Data Visualization Section 22 (DATA 230)

Spring 2023

Project Report
Group 2

Drug Use and Delinquency: A Visual Exploration of Patterns and Risk Factors

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Motivation Statement

The relationship between drug use and delinquency has long been a topic of concern in both academic and societal contexts. According to recent statistics, the prevalence of drug use among delinquent populations is alarmingly high, with many young lives lost as a result of drug-related incidents. In fact, studies have shown that up to 80% of delinquents have reported using drugs at some point in their lives, and a significant proportion of deaths among this population are attributed to drug abuse.

Given the devastating impact of drug use on delinquency, it is crucial to gain a deeper understanding of the patterns and risk factors associated with this problem. Through a visual exploration of these issues, we can shed light on the complex interplay between drug use and delinquency and develop more effective strategies for prevention and intervention in the future. By investigating the underlying causes and correlates of drug use in delinquent populations, we can work towards creating a safer and more just society for all.

Literature Review

1. The Relationship between Exposure to Trauma and Substance Abuse among Adolescents in Juvenile Detention" by Myers and Brown (2006): This study found that exposure to traumatic events was associated with an increased risk of substance abuse among adolescents in juvenile detention centers.
2. . Early Childhood Risk and Protective Factors Predicting Resilience against Adolescent Substance Use" - Eiden, R.D., Godleski, S.A., Colder, C.R. et al. (2020): the relationship among factors in young children coming from families with and without alcohol problems that led to substance abuse, such as binge drinking and illicit drug use.
3. Abram, K. M., Choe, J. Y., & Washburn, J. J. (2014). " Measuring the links between violence and substance use among adolescent psychiatric inpatients". Journal of Interpersonal Violence, 29(2), 277-292. This study found that among adolescent psychiatric inpatients, a history of serious life events (such as parental problems with alcohol or drugs) was associated with a greater likelihood of both violence and substance use.

4. Drug selling among high school students: Related risk behaviors and psychosocial characteristics"(2003) -Kenneth J. Steinman Ph.D., M.P.H.
5. Neighborhood environment and opportunity to use cocaine and other drugs in late childhood and early adolescence" (1996) - Rosa M. Crum a b c, Marsha Lillie-Blanton d, James C. Anthony a c.

Story of our presentation

Chapter 1: The Landscape of Delinquency

As we begin our exploration, a bar chart reveals the prevalence of various delinquent behaviors. Remarkably, drug use ranks fourth among the listed behaviors, hinting at its significant presence in the world of delinquency.

Chapter 2: The Gendered Drug Landscape

Taking a closer look at drug use, a side-by-side circle chart uncovers fascinating patterns between males and females. Notably, those who reside alone, away from social networks, are more susceptible to drug use. It becomes evident that the environment plays a crucial role in shaping drug-related behaviors.

Chapter 3: The Neighborhood's Impact

Shifting our focus to the broader community, a pie chart paints a stark picture of drug sales and consumption. In neighborhoods where drug sales are present, the percentage of drug users rises almost fourfold compared to areas without drug sales. The influence of drug availability and exposure becomes apparent, necessitating targeted interventions at the neighborhood level.

Chapter 4: Influences in a Child's World

The fourth visualization showcases the influence of key factors on a child's involvement in drug use. A donut chart effectively displays the percentages of children engaged in drug usage based on the level of influencing environments, considering three factors: parental influence, school environment,

and peer influence. By understanding the significance of these influences, policymakers and educators can design targeted interventions to break the cycle of drug use among youth.

Accompanying the donut chart is a bar chart, representing gender category of influencing factors. This visual aid provides an effective graphical representation, highlighting the categorical data associated with drug usage. Educators and stakeholders can gain valuable insights into the relative impact of parental influence, school environment, and peer associations, allowing for informed decisions on prevention and intervention strategies.

