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Predictive Policing on Portland State University's Campus

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**Portland State University
Urban Honors College**

Predictive Policing on Portland State Universities Campus

Portland, OR

**By
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PREDICTIVE POLICING ON PORTLAND STATE UNIVERSITY'S CAMPUS

by

Kiley Enger

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Portland State University

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ABSTRACT

Although many want to believe that campuses are safe and free of crime acts, there is a reason for the campus public safety department. Reed College, Lewis and Clark College, and University of Portland all rank as safer schools than Portland State University (PSU) (Niche, 2017). The parking garages and lots in particular have a large number of crimes (Enger, 2016). Using predictive analytics to forecast crime is becoming very popular with large police departments within the last few years. It emphasizes the importance of collecting crime data and created a use for past incident reports. The goal of the experiment is to identify patterns in crime in PSU's parking structures and lots, and to use those patterns to characterize and forecast future crime. Overall, to conduct this experiment I used both quantitative and qualitative approaches. The majority of this project was done with quantitative approaches however. I did multiple calculations to find base rates and make a prediction. After forecasting future crime, I designed an intervention to give to Campus Public Safety (CPSO) to implement. Currently no research has been done on predictive policing in the PSL at Portland State University. All the data development was from PSU CPSO's Daily Activity Log (DAL); a hard copy record of daily incident reports. The average number of incidents per year is 183. The average number of crimes that occur per week is 3.5. On any day, I am mostly certain that crime will occur between 1000 and 1700, with an even higher chance at 1300 hours and 1500 hours.

INTRODUCTION

When and where does crime occur most often? Why does crime occur in specific locations and times? Do officers personal impressions of crime line up with reality? What can Campus Public Safety do to decrease crime in hot spot areas? Campus crime seems almost non-existent; after all, a college is its own community separate from the “real world”. Although many want to believe that campuses are safe and free of crime acts, there is a reason for the campus public safety department (CPSO). Reed College, Lewis and Clark College, and University of Portland all rank as safer schools than Portland State University (PSU) (Niche, 2017). The parking garages and lots in particular, have 50% of the incidents that occur on campus (Enger, 2016). The idea of using predictive analytics for the purpose of predicting crime has started to become very popular within the last few years. It has shown to emphasize the importance of collecting crime data and made a use for past incident reports. Many large departments, such as New York Police Department (NYPD) have implemented predictive policing into their practices (Shapiro, 2017). Portland Police Bureau (PPB) now uses predictive policing (IBM Corporation, 2014). Although there are many city departments that are now using predictive analytics, smaller department still have yet to catch on (B. Rominger, Personal Communication, April 2017).

From the literature review I conducted, this research is the first of its kind. After emailing 12 campus police departments from 5 states 100% of them say that they do not have any knowledge of research that has been done on their university (Appendix C and D).

The goal of this research is to identify patterns in crime in PSU parking structures and lots, and use those patterns to characterize and forecast future crime. After analyzing historical data, I will then recommend an intervention or change in patrol patterns to

Portland State University's Campus Public Safety Office to implement and hopefully reduce crimes in the PSL's.

To achieve this I looked through the CPSO's DAL, hard copy binders of brief descriptions of each incident that occurred, took down the main information needed to analyze and make a prediction. This was all compiled into Microsoft Excel. Finding many different base rates and using extrapolations to make a prediction.

This thesis will start with a detailed review of predictive analytics in policing, then describe the scope and methods used in my analytics of crime at PSU. The third section will report my analysis of historical data and provide a general forecast. I will then discuss implications for policy at PSU, review the intervention recommended to CPSO, and last consider lessons for predictive policing at colleges and universities.

PREDICTIVE POLICING OVERVIEW

Predictive policing, although a relatively new field, has shown to be effective (Clarke, 2005). There are multiple departments currently using predictive policing, however, there are very few published article on the methods or outcome. News articles talk about the improvements police departments are making by using predictive policing (Perry et. al. 2014, Greenguard, 2012). Predictive policing can reduce time wasted and can maximize the effectiveness of officers, one example being patrolling in areas that have higher crime rates, especially with the current shortage of officers (B. Rominger, Personal Communication, April 2017). As a student at Portland State University, and as a Resident Assistant who works closely with CPSO, I have generally felt safe on campus. I also know that our garages and lots tend to be unsafe in regards to property theft. In a pilot study in 2016, I determined that theft tended to be highest on campus in Parking Three (Enger, 2016). The current study thus focuses on PSL's and applies predictive policing specifically to PSL's on campus.

A. What is Predictive policing?

Perry et. al. (2013) defines "predictive policing [as] the application of analytical techniques-particularly quantitative techniques-to identify likely targets for police intervention and prevent crime or solve crimes by making statistical prediction" (p. 1). Essentially, it is forecasting crime. Although a large portion of predictive policing (PP) is the statistical analysis, an equally important part of the process is implementation. PP is part of another concept known as Problem Oriented policing (POP). POP is the idea that, rather than solely deterring or responding to crime, problems that give rise to crime should be found and abolished (Clarke, 2005, section 4). POP is broken into four steps also known as

SARA (Scanning, Analysis, Response, and Assessment) (Perry et al, 2013, p. 11). Each step aids in the effectiveness of the outcome. Put in other terms, SARA is understanding the crime problem, doing statistical analysis, implementing an intervention, and evaluating the results. Each step in SARA can go in order or start at any point in the cycle and go in reverse. (see figure 1)



Figure A. SARA diagram.

POP guides PP and gives analysts a problem to focus on and improve. With all the data and outputs in the world, the data alone will not give a direction to departments on where to start. Multiple different aspects of society influence crime, and understanding the cause or motive can end a particular crime. After the statistical analysis is conducted, the process of SARA keeps the researcher on task. Problem Oriented Policing is the concept that Predictive policing is a part of.

Many mathematical algorithms can be used to calculate the statistics for PP. One that is currently being used is similar to calculating after shocks of an earthquake. Near-

repeat crime tends to behave like the aftershock of an earthquake (Hayes, 2015, p. 33).

Each crime makes another crime more likely, like each earthquake tends to make another one more likely to occur (Hayes, 2015, p. 33). This pattern has been observed in one specific study done by UCLA on Los Angeles burglaries. It showed that self-exciting point process model was more accurate than hot spot policing (Mohler et. al., 2011, p. 100)

PP aims to aid in more proactive intervention strategies. With many departments short on staff, it is more crucial than ever to maximize the effectiveness of officers.

Greengard (2012) notes that a goal of PP is changing policing from reactive to proactive (p. 19). They also explain that it is putting officer "knowledge and skills to work in a more effective way" (Greengard, 2012, p. 20). It is assumed that crime will take place in some saturated, or more high risk, areas, called hot spots. An article by Hayes (2015) says that hot spot policing can reduce crime incidence without displacing crime to other areas (p. 31). Hot spot policing is patrolling in areas where crime tends to occur at higher rates. Research shows that hot spot policing can be an effective way to control crime. (Hayes, 2015, p. 31)

Predictive policing can also maximize the individual effectiveness of officers. PP has become an important part for shift commanders in times when funding was short (Perry, Hollywood, & Smith, 2014, p. 32). Because PP aims to pinpoint high risk areas, officers are sent to those areas rather than wasting time in areas where incidents do not occur often. Beth Pearsall (n.d.) states that with PP, more resources can be brought into an area at the right time to deter or reduce crime (p. 17). This reduces the money spent on wasted time. (Pearsall, n.d., p. 17). If there is a shortage of officers, it can also place the officers that are

on duty in areas that crimes typically occur so that they respond faster and are not having to waste gas and time driving to a location.

B. What Predictive policing is not?

Predictive policing is not a crystal ball. It does not predict future crime 100% accurately. This statement can be found in multiple sources, “predictive analysis is not a crystal ball” (Hayes, 2015, p. 2). “It is not a crystal ball” (Perry et. al., 2013, p. 7). It forecasts what could happen in the future but does not tell the future. In the same regard, it is not like *Minority Report* either. *Minority report* is a movie set in a dystopian future, Tom Cruise is part of a policing organization that arrest’s people before they commit crimes. In actuality, there is not a way to actually see what plans people have before they set out to do them. The idea of being able to prevent crime, rather than responding after the crime was committed, is an exciting topic, but there must still be probable cause to arrest (Perry et. al. 2013, p. 8). At best, these predictions are probabilistic (Perry et. al. 2013, p. 8).

