Trimet Crime Prevention Plan

Operational Research Report

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Executive Summary

As a Municipality TriMet’s ridership has increased over the past several years. The opportunity to expand services across the Portland Metro area has resulted in increased ridership and revenue for Oregon. An unfortunate side effect of increased ridership is an increase in crime. The increased crime has caused the customer satisfaction and safety scores to see a decline in recent years.

The goal of this project is to reduce the number of safety incidents riders experience by optimizing the officer allocation per region to deter crime.

Optimizing the officer allocation per region to deter crime is key to utilizing the array of officers available to TriMet. Our models focused on 3 key areas:

1) Model 1 - Count frequency of a region.
2) Model 2 - Weighted approach, the frequency of an incident weighted by incident severity.
3) Model 3 - Population size.

Based on the model we recommend a weighted crime severity model that assigns varying weights to crimes based on their severity to prioritize efforts on more critical issues. The weighted scores will then be allocated to the appropriate Officer for proper disposition.

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1. Introduction

TriMet is committed to providing a safe experience as riders avail themselves to TriMets public transportation system. In a recent report TriMet states they have security resources of nearly 350 people whose sole focus is on reducing crime. As a team our goal is to weigh Trimet's current and future needs to provide an officer allocation that addresses current needs, and one that is scalable to grow as TriMet grows.

2. Background

TriMet, facing a budget crunch and a decline in ridership, is taking significant steps to enhance public safety on its trains, buses, and platforms. The agency has secured a new five-year contract, worth $108 million, with a private security company in response to high-profile crimes. A pilot program that began in 2021, was implemented to hire unarmed security guards to deter criminal activity and assist riders in crisis. TriMet's goal is to restore public confidence in the safety of its TriMet services and to reduce the number of criminal incidents, especially as ridership has declined by almost 40% since the pre-pandemic period.

TriMet's Public Safety Operations involve various roles and teams to ensure customer safety and respond to incidents. Customer Safety Supervisors (CSS), who patrol the transit system to discourage inappropriate behavior, enforce rules, and address fare violations. Customer Safety Officers (CSO), contracted through Portland Patrol Inc., and Transit Security Officers (contracted through Allied Universal Security) also contribute to patrolling, assisting riders, and deterring illegal activities. The Safety Response (SR) and The Safety Response Team (SRT) provide an additional security presence, supporting riders, employees, and the community.

The project is designed to assist in enhancing ridership within the TriMet service area by efficiently allocating police officers. By optimizing the allocation of officers' resources, the project enhances public safety, minimizing the likelihood of crimes. This approach not only ensures efficient use of resources but also improves coverage in areas where they are most needed, avoiding unnecessary waste. Additionally, the initiative focuses on enhancing the overall ridership experience by taking a preventive approach, proactively working to deter crimes before they occur.

3. Research Objectives

To prevent possible crime and security incidents, we aim to maximize the allocation of security officers to the Portland region/sectors. Since there is a limited number of security resources, our objective is to distribute the security officers effectively to address crime in the regions.

4. Methodology

For the research project, a dataset of all the crime incidents for the Portland, Metro area was obtained from a contact within TriMet. The dataset was limited in nature due to personal information related to the dataset. TriMet implemented restrictions and only provided a count of all incidents for the past five years, description categories of the recorded incident, and the street intersections where the incident occurred. They also provided the number of available officers to allocate which was validated through public news articles.

In the dataset obtained from TriMet, each incident needed to be assigned to a specific region labeled North, South, East, West, Northwest, Southwest, Northeast, and Southeast.

In researching the topic of police allocation strategies, research was conducted with Portland Police bureau regarding their allocation model of patrol staffing. The allocation of patrol officers within the Portland Police Bureau is a dynamic and evolving process, influenced by both predictable and unforeseen factors. Traditionally, the bureau employed a model that integrated data on service calls and the prioritization of precinct needs to distribute patrol officers strategically. However, this model faces challenges due to the current shortage of staff. Despite these hurdles, the bureau endeavors to adapt and maintain the effectiveness of their deployment strategies.

In practice, the allocation of patrol officers is subject to variables that are largely beyond the bureau's control. These include but are not limited to, officer availability due to injuries, training commitments, vacation periods, and various leaves of absence. Such factors introduce a degree of unpredictability into the staffing equation, necessitating a flexible approach to patrol officer distribution. To manage this variability, a designated lieutenant closely monitors personnel levels, making real-time adjustments to ensure that the precincts are adequately staffed to meet the community's needs.