Chapter 5: Trauma and Drug Use

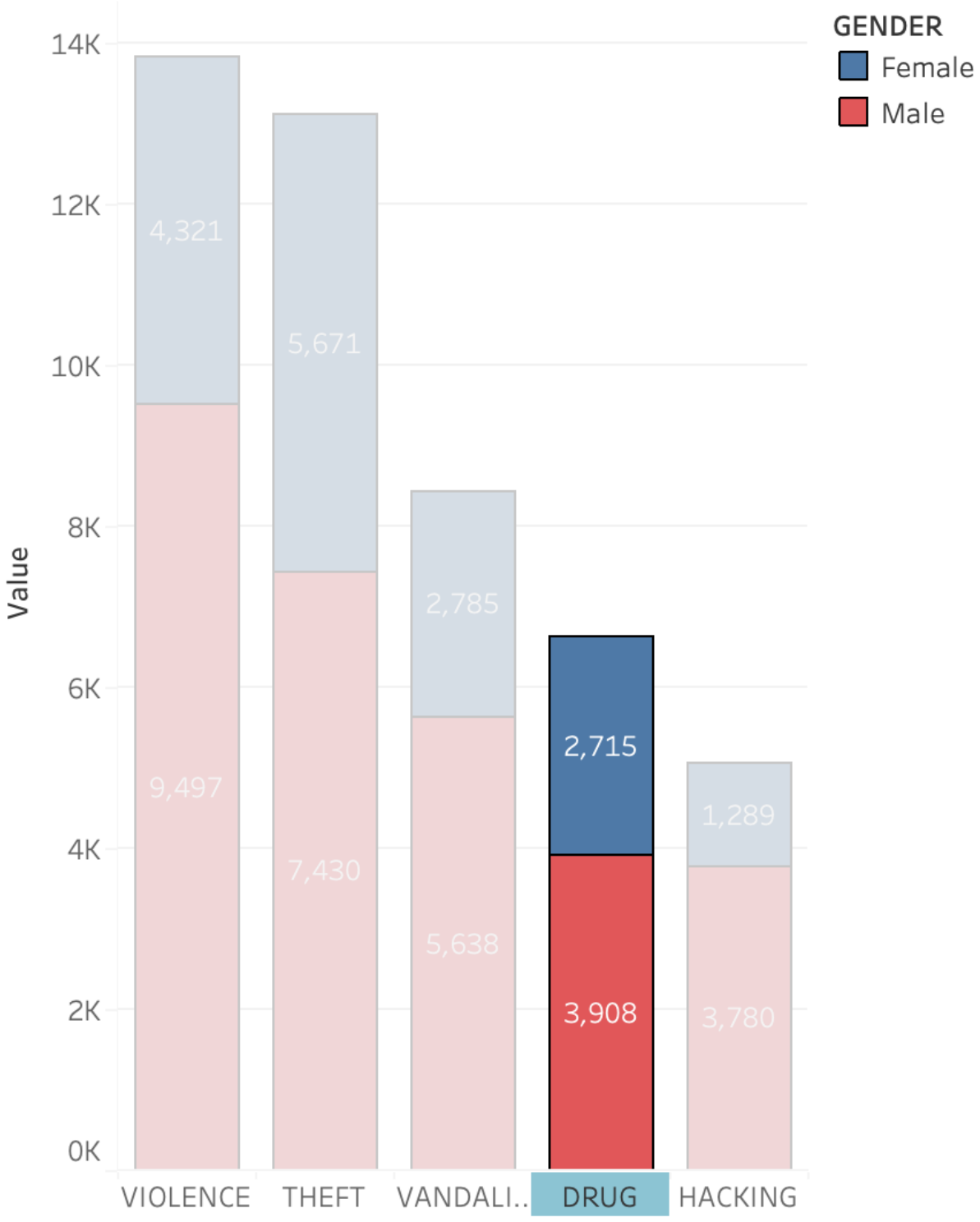
Lastly, a radar bar chart, presented in a radial direction, explores the occurrence of serious life events reported by delinquents with a history of drug use. This visualization provides valuable information for developing targeted interventions. It unveils that 13.3% of delinquents abusing drugs have experienced no traumatic events, suggesting a significant proportion of individuals have encountered at least one serious life event. By understanding the number and type of traumatic events, professionals can tailor interventions to prevent drug use among vulnerable juvenile populations.

Chapter 6: Conclusion

In conclusion, "Drug Use and Delinquency: A Visual Exploration of Patterns and Risk Factors" takes readers on a journey through the intricate relationship between drug use and delinquency. By uncovering the prevailing patterns, identifying risk factors, and exploring the role of influencing environments, this exploration sets the stage for more effective prevention and intervention strategies. Armed with a deeper understanding of these dynamics, society can work towards breaking the cycle of drug use and delinquency, fostering a safer and more prosperous future for all.

Visualization 1

Plotting different delinquent behaviors



DRUG, HACKING, THEFT, VANDALISM and VIOLENCE. Color shows details about GENDER. The view is filtered on GENDER, which excludes Null.

Visualization 1

- **Bar Chart:**
  - **Marks:** Lines
  - **Channels:** Size(length) for quantitative data, Position for categorical data, Color for categorical data such as gender (Female or male)

- **Derived data information**
  - Drug - If students has taken any one of the drugs, then drug == 1

    If [Hashltp] = 1 OR [Xtcltp] = 1 OR [Lhcltp] = 1 OR [Drudltp]=1, Then 1 END
  - Violence - if students has done the violence, then violence == 1
    - IF [Extoltp] = 1 OR [Gfigltp] = 1 OR [Asltltp]=1 then 1 END
  - Theft - If students has done the theft, then theft == 1

    IF [Shopltp] = 1 OR [Burgltp] = 1 OR [Bictltp] = 1 OR [Cartltp] = 1 OR [Carbltp] = 1 OR [Snatltp] =1 then 1 END
  - Vandalism - If students has done the Vandalism, then Vandalism == 1

    IF [Vandltp] = 1 then 1 END
  - Hacking - If student has done hacking, then its value ==1