Although PP does give a good idea of what areas should be patrolled more often and what people considered a risk, PP does not replace the knowledge of the officers or their experiences (Greengard, 2012, p. 19). It aids by giving risk assessments to help in the implantation of the officers experiences (Turner, p73). Greengard (2012) says that it build on the current practices that officers already use (p. 17). It “enables [the officers] to do these things better” (Greengard, 2012, p. 17).

C. How is it implemented?

There are multiple ways that PP can be done, there is not one specific way to do it rather there are a set of tools used. (Pearsall, n.d., p. 17). A how-to manual put out by the Department of Justice outlined predictive analytics into 60 steps. This is the process that I

took when doing my study. It is broken down into 8 main phases, first, prepare yourself, understand the areas you will be researching; learn about problem oriented policing, understand what POP is and how PP is a part of it; study environmental criminology, understand how the environment influences crime; scan for crime problems, find what problems are in the area your researching; analyze in depth, conduct the analysis; find a practical response, develop and intervention; assess the impact, evaluate the response; communicate effectively, communicate the outcome to stakeholders (Clarke, Eck, 2005, Table of Contents).

Finding the non-random aspects also. For example, things like patterns and correlations of day, time, and locations. Like I said earlier, by comparing crime to patterns of nature such as after shocks of an earthquake, it is possible to detect these non-random components of crime (Greengard, 2012 p. 21).

Finally, create an intervention. It is important to make a good use out of crime data by pairing it with an intervention. (Hayes, 2015, p. 36). Not only is increased patrols in hot spots a good idea, but using POP and “addressing environmental factors that contribute to a location’s vulnerability” a good idea (Hayes, 2015, p. 37). “Making predictions is only half of prediction-led policing” (Perry et. al., 2013, p. xviii).

Data must be collected for any type of predictive policing. Many studies start with collection of data. Agencies now make their data publicly available and easy to export. Portland Police just this year launched their database, which makes it so data can be directly exported to excel (Crime statistics, 2017). Because data is constantly coming in, it is important to keep on top of what is coming in, because this can change the outcomes. Crime patterns could shift.

A study done by the Seattle Police Department is one of the few studies that has some published results from their predictive study, which published on the Internet. The study was conducted by George Mason University. The study shows that Problem Oriented Policing and the use of hot spot policing, among other tactics, worked in reducing crime. (George Mason University, 2013).

The current gap in the research is lack of reporting and publishing of predictive policing studies. Many studies are confidential. If the information gets in the wrong hands, it could also be used against the police. If the public knows where officers are patrolling according to the statistics, they are less likely to engage in crime in those areas. And they could engage in crime in areas where officers are patrolling less. There is also little known on the long-term effectiveness of doing PP. According to Hayes, there is no research that shows a cause and effect relationship yet, only correlation (Hayes, 2015, p. 19). Because of this, many smaller departments have not invested in PP software.

METHODS

Overall, to conduct this experiment I used both quantitative and qualitative approaches. The majority of this project was done with quantitative approaches however. I did multiple calculations to find base rates and to make a prediction. After doing some forecasting of the future, I made an intervention and gave some recommendations for Campus Public Safety to implement.

A. Data development

The source for all the data was CPSO's Daily Activity Log (DAL). The DAL was the best option for obtaining information on crime occurrences. It is publicly available and it is the only readily available option for civilians to look at. The DAL is a hard-copy binder containing all incidents that have occurred in a year. Each incident contains the day, time, and location as well as includes a brief description of the incident, the individuals involved, and if someone was arrested or not; using all reports in PSL's from 2012 through 2016. Information before 2012 was not available to the public due to the use of a different reporting system. Although some incidents are redacted, all imperative information is included in the logs. The one aspect of information that was redacted on most all of the incidents was names. Some of the perpetrators names were listed of which I did not use because that was outside the scope of this paper. The DAL also provides the most information short of looking at the full report the officers write.

All the data from these books were manually entered into Microsoft Excel including incident report number for organizational purposes. Entered first was the date and time that an incident occurred. The time the incident was reported was used if the incident time

was not known. Location, type of incident, and if someone was taken into custody were recorded as well. Once the information was transferred into Excel, accuracy and integrity were checked. If there was a time, day, or location missing for the report, then the incident was removed. If the year, time, or location were input wrong, then they were checked against the DAL again and re-input. Each incident was further broken down into multiple subcategories by of day, time, and location. These categories include daylight or night, day of the week, property, person or crime against society, hour, time of day, and lastly if it was in a parking structure or lot.

A survey was given to the officers and can be found in appendix A. Both Quantitative and Qualitative questions were included but included majorly quantitative data. The survey was made on Qualtrics. Nearly all of the questions were on a semantic differential scale. Rating Scales, dichotomous scales, and qualitative questions were also included. The questions were all based on the findings of the statistical analysis. Using the websites statistical analysis function, the results were obtained.

There were a few additional limitations in the data. Because the DAL is publicly available, some incidents that are confidential are not included, probably including some incidents that occurred in garages. Incidents are confidential include quality of life calls and often person crimes. Due to a lack of time, it was also not possible to update the information as it was coming in. Crime does not stop for research, and there was no way of constantly adding in new data. I am also not a statistician, and that made it difficult to do all the statistics that were necessary for this type of research.

B. Analyzing the results

Base rates were used mainly because they are the best way to find normal. Normal is an average and does not occur very often, however it gives a place to start from. It is assumed that the future will be like the past, in other words, the past is prologue. Base rates are mostly appropriate when dealing with oscillation. Crime tends to increase and decrease a lot throughout time. When finding normal, it gives the researcher a place to start. By finding multiple base rates, the goal is to find what has largest predictive power. In this project, 13 different base rates were calculated. All of them were some category of type or place, compared with time. All of these were looked into to help support my prediction of where and when incidents occur most often. They also provide the information needed to analyze past data to predict the future. By finding trends within the data and by making tables of each of the categories, I could see where spikes and lulls were though out all the years. With each table, a graph was also included to help visualize the numbers. Observations were noted where patterns or uncommon phenomenon's were.

Conditional formatting helped determine the most common hours. The incidents occurring per hour 0000 hours-2300 were broken down for each day of the week. Using Excels conditional formatting function, each count of incidents per hour per day of the week assigned a color depending on how many standard deviations from the mean the numbers were. one standard deviation above the average was assigned yellow and two standard deviations above the average were assigned yellow. This means that anything that is red is significant in that it has a higher occurrence rate of incidents on that day of the week for that particular hour.

Finding number of incidents that happened per day gave an output that allowed me to find the average number of incidents that could happen on any given day. To find the

frequency, the number of incidents that happened each day was summed. For example, if there were three separate incidents that occurred on July 10, 2016, then the sum would be three. Second, the number of incidents that occurred each day, ranging from zero incidents to six incidents, was added up using Excel's filter function. For example, On July 10, 2016 there were three incidents, on July 11, 2016 there was one incident and on July 12, 2016 there were three incidents, then there are two days with three incidents and one day with one incident. Each of these calculations were divided by the total number of incidents, giving the probability that on any given day, the probability of x amount of incidents occurring is y percent. For example, there were two occurrences of three incidents in one day and one occurrence of one incident in another day therefore, there is a 66.7% chance three incidents will occur and a 33.3% chance one incident will occur. The average number of incidents that occur per day was found by using Excel's average function adding up every day and dividing it the total.

The survey of CPSO officers was created using the same analytical and computational categories as the statistical analysis, so that the statistical findings could be compared to officers' perceptions. One question on the survey corresponded with each base rate calculation. For example, my analysis's computed the time of day when incidents most often occur, so one question on the survey asked officers to choose what time they thought crime occurred most often in the PSL?

RESULTS

A. What is normal?

Crime is rare in PSL's. An average of 183 incidents occur each year in PSU's PSL's, yielding a monthly average of 15 incidents over five years.. The average number of crimes that occur per week is three point five. An incident is defined here as a reported criminal or non-criminal event with involvement of law enforcement. The highest number of incidents occurring between the years 2012-2016 was 219 in 2014. The lowest number of incidents occurring between the years 2012-2016 was 153 in 2016. The highest number of incidents that occurred any given month between the years 2012-2016 was 32 in January 2012 and the lowest was 6 in August 2012. There is a 63% chance that no incidents will occur in the PSL's on any given day. The incidents will occur in Parking Structure 3 39% of the time. On any day crime will most likely occur between 1000 and 2000 with a 60% chance, with an even higher chance at 1300 hours (7.7%) and 1500 hours (8.4%). That also shows that the crime will occur during the daylight in the afternoon. The survey showed that many officers believed incidents to occur during night. The crime usually will be a property crime (59.5%) and more specifically UEMV (28.4%) and Criminal Mischief (19.7%). The incident will most likely clear without an arrest (87.3%).

