights into the causes of these incidents, their legal implications, and how to navigate insurance matters within the Pennsylvania context. While tailored to the specific circumstances of Philadelphia County, the insights and recommendations presented herein can serve as a blueprint for similar studies in other counties across the state.

Furthermore, this report can potentially inform efforts to enhance cycling safety nationwide by extrapolating the findings and applying the principles discussed. By fostering a collaborative approach and sharing best practices, individuals and organizations can work towards creating safer roadways and promoting cycling as a sustainable mode of transportation on a broader scale.

Appendices

CRASH

Column Name	Short Title/Description	Type	Length	Constraints
BICYCLE_COUNT	Total amount of Bicycles involved	NUMBER	2	
BICYCLE_DEATH_COUNT	Total amount of Bicyclist Fatalities	NUMBER	2	
BICYCLE_SUSP_SERIOUS_INJ_COUNT	Total amount of Bicyclist Suspected of Serious Injuries	NUMBER	2	
COLLISION_TYPE	Collision category that defines the crash	TEXT	1	
CRASH_MONTH	Month when the crash occurred	TEXT	2	
CRN	Crash Record Number	NUMBER	2	Unique key
DAY_OF_WEEK	Day of the Week code when crash occurred	TEXT	1	
HOUR_OF_DAY	The hour of Day when the crash occurred	TEXT	2	
PERSON_COUNT	Total People Involved	NUMBER	2	
ILLUMINATION	Code that defines lighting at crash scene	TEXT	1	
ROAD_CONDITION	Roadway Surface Condition Code	TEXT	1	
LOCATION_TYPE	Code that defines crash location	TEXT	2	

FLAG

Column Name	Short Title/Description	Type	Length	Constraints
CRN	Crash Record Number	NUMBER	10	Unique key
BICYCLE	A Bicycle was involved	NUMBER	1	0=No, 1=Yes
INJURY_OR_FATAL	At least one Person was Injured or Killed in the Crash	NUMBER	1	0=No, 1=Yes
SPEEDING_RELATED	At least one vehicle was Speeding, Racing, or was Driving too fast for conditions	NUMBER	1	0=No, 1=Yes
STOP_CONTROLLED_INT	The crash took place at a Stop Controlled Intersection	NUMBER	1	0=No, 1=Yes
DISTRACTED	At Least one Driver Action Indicating a Distraction	NUMBER	1	0=No, 1=Yes

PERSON

Column Name	Short Title/Description	Type	Length	Constraints
AGE	AGE of Person	NUMBER	2	
CRN	Crash Record Number	NUMBER	10	Unique key
SEX	Sex of this individual	TEXT	1	1=Y, 0=N
TRANSPORTED	Transported to medical facility Y/N	TEXT	1	Y=1, 0=N
AIRBAG_PADS	Airbag deployment for motor vehicle occupant or bicycle/motorcycle protective gear	TEXT	2	

CYCLE

Column Name	Short Title/Description	Type	Length	Constraints
CRN	Crash Record Number	NUMBER	10	Unique key
PC_PASSNGR_IND	Did the Pedal cycle have a passenger?	TEXT	1	1=Y, 0=N
PC_HDLGHT_IND	Did the Pedal cycle have a Headlight?	TEXT	1	1=Y, 0=N
PC_HLMT_IND	Did the Pedal cycle driver wear a helmet?	TEXT	1	1=Y, 0=N
PC_REAR_RFLTR_IND	Did Pedal cycle have a Rear Reflector?	TEXT	1	1=Y, 0=N

Sources

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