    IF [Hackltp]=1 then 1 END

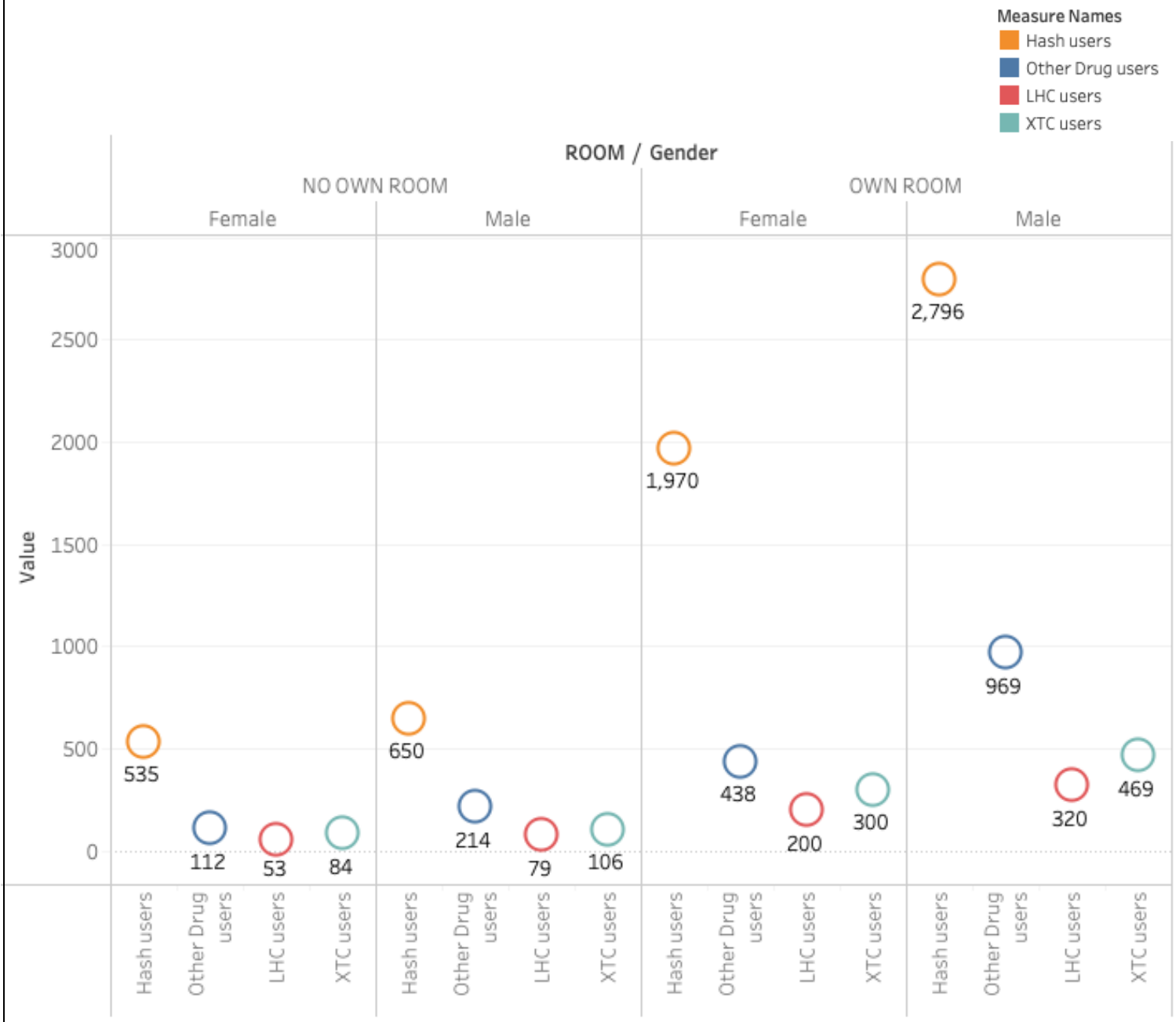
- **Why do you choose these marks and channels (problem-specific not general)?**
  - **Bars** are an intuitive way to represent quantities or values, as they can easily show the relative size or magnitude of different values such as various delinquent behaviors.
  - **Colors**, on the other hand are used to represent distinguish between distinct groups in this case it is male and female.

- **What do you want to show/describe from this visualization?**
  - Aim is to show and describe the different delinquent behaviors, with a specific focus on the position of drug use among them. The chart visually represents the frequency or prevalence of various delinquent behaviors, with each behavior represented by a bar.

- The key point to highlight from this visualization is that drug use is positioned in the fourth position among the listed delinquent behaviors. This information demonstrates the significant presence of drug use within the realm of delinquency. By highlighting drug use as a prominent behavior, the chart emphasizes the importance of understanding the patterns and risk factors associated with drug use in relation to delinquency.
- The Bar Chart serves as an introductory visualization, setting the foundation for further exploration and understanding of drug use and its connection to delinquency. It indicates that drug use is a prevalent behavior among delinquents and prompts the need for a deeper exploration of the topic.

Visualization 2

Frequencies of most used drug among males and females with and without a room



Other Drug users, Hash users, LHC users and XTC users for each Gender broken down by ROOM. Color shows details about Other Drug users, Hash users, LHC users and XTC users. The view is filtered on Gender and ROOM. The Gender filter keeps Female and Male. The ROOM filter excludes Null.

Visualization 2

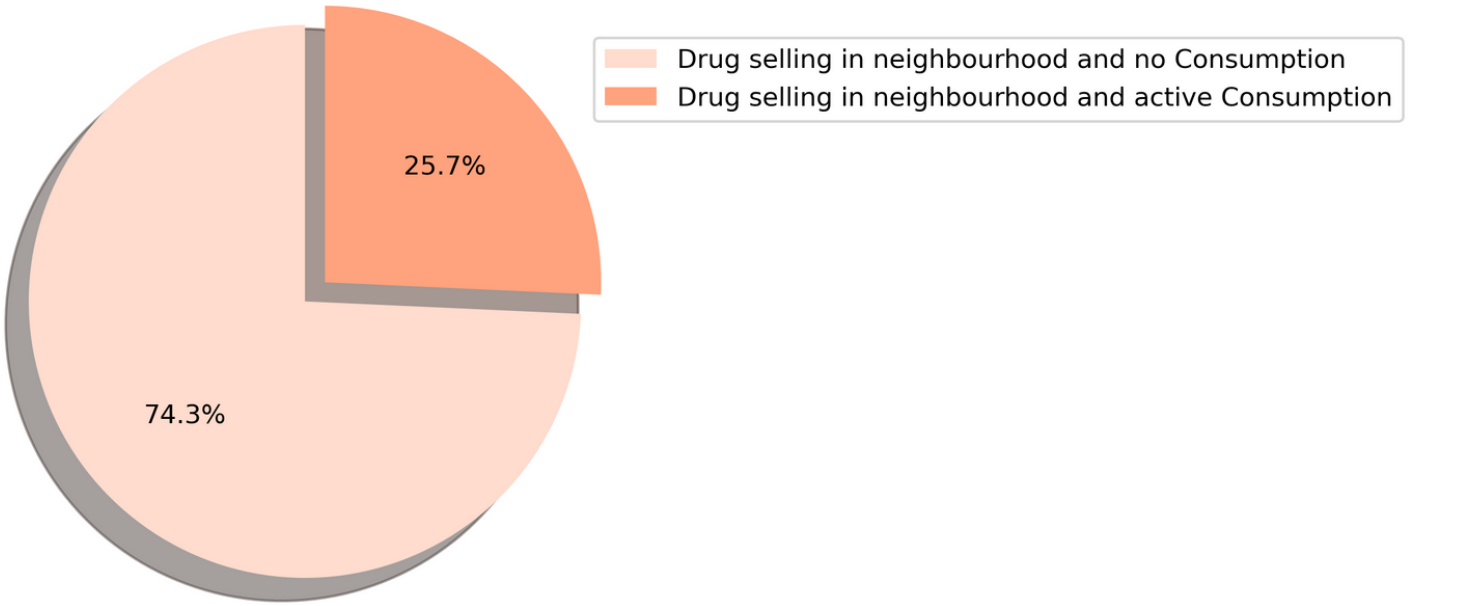
- **Side-by-Side Circle Chart:**
  - **Marks:** Circles
  - **Channels:** Position along x-axis, colors/hue