B. Annual Crime Trends

Crime in the PSL's has been decreasing since 2014. Rates were relatively constant from 2012 to 2013, with a difference of one incident, but then increased by 50 incidents from 2013 to 2014. The rates started to decrease in 2014 and have been since. In 2014 an increase of incidents in the parking garages occurred.

Per year, there is an average of 183 incidents in PSL's. There was a spike in reported crime 2014, most likely because an increase in patrols in the parking structures led to more reported incidents(B. Rominger, personal communication, April 2017). This could mean that incidents per year could be closer to 219 like they were in 2014. If patrols were more concentrated in PSL's then more incidents would be found and reported by officers. It could also mean that there was an increase in incidents or reporting in that year. The trend is increasing and if the pattern, low, medium, high, medium, low, is being followed then the number of incidents should increase in 2017 to medium again.

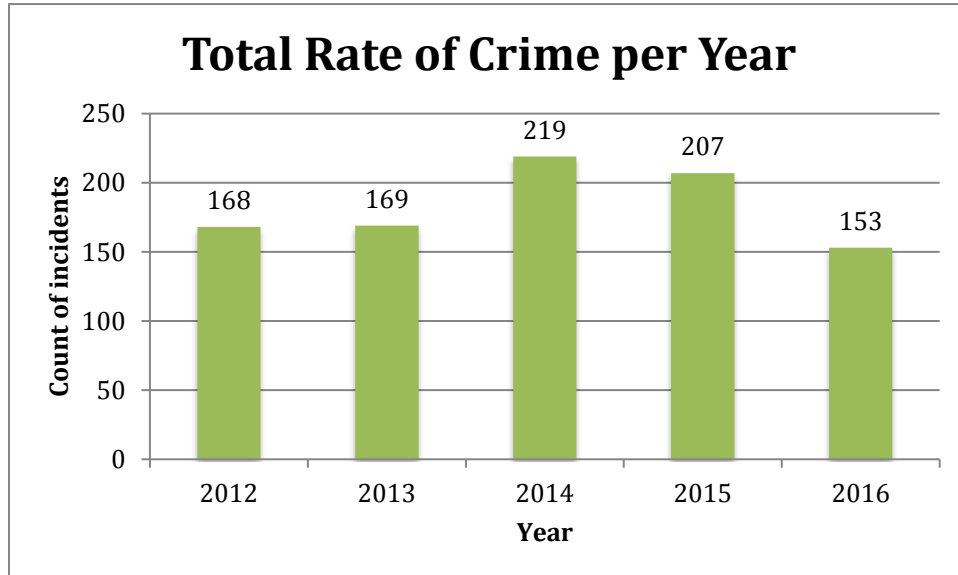


Figure 1. This shows the total rate of crime for 2012-2016. In 2014 the incidence was the highest.

C. Month

In the beginning I hypothesized that summer months would be the highest in count of crime due to the nice weather. Nicer weather typically brings more people outside. Instead, January, February and November have the highest monthly crime rates. Even though 2014 had the highest number of incidents compared to the other four years, there was a large difference in count in February (9 incidents) compared to the other four years in February (2012-19 incidents, 2013-25 incidents, 2015-22 incidents, 2016-28 incident). Generally, incident rates are higher in January and February and start to decrease from March to September, then increase again beginning in October. May-August 2016 there was a decrease relative to the other four years. July through October 2014 there was an increase in incidents relative to the other four years.

It was assumed that the summer months would be more popular for incidents to occur due to more people being on campus and outside. More people means more cars, and more people who are willing to leave their home to break into cars. The results showed though that most incidents occurred in colder months. Because there is not a lot of activity in the summer months, due to many people returning to their parent's homes or not taking classes for summer break; there are fewer cars in the garages. When there are fewer cars, there are fewer opportunities. January could also be higher due to more valuables being in people cars because it is after the holiday season. Many people come back to campus with gifts, clothing, and other miscellaneous items.

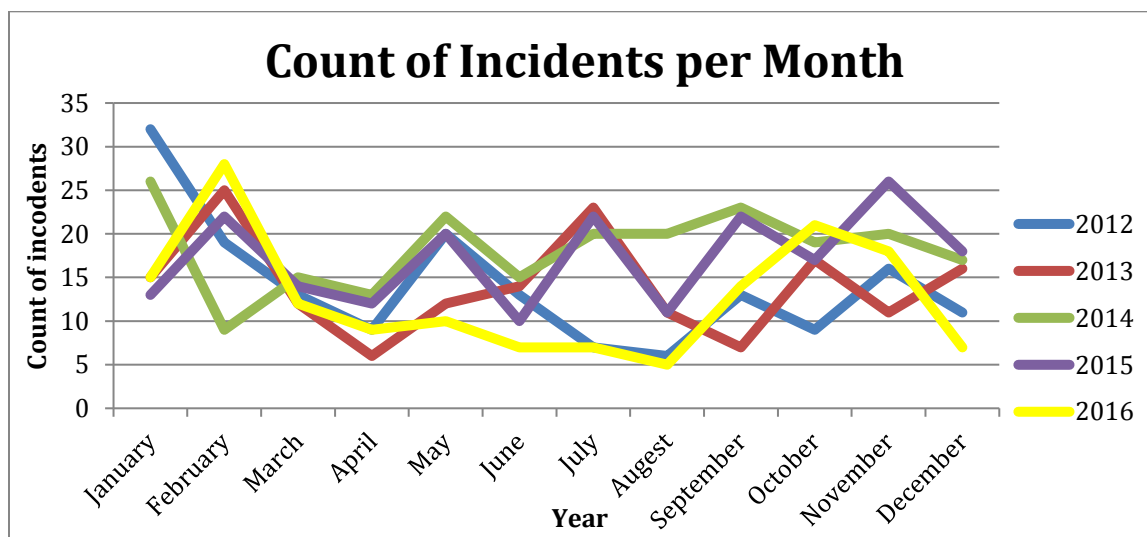


Figure 2. This shows the count of incidents per month. February was highest for 4 of 6 ywars.

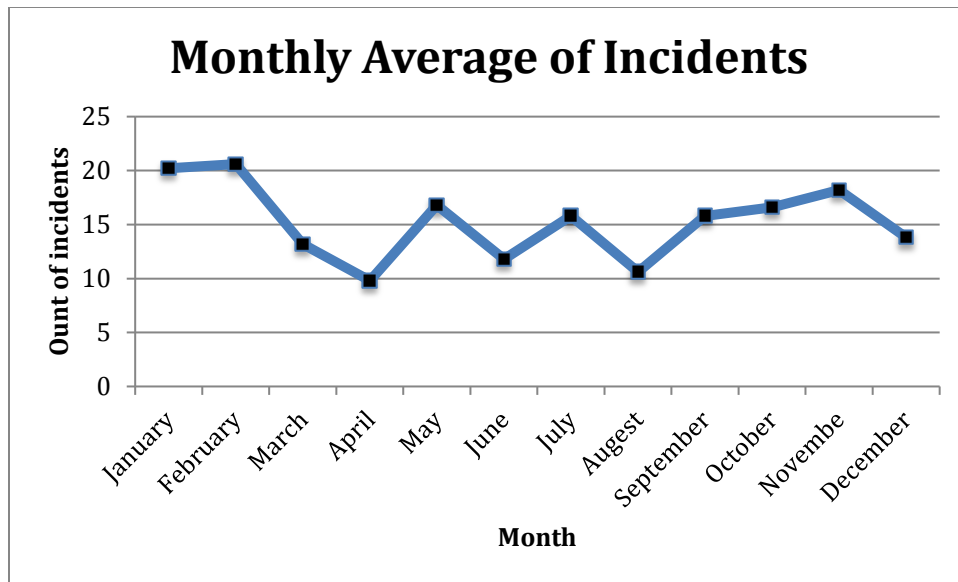


Figure 3. This shows the monthly average of incidents. January and February both are highest among the rest of the months.

D. Day of the Week

When starting the analysis, I hypothesized that weekends would have the highest crime rates. However, the data suggest that day of the week is not significant. Mondays and Wednesdays have the highest crime at 15%.

For five of the seven days of the week there was a decrease in the number of incidents starting in 2014. Every day of the week, a decrease occurred from 2015-2016 (Monday, Wednesday, Thursday, Friday), except for Tuesday, which increased by five incidents. A decrease of 12 incidents occurred of overall incidents from 2014-2015 and a decrease of 54 overall from 2015-2016. Between 2012 and 2013, a large drop in incidents occurred from 27 incidents to 14 incidents on Wednesday. From 2013-2014, there was an increase in incidents on Monday. Mondays and Wednesdays are two of the most popular times for classes typically 1000-1150. The original hypothesis was clearly refuted.