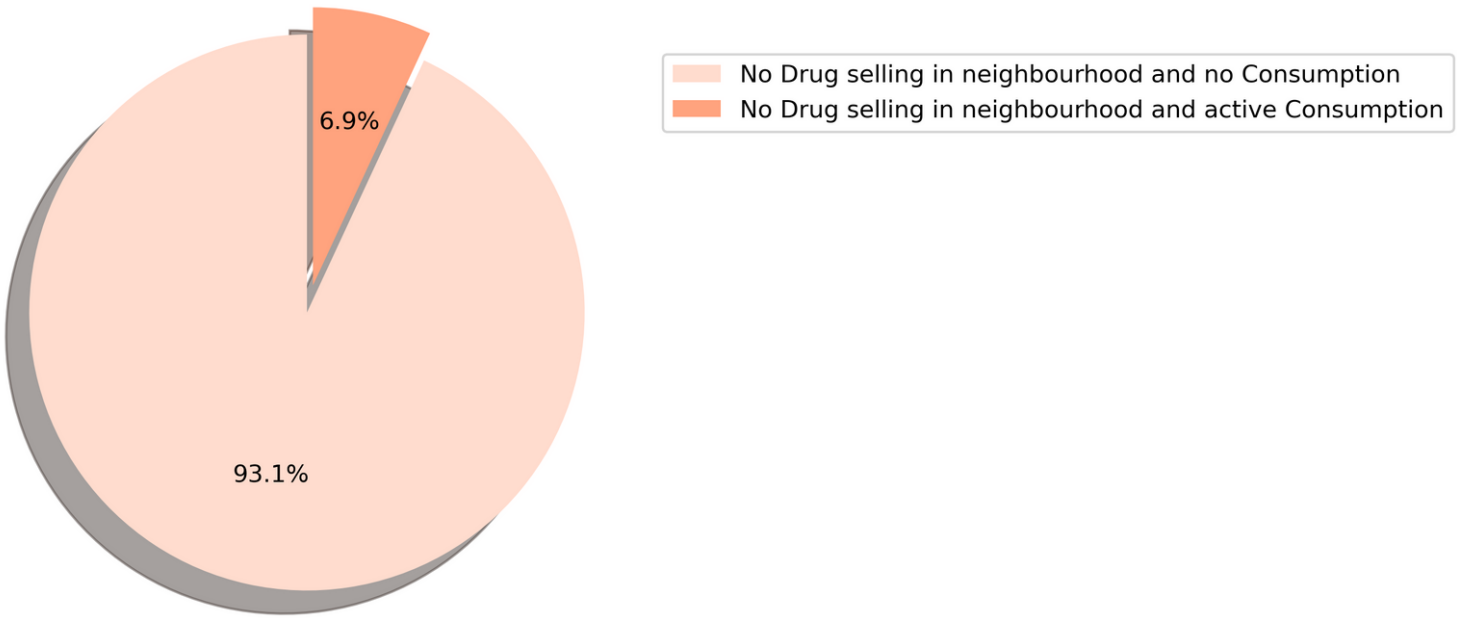
- **Derived data information**
  - Hash Users - If students have taken Hash drug, If [Hashltp] = 1
  - LHC Users - If students have taken LHC drug, If [Lhcltp] = 1
  - XTC Users - If students have taken XTC drug, If [Xtcltp] = 1
  - Other Drug Users - If students have taken any other drugs, If [Drudltp]=1

- **Why do you choose these marks and channels (problem-specific not general)?**
  - Marks as circles: Circles are a commonly used mark in data visualization because they are simple, easily recognizable, and allow for accurate comparisons. By using circles as marks, you can represent the value of the data series in a visually appealing and straightforward manner. In this case, the circles used to represent the value of each category, such as the male and female populations and their drug usage and private room ownership.
  - Position: The position of the circles is used to show magnitude of differentiate between males and females. Placing the circles side by side allows for a direct visual comparison between the two genders. This channel enables viewers to quickly discern any differences in drug use frequencies between the groups.
- **What do you want to show/describe from this visualization?**
  - The visualization allows to display the different drugs used by males and females. By using circles as marks and representing the prevalence or frequency of each drug use for each gender. It also enables us to examine the association between drug usage and private room ownership. By positioning the circles representing males and females who own a private room alongside those who do not, you can visually assess any patterns or trends. This can help identify whether there is a correlation between private room ownership and drug usage for each gender group.

Visualization 3

Drug selling in Neighborhood vs Drug Consumption





Visualization 3

- **Pie Chart:**
  - **Marks:** Wedges
  - **Channels:** Color and Size

- **Derived data information**
  - DRUG - If students has taken any one of the drugs, then drug == 1

    If [Hashltp] = 1 OR [Xtcltp] = 1 OR [Lhcltp] = 1 OR [Drudltp]=1, Then 1 END
  - Replace values in ATSCH08 column.