Monday and Wednesday have the highest count of crime occur out of all 7 weekdays, this is when people are on campus most often. The most popular class times are these two days. (Housing and Residence Life, 2016). In 2014, when garages were being monitored more frequently, Monday and Wednesday also had the highest occurrence of incidents. In fact, the highest number of incidents occurring on any day for any year happened in 2014 on Monday.

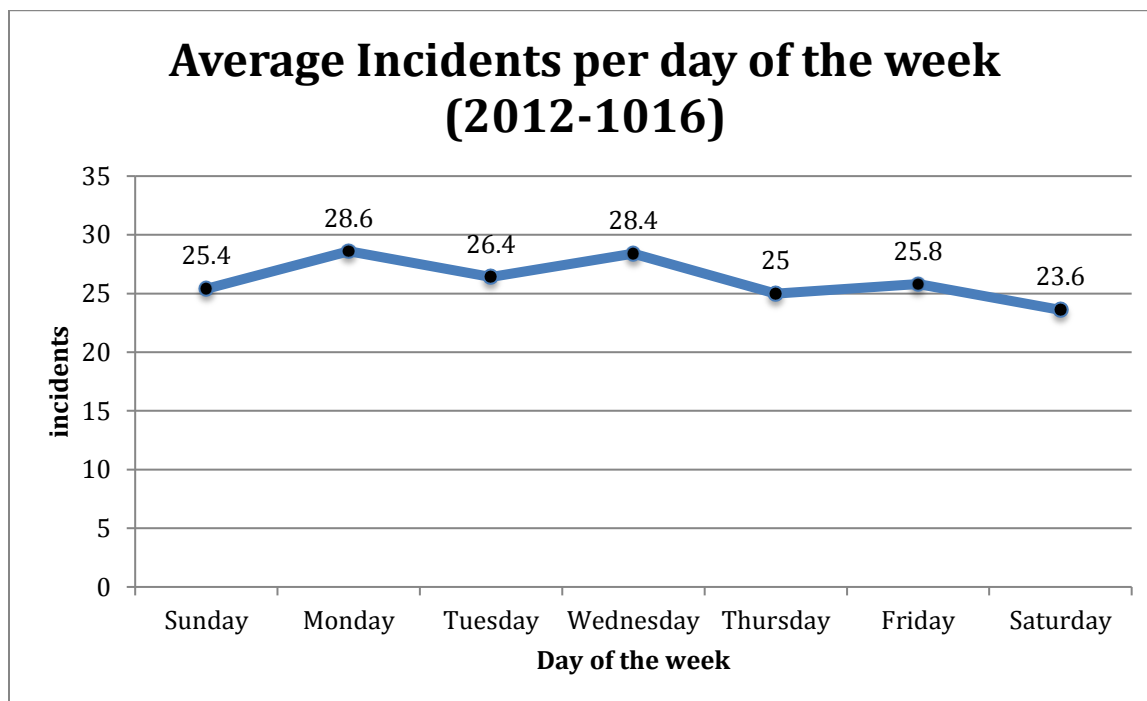


Figure 4. This shows the average count of incidents per day of the week for 2012-2016. Monday and Wednesday are the highest.

E. Hour

I expected that crimes occurred more often throughout the night, due to less people being out and the streets being lit by streetlights; usually between the hours of 2100 and

0400 hours. Summing the count of incidents per hour, per year, the most common hours incidents occurred were 1300 hours (8%) and 1500 hours (8%). The hours of 1300-1500 account for 26% of incidents on Mondays. Nearly half of all incidents occur between 1000 hours and 1700 hours (48%).

Daily rates of crime throughout the day start to increase at 600 hours and continue to increase until 1500 hours when crime decreases. Rates start to increase again at 2100 hours and decline again at 2300 hours.

Incidents typically occur during the time intervals of 1000, 1300, and 1500 hours. The most popular class times for students is 1000-1150 (Residence Life, 2016) and, many students are on campus during the day between 1000 and 1700 hours. This finding was unexpected. It was thought that crime would occur at night due to being dark outside and there being fewer people around. Although some incidents do occur overnight, there are higher portions that occur during the day. Probably also affected by opportunity. Because many of the incidents that occur in garages are unlawful entry to a motor vehicle, or related vehicle crimes there must be cars present. The more cars there are, the more opportunities for perpetrators.

| Day of the Week | 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Sunday | 3 | 7 | 2 | 1 | 3 | 4 | 1 | 1 | 5 | 2 | 12 | 6 | 7 | 11 | 1 | 13 | 7 | 5 | 3 | 3 | 3 | 5 | 7 | 7 |
| Monday | 3 | 4 | 2 | 3 | 1 | | 1 | 6 | 6 | 7 | 6 | 4 | 4 | 11 | 13 | 11 | 5 | 5 | 8 | 5 | 5 | 5 | 6 | 9 |
| Tuesday | 9 | 3 | 4 | | 1 | 1 | 1 | 1 | 3 | 6 | 5 | 5 | 9 | 9 | 6 | 12 | 9 | 4 | 9 | 3 | 6 | 5 | 5 | 5 |
| Wednesday | 2 | 3 | 6 | 3 | 5 | 3 | 1 | 5 | 4 | 6 | 10 | 3 | 5 | 11 | 5 | 11 | 9 | 8 | 1 | 4 | 9 | 4 | 9 | 7 |
| Thursday | 6 | 4 | 4 | 2 | 4 | 2 | | 2 | 2 | 6 | 7 | 5 | 5 | 8 | 5 | 6 | 5 | 5 | 6 | 12 | 4 | 4 | 7 | 7 |
| Friday | 3 | 2 | 2 | 3 | 4 | 3 | 2 | 3 | 4 | 5 | 5 | 4 | 7 | 11 | 8 | 9 | 6 | 11 | 6 | 6 | 1 | 1 | 5 | 8 |
| Saturday | 5 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 1 | 5 | 3 | 6 | 7 | 8 | 4 | 3 | 9 | 8 | 7 | 3 | 5 | 6 | 2 | 9 |

Figure 5. This shows the number of incidents that occur per day of the week for the years 2012-2016. Mondays from 1300-1500 hours have the most incidences that occur.

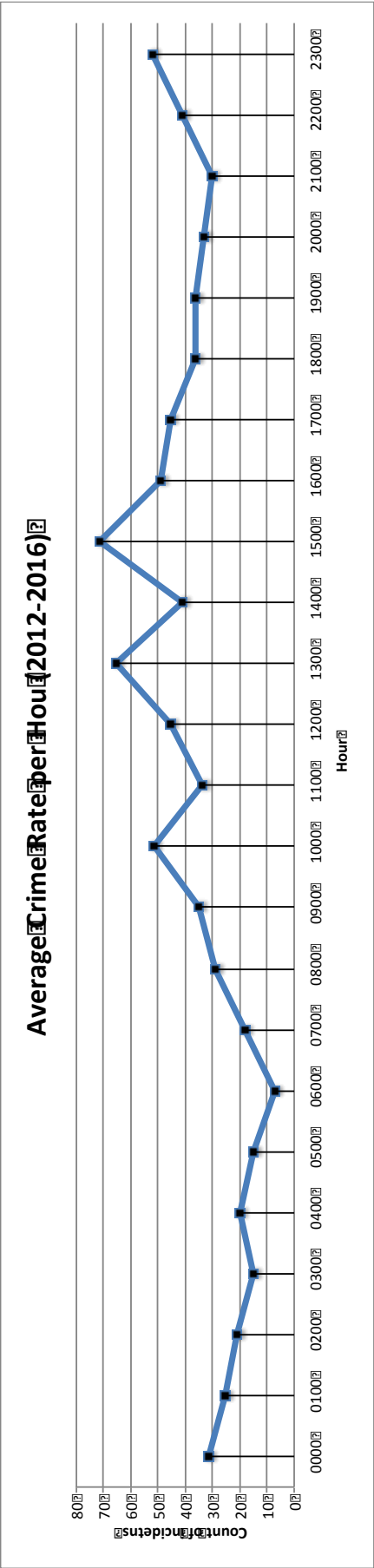


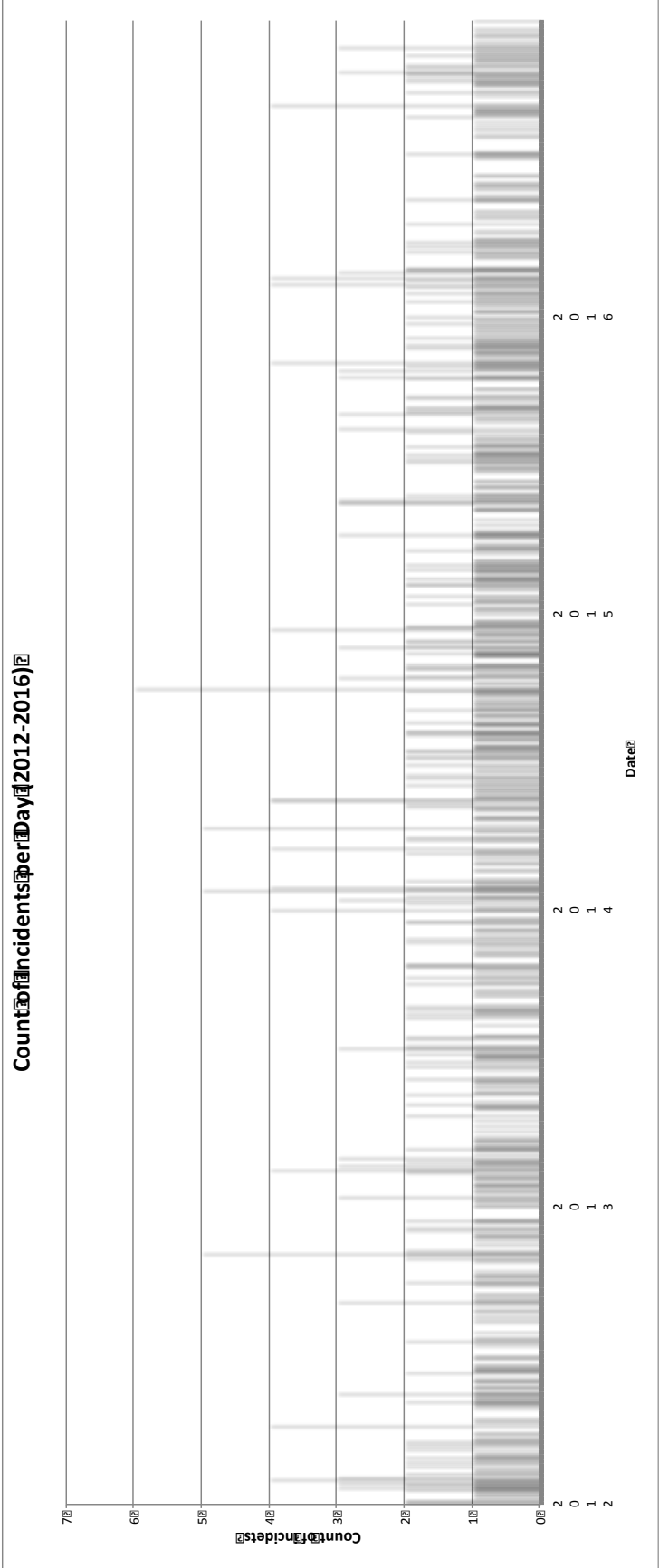
Figure 6. This shows the average number of incidences that occur per hour from 2012-2016. The most common hours are 1300 and 1500 hours.

F. Count Per Day

One a single day, over the five year period (2012-2016), the most crimes reported in PSL's was 6 however, it is more common no crime will occur. There is a 63% chance that there will be no crime reported in the PSL's on any given day of the week. Crime was not reported in a parking garage or lot 1,152 days out of 1,827 over the five year period. The chance one incident occurred in a PSL was 27.6% (505). There was a 63% chance that nothing occurred in a day, then for one incident to have occurred in a day. It was extremely rare that more then 2 incidents occurred in a day. On average in a 7 day week, there would be 3.5 incidents.

| Number of Incidents Per Day | | |
|-----------------------------|-------------|-------|
| Number of Incidents | Occurrences | % |
| 0 | 1152 | 63 |
| 1 | 506 | 27.7 |
| 2 | 131 | 7.2 |
| 3 | 24 | 1.3 |
| 4 | 14 | 0.77 |
| 5 | 4 | 0.22 |
| 6 | 2 | 0.11 |
| Total | 1827 | 100.3 |

Figure 7. This shows the count, 0-6, of number of incidents that occur per day, as well as the percent each occurs. It is most common that no incidents that will occur.



G. Time of Day

Expected crime would occur most often during the evening hours, 2000-0300 hours, however, crime rates are much higher during the afternoon hours, 1200-1900 hours (46.6%) compared to morning, 0400-1100 hours, or evening. Evening hours are the next highest (29%) with morning last (24.4%). The hypothesis was shown to be wrong.

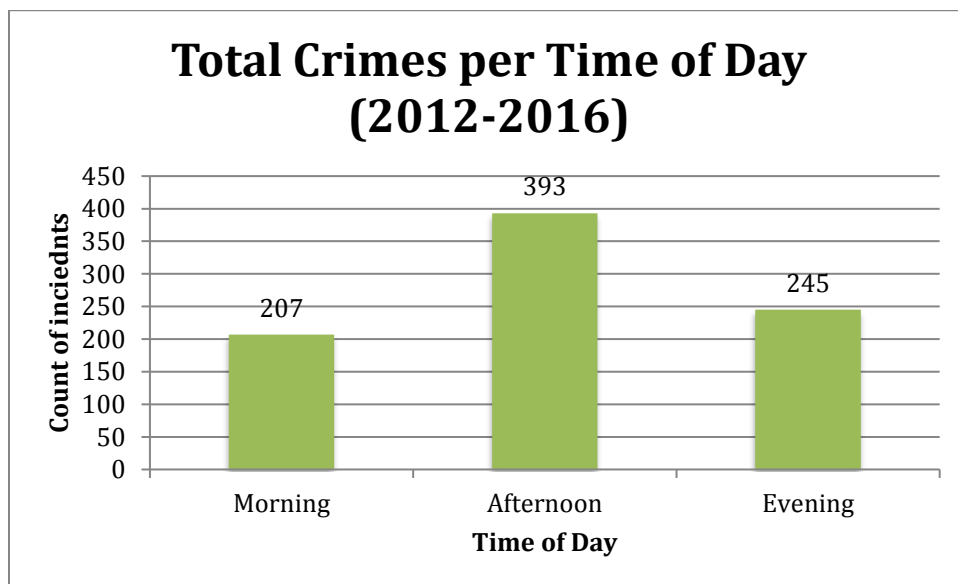


Figure 9. This shows the total crimes that occur during each time of say from 2012-1016. Most incidents occur in the afternoon.

H. Night or Day

As I have hypothesized in the other sections, night would be a time of higher crime, however, there is a large difference in night and daylight crime rates: night has a much lower occurrence rate, only 40% of reported crimes occurred at night. Night is anytime after sunset and before sunrise. Day is considered anytime after sunrise and before sunset.

Looking at a website with historical sunrise and sunsets, each incident time was searched and either categorized into night or day. Night increased from 2012-2014 and decreased from 2014-2016. An increase in crime occurred during daylight from 2014-2015 and was steady in 2012, 2013, and 2016. The highest number of incidents during daylight in any given month from 2012-2016 was 17 on May 2015 and the highest number of incidents during night in any given month from 2012-2016 was 12.

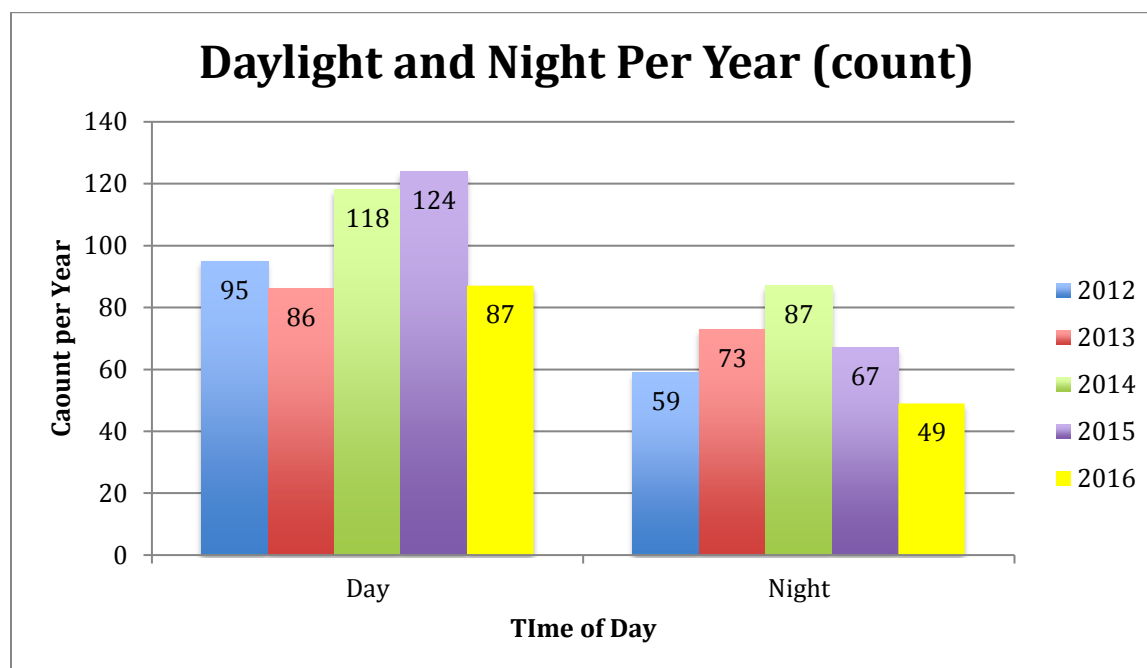


Figure 10. This shows the amount of crimes that occur per year either during the day or at night. More incidents occur during the day.