    data['NHOOD06'] = data['NHOOD06']. replace ({1: 'NO', 2: 'NO', 3: 'YES', 4: 'YES'})

    data['NHOOD06'] = data['NHOOD06']. replace ({9: 'NA', 7: 'NA', -9: 'NA'})
  - Neighborhood_Use - Based on Drug Selling (Yes) and Consumption (Yes or No)

    data['NHOOD06'] == 'YES') & (data['DRUG'] == 1), 'Neighborhood_Use'] =

    'Drug selling in neighborhood and active Consumption'

    data['NHOOD06'] == 'YES') & (data['DRUG'] == 0), 'Neighborhood_Use'] = 'Drug selling in neighborhood and no Consumption'
  - Neighborhood_Not_Use - Based on Drug Selling (No) and Consumption (Yes or No)

    data['NHOOD06'] == 'NO') & (data['DRUG'] == 1), 'Neighborhood_Not_Use'] =

    'No Drug selling in neighborhood and active Consumption'

    data['NHOOD06'] == 'NO') & (data['DRUG'] == 0), 'Neighborhood_Not_Use'] =

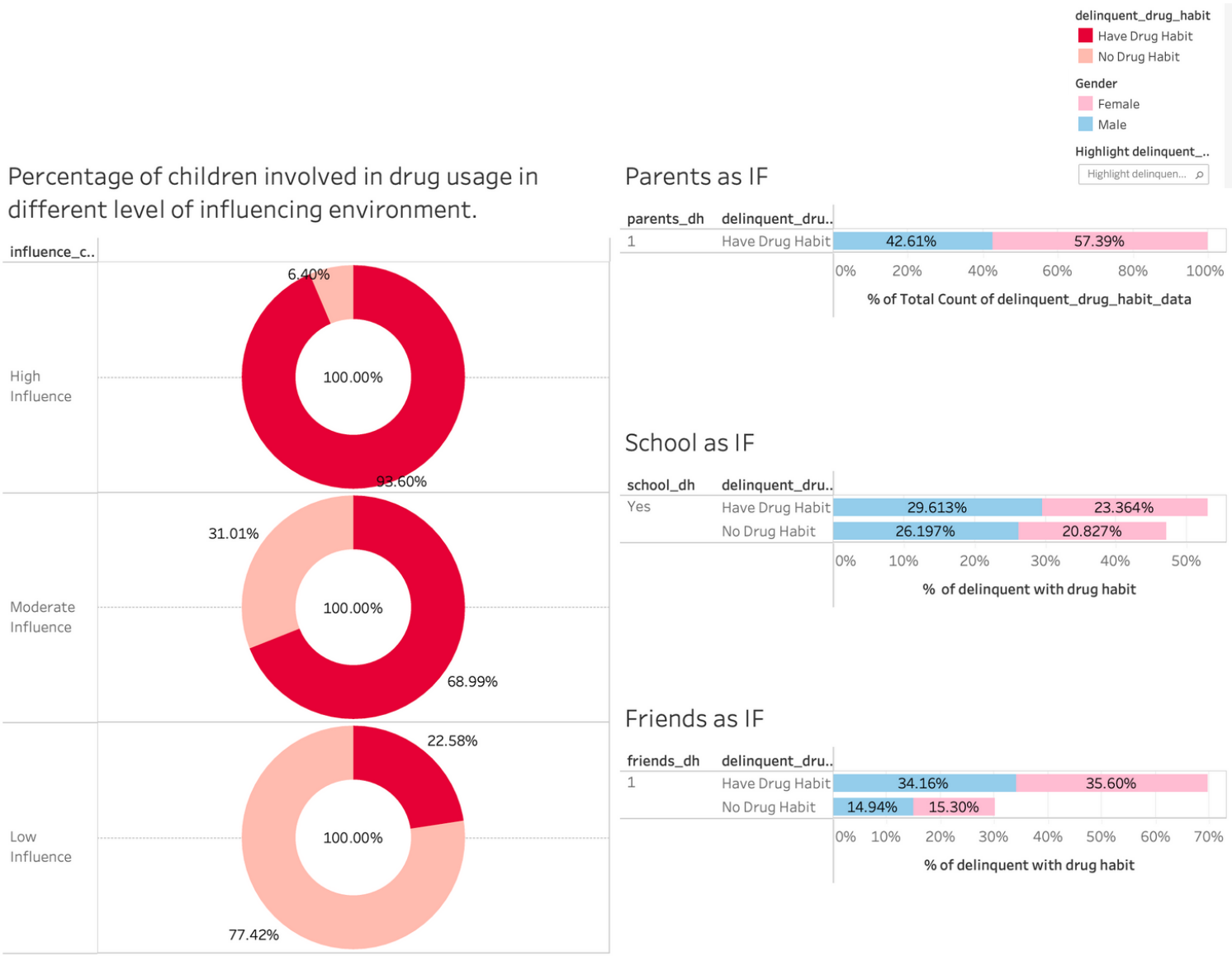
    'No Drug selling in neighborhood and no Consumption'

- **Why do you choose these marks and channels (problem-specific not general)?**
  - For marks, to compare the proportion of drug selling in neighborhood and drug consumption we used wedges as marks, as it is a common way to represent the different categories within the chart.
  - For channels, the choice of color and size can help distinguish between the two categories, for comparison in between drug selling in neighborhood and drug consumption, lighter and darker peach color is used in this case to creates a clear visual distinction between the two categories and size of each wedge is proportional to the value it represents.

- **What do you want to show/describe from this visualization?**
    - Above Pie charts visualizes the proportion of drug selling in neighborhood versus drug consumption. Pie chart is a useful way to quickly compare the relative sizes of the two categories, The marks are the wedges that represent the proportion of each category (i.e., drug selling in neighborhood (Yes or No) and drug consumption (Yes or No)), while the channels are the visual properties used to represent the data, such as colors which are used to represent two different categories where drug consumption with drug selling in neighborhood , drug consumption with no drug selling in neighborhood represented by a dark peach color (#FFA37E) and remaining categories represented by a lighter peach color (#FFDCCE) and the Darker wedge is also slightly separated from the rest of the pie, using the explode parameter.