I. Location

My 2016 pilot study found that parking 3 and 1 were the most common locations for crime in PSL's. There were 16 lots and structures that had crimes occur in them. The locations with the most crime were; Parking 3 (39%), Parking 1 (25%), Parking 2 (7%),

University Center Building (7%), and Blumel (5%). All of these are parking structures.

Nearly all of PSL's show decreasing crime since 2014. University Place Hotel is the only location that consistently increasing. The highest number of incidents in any given year occurring in any PSL was 77 in Parking 3 in 2015. Suggesting

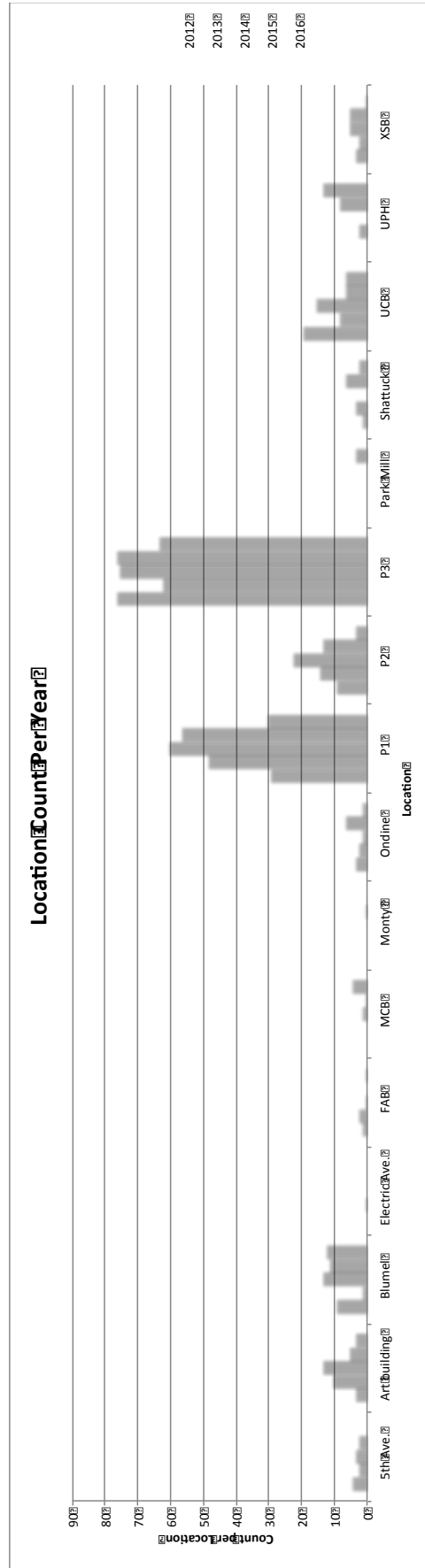


Figure 11. This shows the number of incidents that occur in each location on campus. Most incidents occur in Parking Three and Parking One.

that it is unlikely for there to be more than 77 incidents in a year in one location, especially a location other than parking structure 3 with 11 incidents per 10,000 square feet.

Incidents occurred most often in Parking 3. This garage is right next to the freeway, which makes it more accessible for anyone, student or not. There is also a houseless camp just over a fence and across the street from the garage. Many of these people rely on theft for their basic needs, such as clothing and bedding. There are more incidents in garages as well, 86% of the time incidents occur in garages as well. This I believe is because of the more intimate feeling that they have. It feels more private and like there are fewer people around. They are more secluded as well, with more places to hide.

Even though Parking Structure 3 is the largest garage at 324, 456 square feet, it still had the most incidents. Blumel was second, with 8 incidents per 10,000 square feet. Although Blumel is a smaller garage, it had the second highest rate of incidents that occurred.

J. Type

The rate of property crime was hypothesized to be higher than the other categories due to the nature of crime in parking garages, there are more cars than people. Property crime rates are very much higher than the other categories. Property crime totals were on average 59% higher than other categories; the second most common was crime against society (20.4%) Property crime includes most theft including unlawful entry to a motor vehicle (UEMV), theft of a vehicle, and burglary. It also includes vandalism, and arson and criminal mischief. The hypothesis was supported.

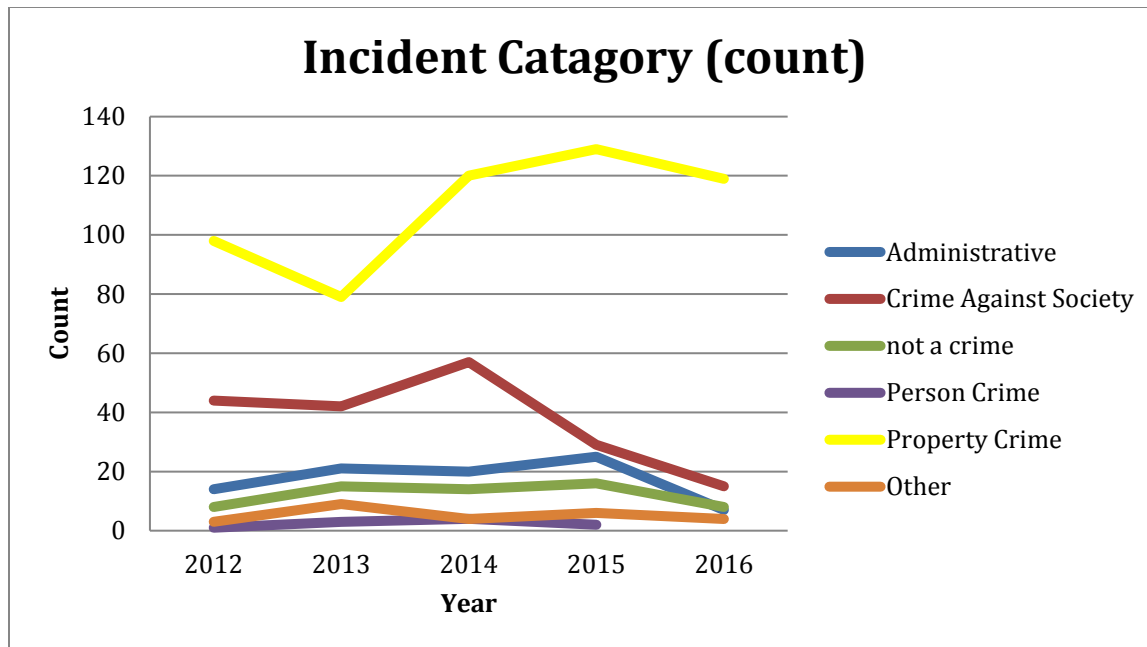


Figure 12. This shows count of incidents per category for the years 2012-2016. The most common type of crime is property crime.

It was hypothesized that Unlawful Entry to a Motor Vehicle (UEMV) would be the most common form of incident in a parking garage or lot. The most common incident was indeed UEMV (27%). It, alongside Criminal Mischief, were the two highest situations that occurred and surpassed total for any other category by more than 50%. The hypothesis stands with the results.

Like I previously noted, property crimes, especially UEMV, have the highest rate of occurrence total. This is because the PSL are not monitored 24 hours a day. There are cameras at every entrance of each garage. The cameras are aimed mostly at the attendant kiosks and benefit if a thief drives into the parking garage, however, if they are on foot, this become of little to no use to CPSO. Criminal mischief is the second highest type of crime. This is because criminal mischief tends to be in conjunction with UEMV. Criminal mischief

happens when people are not around and in areas that are not monitored, so it is hard to catch and know when it was done.