Visualization 4

% of children involved in drug usage in different levels of influencing environment



Visualization 4

- **Donut Chart:**
  - **Marks:** Area radially separated with uniform height (radius). **Channels:** Angle (2D Area)
- **Bar Chart:**
  - **Marks:** Lines. **Channels:** Size(length) for quantitative data, Position for categorical data

- **Derived data information**
  - Gender:

```
If [Male]==1, THEN "Male"       ELSEIF [Male]==0 THEN "Female"    END
```

  - Influencing Factor: This is a weighed sum to derive overall score for influencing factor.

```
([parents_dh] *30) +
(IF [Atsch08] IN (1,2) then 0 ELSEIF [Atsch08] ==3 then 20
ELSEIF [Atsch08] ==4 then 30          ELSE 0        END)
+
(IF [parents_dh] == 0 AND [school_dh] = 'No' THEN
   (IF [friends_dh] ==1 AND [Delpdrn] >=30 THEN 60
   ELSEIF [friends_dh] ==1 AND [Delpdrn] <30 THEN 50
   ELSE 0 END)
ELSE
   (IF [friends_dh] ==1 AND [Delpdrn] >=30 THEN 40
   ELSEIF [friends_dh] ==1 AND [Delpdrn] <30 THEN 30
   ELSE 0 END)
END)
```

  - Influencing Category: Calculation for deriving level of influencing environment.

```
If [influencing_factor] < 30 then "Low Influence"
ELSEIF [influencing_factor] >=30 and [influencing_factor] < 70
then "Moderate Influence"
ELSEIF [influencing_factor] >=70 then "High Influence"   END
```

  - Delinquent drug habit (Category):

```
If [Spirltp]==1 or [Xtcltp]==1 or [Lifeev06] ==1, then "Have Drug Habit"
else "No Drug Habit"    end
```

- **Why do you choose these marks and channels (problem-specific not general)?**
  - **Bar Chart:**
    a. Each Category of Influencing factors such as drug usage of Parent, School and friends are represented in Bar Chart as it is an effective way to display categorical data in a graphical

format. In this scenario, the data is about the relationship between drug habits in each category and their children's drug habits, as well as the gender distribution of the children with drug habits.

b. The bar chart allows for a quick comparison of the percentage of delinquent children with drug habits based on whether their parents, school or friends have a drug habit or not. It also allows for a comparison of the gender distribution within each group.
c. The audience can easily visualize and understand the data presented, making it an appropriate choice for this scenario. Additionally, the bar chart allows for easy comparison of the different categories, making it useful for drawing conclusions and identifying patterns in the data.

◦ **Donut Chart:**

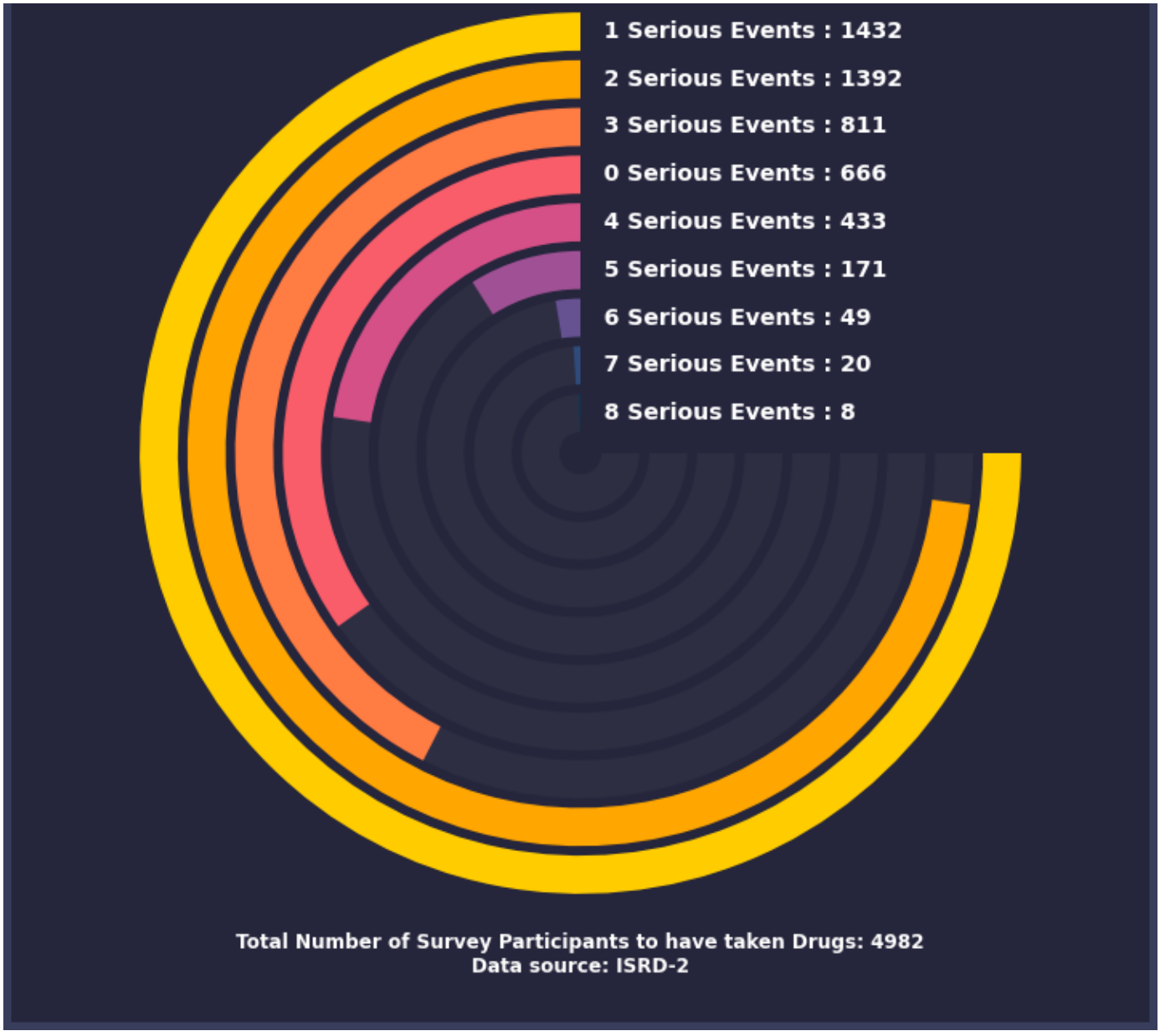
a. A donut chart is used to display data in a way that shows the relationship between a whole and its parts. In this scenario, the data is about the % of children involved in drug usage based on the level of influencing environment considering all the three factors.
b. A donut chart is an appropriate choice for this scenario because it allows the audience to see the whole (the total percentage of children involved in drug usage) as well as the parts (the percentage of children involved in drug usage based on the level of influence from each of the three factors).