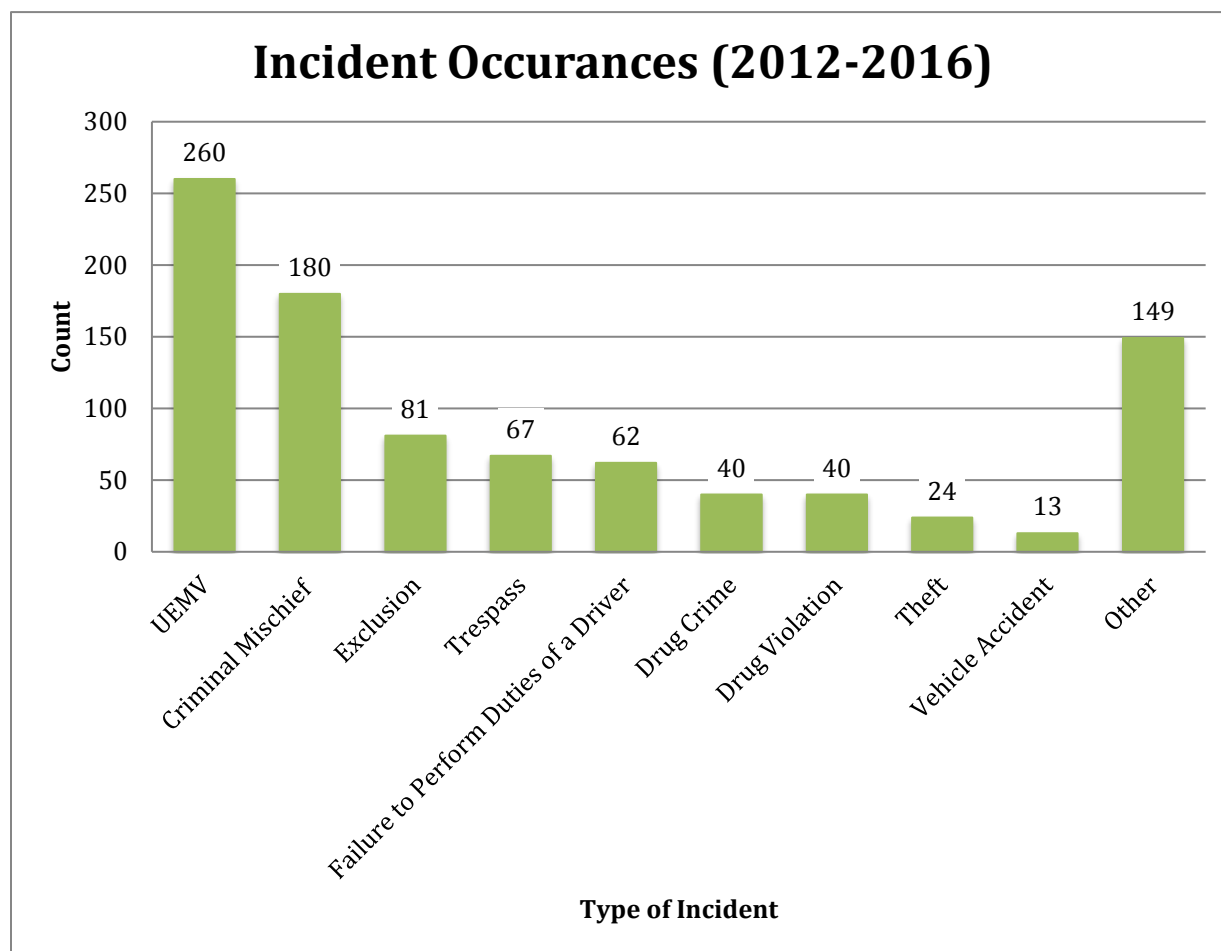


Figure 13. This graph displays 10 categories of incidents and their prevalence from 2012-2016. Incidences of UEMV made up the majority of incidents at 260.

L. Arrest

Most incidents do not clear, end, in arrest (88%). and there has been a decline in arrests since 2014 (from 32% in 2014 to 8.6 % in 2016). Highest number of arrests (6 arrest) occurred both in February 2013 and 2016 as well as July 2014. It is very unlikely

that there will be more than 6 arrests in any given month because it has only occurred 3 times in the past. Many incidents occur over a period of time of which officers are not present.

Most incidents do not result in arrest. A lot of incidents that occur in garages are property crimes. Property crimes most often happen when no one is around. A lot of motor vehicle break-ins happen while the owner is gone, for example, when they are in class. This makes it hard to know that exact time the incident happens. It also makes it virtually impossible to capture the perpetrator without the necessary tools and resources. Hence, there are so few arrests made.

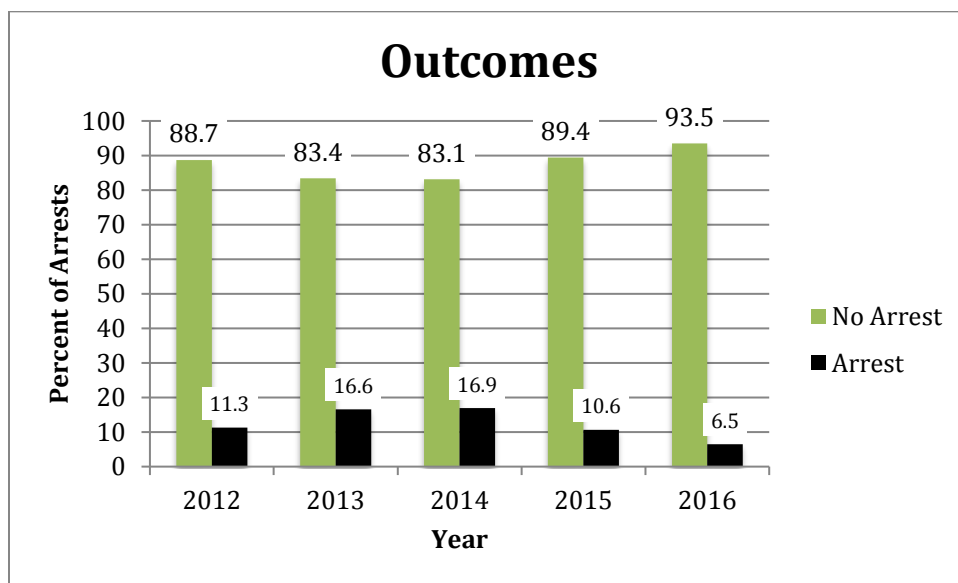


Figure 14. This presents the amount of arrests that happened each year. A majority of the time no arrest are made.

DISCUSSION

At PSU, crime in the PSL tends to happen most often in parking structures rather than in parking lots. Crime in PSL occurs more often during the day, specifically the afternoon, then at night. Overall, the incidents usually clear without arrest. Although a direct connections of day, time, and location were not found, there are still things that can be done in regards to the conclusions of this paper. Many of the results reiterated the apparent randomness of crime and made it difficult to find patterns.

One of the main factors of crime in the PSL is opportunity, which presents itself in the parking garages and lots as motor vehicles. The more cars present in the lots and garages, the higher the rate of crime. This is shown mostly in the results for the time of day.

RECOMMENDATION

This research lead to my recommendations to improve policing at PSU:

1. *Officers should patrol the garages at times that crime tends to increase.* The times that patrols should be increase in PSL are 1000, 1300, 1500 and 2300 hours. Incident rate averages were increased during these times.
2. *Patrol in garages that are hot spots.* The locations that should be patrolled most often are Parking 3, Blumel and Parking 1. These had the highest incident rates.
3. *Times that patrols should be focused elsewhere are between midnight and 0700 hours.* This time range accounts for only 18% of incidents. Resources should be allocated elsewhere.
4. *The days of the week that should be patrolled most often are Monday and Wednesday.* These two days are when most students are on campus. Because many students commute, there are more cars in the PSL.
5. *Months where incidents occur the least are during April, June, and August.* These months would be a good time to hold training and would minimize risk. April, June, and August would also be a good time to focus on other areas of campus.
6. *Either install or update the cameras in the PSL.* Ronald Clarke, wrote that CCTV system[s] can document thieves in the act and are relatively inexpensive (Clarke, 2002, 28). A good camera system would be beneficial to both officers and PSL users for added safety and security.
7. *Study access control strategies.* For example, have each garage only be one entrance and make all pedestrian entrances exit only. Have an attendant at the entrance

monitoring who is entering and exiting. This would monitor garage users and discourage thief's from coming into the garages at all.