- **What do you want to show/describe from this visualization?**

a. The Visualization aims to show the percentage of delinquent children who have a drug habit for each category of influence such as whether their parents/school or Friends have a drug habit and overall, how it affects the children. It also shows the gender distribution of the delinquent children with drug habits. Each Bar chart is used to identify which factor has the greatest influence on a child's drug use.
b. The donut chart is useful in showing the overall distribution of drug use among children and identifying the relative influence of different environmental factors on a child's drug use and aims to compare the relative influence of each of these factors on a child's likelihood of drug use.

Visualization 5

Occurrences of Serious Life Events Reported by Delinquents with a History of Drug Use



Visualization 5

- **Radar Bar Chart:** (Bar Chart in Radial Direction)
  - **Marks:** Lines that extend outwards from the center point along each axis
  - **Channels:** Size/Length, Position along each axis, Color/Hue

- **Derived data information**
  - The derived data represents the count of delinquents who reported having experienced 0 to 8 serious life events, out of those who have used drugs. Firstly, the data is filtered to include only valid responses, where the values in the columns are either 0 or 1. Then, a new column 'used drugs' is created which identifies individuals who have used any class of drugs, by performing a logical OR operation on the concerned data. Next, the data is filtered to include only individuals who have used drugs. Finally, the count of serious events reported by each individual is calculated by summing up the values in relevant columns.

- **Why do you choose these marks and channels (problem-specific not general)?**
  - Marks - The length of each bar along each axis was chosen as the channel to represent the different categories of serious events, as it allows for a direct comparison between the frequency of events for each category.
  - Channels - Color/hue is used to represent different categories of serious events, but in this case, it does not provide any additional information beyond what is already conveyed by the length of each bar. It is used to make the visualization more pleasing to.

- **What do you want to show/describe from this visualization?**
  - This radar bar chart provides a visual representation of the occurrences of serious life events in the lives of delinquents with a history of drug use. By including multiple bars for each participant, representing the number of serious life events they have experienced, we can observe the distribution of events and potentially identify any relationships between the number of traumatic events in a delinquent’s life that led to drug use.

- This information could be useful for developing targeted interventions to prevent drug use among juvenile populations based on the number and type of traumatic events they have experienced.
- 13.3% reported no traumatic events, which means a significant proportion of delinquents abusing drugs have experienced at least 1 serious life event.

Summary and Results

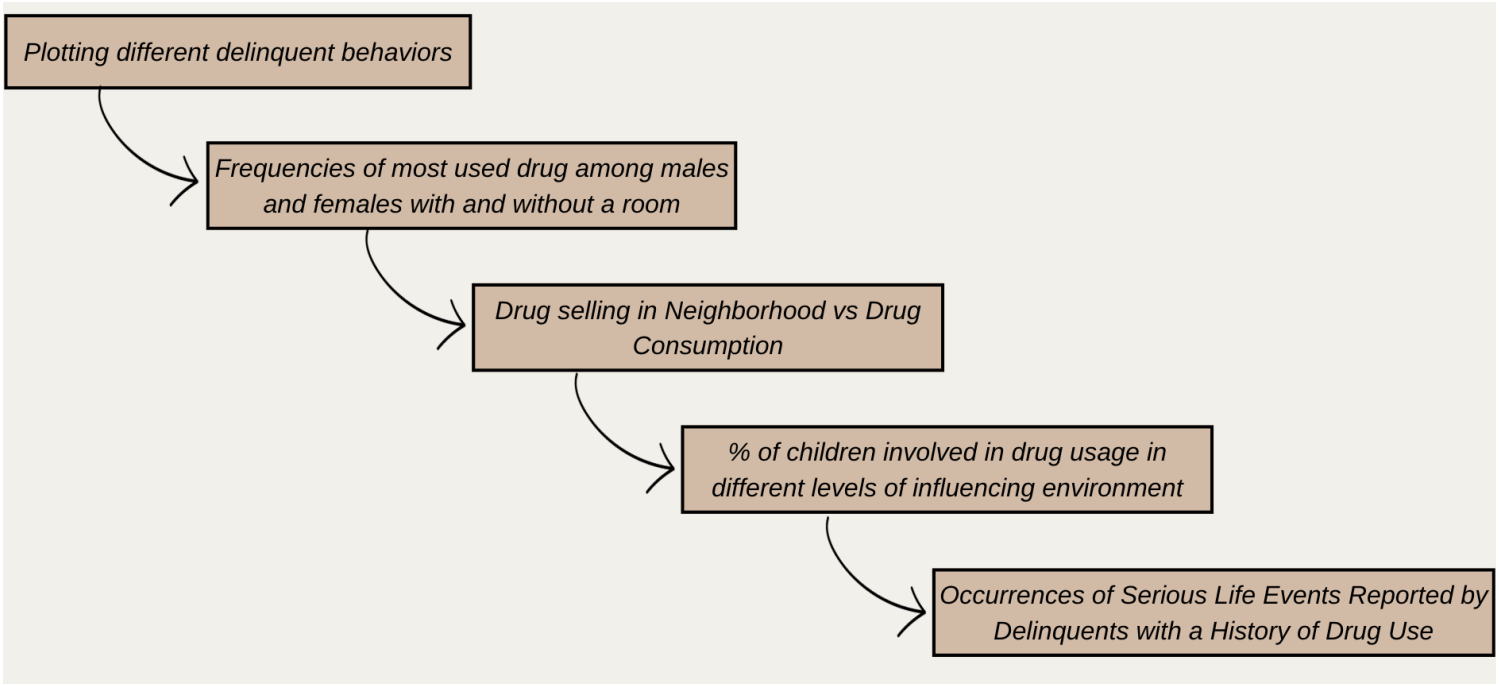
- In this experiment, we plotted and mapped patterns of many risk factors, including privacy, drug use among parents and children, friends, childhood trauma, and neighborhood drug sales.
- By comparing the various risk variables, we discovered that the likelihood of a delinquent developing a drug habit is 100% higher if their parents are drug users.
- And the most used drug among males and females is Hash drug and both of them use it more frequently if they live alone rather than in a shared space.
- When compared to neighborhoods where drug sales are not present, the percentage of people who use drugs is higher in neighborhoods where drug sales are present.
- The overall affecting elements are, from high to low, as follows: Parents > Childhood Trauma > Friends> School > Privacy > Neighborhood drug selling.
- There is a 93% likelihood that children living in high-risk environments would use drugs, compared to 68% in moderate-risk environments and 22% in low-risk environments.