8. *Increase signage.* Hang up signs that remind users to lock their car and take all of their valuables. Make them large and place them in multiple areas throughout the PSL. In order to reduce crimes, opportunity needs to be controlled first, since this tends to be the cause of most property crime. If there is no opportunity, then there is no incentive to steal.
9. *Have the officers fill out surveys annually.* Continue to conduct predictive policing strategies. Patterns of perception can be tracked and compared to the statistical findings.
10. *Continue to do statistics and get software that helps to decrease the middleman.* Invest in a program such as PredPol. Continue to transfer the DAL to excel weekly so that it is in a database. Make the Excel document publicly available. Ensure that officers are entering in all required data into the DAL so it is as accurate as is possible. Compare the surveys and the statistics to help the officers to improve their patrolling practices and back up or change their assumptions.

CONCLUSION

My research showed that predictive policing can lead to new findings. It would not have been known that more incidents occur during the day than at night by the majority of the officers as well and me, if it was not for this research. Although, to my knowledge, no university has researched the use of predictive policing. It is also important that the problem of theft in parking garages be addressed. It can be assumed that there are more incidents occurring than are being reported. Car prowlers will continue to target specific garages and will continue to get away with their actions if they are not caught more frequently. Or their opportunity is taken away. Just recently my car was broken into, ironically. It can happen to anyone.

APPENDIX

Appendix A. Survey given to the officers

Perception of Crime at PSU

Q1 How long have you been an officer for the department?

Q2 How long have you been in law enforcement?

Q3 Are you a PSU Alumni?

- ☐ Yes (1)
- ☐ No (2)

Q5 What is your rank?

- ☐ Sergeant, Lieutenant, or Chief (1)
- ☐ Police Officer (2)
- ☐ Public Safety Officer (3)

Q6 Are you a veteran?

- ☐ Yes (1)
- ☐ No (2)

Q7 What are 3 of the best interventions you believe CPS is doing to proactively reduce or control the crime rate on the PSU campus?

Q8 Please rate the prevalence of the following crimes and quality of life issues on campus for the past 5 years. (label 1-10)

_____ Drug Offenses (Attempted Drug Crime, Drug Violation, Drug Crime) (1)

_____ Alcohol Offenses (MIP, Open Container) (2)

_____ Vehicle Related Offenses (Failure to Perform the Duty of the Driver, Vehicle Accident, Parking Violation, DUII) (3)

_____ Quality of Life (Suicidal Ideation, Transport, Welfare Check) (4)

_____ Larceny (Theft, Motor Vehicle Theft, UEMV, Forgery, Burglary, Found Property, Found Stolen) (5)

_____ Destruction/Damage of Property (Criminal Mischief, Suspected Criminal Mischief, Offensive Littering, Fire, Disorderly Conduct) (6)

_____ Trespass (Camping, Suspicious Person, Loitering, Exclusion) (7)

_____ Administrative (Warrant, Student Conduct, Parol Violation, Restraining Order) (8)

_____ Other Offenses (Public Indecency, Reckless Endangerment, Eluding Officers, IPV, etc.) (9)

Q9 Think about the amount of crime on campus and how it has changed in the last 5 years.

| | Increased a Lot (1) | Increased a Little (2) | Stayed the Same (3) | Decreased a Lot (4) | Decreased a Little (5) | Do Not Know (6) |
|--|-----------------------|------------------------|-----------------------|-----------------------|------------------------|-----------------------|
| The amount of overall crime on campus has... (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The amount of crime in parking garages and lots has... (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The amount of UEMV at PSU has... (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The amount of criminal mischief at PSU has... (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The amount of trespass offenses have... (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q11 Think about the amount of crime on campus and how it has changed in the last 12 Months.

| | Increased a Lot (1) | Increased a Little (2) | Stayed the Same (3) | Decreased a Lot (4) | Decreased a Little (5) | Do not Know (6) |
|--|-----------------------|------------------------|-----------------------|-----------------------|------------------------|-----------------------|
| The amount of overall crime on campus has... (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The amount of crime in parking garages and lots has... (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The amount of UEMV at PSU has... (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The amount of criminal mischief at PSU has... (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The amount of trespass offenses have... (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q12 In your opinion, how much have the following factors contributed to the crime rates on campus in the last 5 years?

| | Large influence (1) | Moderate Influence (2) | Slight Influence (3) | No Influence (4) | Do Not Know (5) |
|---|------------------------|---------------------------|-------------------------|-----------------------|-----------------------|
| Courts are Too Lenient (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Drug/Alcohol Abuse (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lack of Education (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lack of Jobs/Unemployment (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Limited Police Presence (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Poor Parenting (6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Poverty/Low Income (7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Transient Population (8) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Weapons Availability (9) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Affluence/Opportunity (10) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Infrastructure Factors Such as Bars (11) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other _____ (12) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q14 Which day(s) of the week do you think have the most incidents? (Choose up to 3)

- ☐ Sunday (1)
- ☐ Monday (2)
- ☐ Tuesday (3)
- ☐ Wednesday (4)
- ☐ Thursday (5)
- ☐ Friday (6)
- ☐ Saturday (7)

Q15 Which Hour(s) do you think are the most popular times for incidents to be reported?
(Choose up to 3)

- ☐ 0000-0100 (1)
- ☐ 0100-0200 (2)
- ☐ 0200-0300 (3)
- ☐ 0300-0400 (4)
- ☐ 0400-0500 (5)
- ☐ 0500-0600 (6)
- ☐ 0600-0700 (7)
- ☐ 0700-0800 (8)
- ☐ 0800-0900 (9)
- ☐ 0900-1000 (10)
- ☐ 1000-1100 (11)
- ☐ 1100-1200 (12)
- ☐ 1200-1300 (13)
- ☐ 1300-1400 (14)
- ☐ 1400-1500 (15)
- ☐ 1500-1600 (16)
- ☐ 1600-1700 (17)
- ☐ 1700-1800 (18)
- ☐ 1800-1900 (19)
- ☐ 1900-2000 (20)
- ☐ 2000-2100 (21)
- ☐ 2100-2200 (22)
- ☐ 2200-2300 (23)
- ☐ 2300-2400 (24)

Q16 Do incidents occur most often during daylight or at night?

- ☐ Daylight (1)
- ☐ Night (2)

Q17 What time of day do incidents occur most often?

- ☐ Morning (1)
- ☐ Afternoon (2)
- ☐ Evening (3)

Appendix B. Email sent with survey

Hello!

My name is Kiley Enger, if you don't know me already, you probably have seen me around, sitting at the table in the center of your office looking through the Daily Activity Logs. I am working on my senior thesis for the University Honors College. The basis of my thesis is predictive policing on Portland State University's campus. I am looking into incidents occurring in parking garages and lots and finding the most common days and times for incidents to take place. I have created a survey that will supplement my thesis. I would appreciate if you could fill out this survey. Here is the link:

https://portlandstate.qualtrics.com/jfe/form/SV_czGaOGGdk8CEpet

This survey is completely anonymous. The password is _____
Thank you so much for taking your time to read this.

Best,

Appendix C. Universities Emailed

University of Oregon
Western Washington University
Central Washington University
University of Washington
Oregon Health and Science University
Florida State University
University of Virginia
University of Vermont
Western Washington University
Eastern Washington University
Portland Community College
Virginia State University

Appendix D. Email sent to Universities.

Dear _____,

My Name is Kiley Enger and I am a senior at Portland State University. I am writing to ask about research that has been done at University of Washington. I am conducting undergraduate research on the use of predictive policing on college campuses for my honors thesis. I am interested to know that, if to your knowledge, there has been any research done at your university that is similar to this topic. If there has been any research, would it be possible for me to get a PDF of it? I am looking for case studies to include in my literature review. Thank you in advance for your time.

Best,

Appendix E. Abbreviations

| Abbreviation | Location |
|---------------|---------------------------------|
| 5th Ave. | 5th Avenue Building |
| Art Building | Art Building Lot |
| Blumel | Joseph C. Blumel Residence Hall |
| Electric Ave. | Electric Avenue |
| FAB | Fourth Avenue Building Lot |
| MCB | Market Center Building |
| Monty | Montgomery Residence Hall Lot |
| Ondine | Ondine Residence Hall |
| P1 | Parking Structure 1 |
| P2 | Parking Structure 2 |
| P3 | Parking Structure 3 |
| Park Mill | Park Mill Lot |
| Shattuck | Shattuck Hall Lot |
| UCB | University Services Building |
| UPH | University Place Hotel |
| XSB | Extended Studies Building |

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