Possible Intervention Strategies

The following strategies could be considered for dealing with juvenile drug use:

- **Professional Counseling:** Children who have experienced significant life events can be helped by seeking appropriate professional consultation.
- **Develop Coping Strategies:** Identify healthy ways to cope with difficult emotions and situations. This may include practicing mindfulness, journaling, or seeking the support of a trusted friend or family member.
- **Monitor Social Circles:** Monitor the social circles of juveniles to ensure that they are not being influenced by peers with a history of drug use. It is also essential to create a safe and open environment for juveniles to talk about their concerns or issues with drug use.

Arrangement



1. **Why do you choose these five visualizations?**

The selection of these five visualizations is based on the provided information and the objective of gaining a deeper understanding of the patterns and risk factors associated with drug use and delinquency. Each visualization serves a specific purpose in exploring different aspects of the topic:

- Bar Chart: This visualization is chosen as an introductory chart to provide an overview of various delinquent behaviors, with a focus on drug use. It helps establish the prevalence of drug use among delinquents and sets the stage for further exploration.
- Side-by-Side Circle Chart: This chart is selected to examine the gendered aspects of drug use. By comparing the frequencies of the most used drug among males and females, it highlights the influence of living environments and social connections on drug-related behaviors.
- Pie Chart: The pie chart is used to illustrate the comparison between drug selling and drug consumption in neighborhoods. It reveals the higher percentage of drug users in neighborhoods with drug sales, emphasizing the impact of drug availability and exposure within a community.

- Donut Chart and Bar Chart: These charts are chosen to delve into the influences on a child's involvement in drug use. The donut chart showcases the percentage of children involved in drug usage based on parental influence, school environment, and peer influence. The accompanying bar chart breaks down each influencing factor individually, providing a clearer understanding of their relative impact.
- Radar Bar Chart: This chart explores the occurrences of serious life events reported by delinquents with a history of drug use. By presenting the number and types of traumatic events, it helps identify patterns and provides valuable information for developing targeted interventions.
- These five visualizations are selected to cover a range of aspects, from the prevalence of drug use to gender differences, community impact, influencing factors, and the role of trauma. Together, they create a comprehensive exploration of the topic, shedding light on the complex interplay between drug use and delinquency.

2. Why do you choose a certain order of visualization?

The order of arrangement and selection of charts in this story have been carefully chosen to create a logical and coherent narrative that progressively explores the topic of drug use and delinquency. Here's an explanation of why each chart is positioned as it is:

Visualization 1: Bar Chart - The story begins with a bar chart illustrating different delinquent behaviors, where drug use is presented as the fourth position. This chart sets the foundation by providing an overview of delinquent behaviors, emphasizing the prevalence of drug use among delinquents. It establishes the significance of drug use in the context of delinquency.

Visualization 2: Side-by-Side Circle Chart - Following the introduction of drug use as a prevalent delinquent behavior, the second chart examines the gendered aspects of drug use. The side-by-side circle chart compares the frequencies of the most used drug among males and females, highlighting the influence of the living environment. It reveals that males and females who live alone and are less socially connected are more affected by drug use. This chart showcases the role of environmental factors in shaping drug-related behaviors.

Visualization 3: Pie Chart - The third chart expands the perspective from individual environments to the broader community. The pie chart compares drug selling in neighborhoods to drug consumption. It shows that neighborhoods with drug sales have a significantly higher percentage of drug users compared to those without drug sales. This visualization emphasizes the impact of drug availability and exposure within a community and sets the stage for understanding the need for targeted interventions at the neighborhood level.

Visualization 4: Donut Chart and Bar Chart - The fourth set of charts delves deeper into the influences on a child's involvement in drug use. The donut chart illustrates the percentage of children involved in drug usage based on three key factors: parental influence, school environment, and peer influence. It provides a comprehensive view of the contributing influences. The accompanying bar chart breaks down each category of influencing factors individually, providing a graphical representation of categorical data. This arrangement allows policymakers and educators to grasp the relative impact of each influencing factor and make informed decisions on prevention and intervention strategies.

Visualization 5: Radar Bar Chart - The final chart explores the relationship between trauma and drug use. The radar bar chart showcases the occurrences of serious life events reported by delinquents with a history of drug use. This visualization highlights the number and types of traumatic events experienced by individuals. By understanding this information, professionals can develop targeted interventions to prevent drug use among vulnerable juvenile populations based on the specific traumatic events they have encountered.

Overall, the order and placement of these visualizations in the story create a logical progression, starting from the overall prevalence of drug use among delinquents and gradually zooming in on various aspects such as gender differences, community impact, influencing factors, and the role of trauma. This approach allows the readers to gain a comprehensive understanding of the complex relationship between drug use and delinquency and prepares the ground for developing more effective prevention and intervention strategies.