The bureau is aware of the need for a more systematic study to optimize staffing. Discussions about a future staffing study suggest a recognition of the potential benefits of a data-driven approach to resource allocation. However, as of the latest communication, there are no concrete plans or timelines for such a study. The absence of specific details underscores the current state of flux and the bureau's focus on immediate, adaptable solutions to personnel management.

While the information received from the Portland Police Bureau was insightful it did not provide a perfect model to incorporate to the crime prevention plan and further research needed to be conducted

Additional research was conducted in the topic of crime prevention, a relatively recent report was published regarding a data driven crime prevention plan. The report introduces the crime-severity index, a quantifiable measure of the severity and frequency of an area’s recent criminal incidents. To construct this index, each serious crime is assigned a severity score based on the maximum sentence prescribed by Illinois state law, reflecting societal views on the gravity of different crimes. For instance, first-degree murder and homicide carry the highest severity value of 100, while lesser offenses like assault are scored lower on the scale.

For the project a crime severity approach seems reasonable and relatively straightforward to implement. The crime severity index used in this report will closely resemble the index used in the report used for research.

The computation of a person's crime-severity index is straightforward: it is the sum of the severity values of the crimes they were involved in. For example, involvement in a homicide and two armed robberies would result in a crime-severity index of 114 (1x100 for the homicide plus 2x7 for the robberies). This scoring system allows for a nuanced view of risk profiles, enabling targeted interventions.

The crime-severity index serves as an important tool for prioritizing areas for intervention, with historical data showing which areas have a high crime severity score and which have a lower crime severity score. This index, therefore, becomes a tool to the allocation of resources and the formulation of a crime prevention strategy that is data-driven and focused on prevention through allocating available resources to those areas to effectively mitigate future crime incidents.

This weighted approach to allocation seemed like a reasonable approach to implement into the model because it attempts to allocate resources to areas with more severe crime incidents, based on the research already conducted. While not exact to the Portland Police method, it is similar in that it attempts to prioritize the allocation of resources to areas that likely need it.

Further research uncovered that the relationship between population size and crime rates is complex and multifaceted. Studies have indicated that crime rates do not increase linearly with population size. This nonlinearity suggests that as a city grows, certain social indicators, including crime, can rise at a rate that outpaces population growth. Research has shown that social aspects like crime may increase super linearly with population size, meaning that if a city’s population doubles, the crime rate could more than double. This is explained by scaling laws, which highlight the disproportionate growth of certain urban indicators as cities expand.

This phenomenon is not uniform across all types of crime or all urban environments. A study analyzing the Uniform Crime Reports data for cities with populations over 25,000 revealed a significant positive relationship between crime rate and population size, with higher populations correlating with higher reported crime rates. However, when cities were analyzed in different population regions, and crime rates were broken down into violent and property crimes, the relationship became more interesting. The study suggests that the relationship between crime rate and population size varies depending on the specific subset of jurisdictions being examined.

This implies that larger populations may provide more opportunities for crime due to factors such as increased anonymity, a greater number of potential targets, and possibly strained law enforcement resources that cannot keep pace with population growth. However, it's important to note that the link between population size and crime is influenced by a host of other factors, including socioeconomic conditions, urbanization rates, law enforcement effectiveness, and social dynamics, making it a complex issue that defies simple characterization.

Due to the complexity of this topic, the following analysis aims to provide three possible models that could be considered when allocating security personnel, a proportion model based on the number of reported incidents, a proportion model based on a weighted crime severity score of a region, and a proportion model based on population size of a region. These techniques should be reasonable to implement and provide some insight into allocation strategies.

5. Data Analysis

Concluding from the research above, there are many metrics that could be used in allocating security resources to the various regions effectively. In the following section we will assess three possible models, one based on an allocation based on the number of security related incidents in a region. The second model will assess with a weighted approach using a crime severity as indicator in the allocation. The final model will assess allocation in regards to population size.

First TriMet reported the number of security personnel available to allocate, 346. Next, some data wrangling/data prep with the dataset needed to be conducted before model implementation. While the data was limited, it provided use; each row represented a security incident involving TriMet, and each time the Police were called for an incident, although it is unclear if a police officer arrived at the scene due to staffing issues with the Portland Police Bureau.

There were 17,903 rows in the dataset. These rows only had corresponding street intersections associated with them. Then, via Vlookups and Xlookups nearly all the rows were assigned to a geographical region, the leftover rows needed to manually be looked up through Google maps and reasonably assigned to a location. Note – there was a column in the data set label direction that had characters “N, S, E, and W”, but it was later determined that these characters represented the direction the bus was heading, northbound, southbound…etc. Also, some incidents were not able to be assigned to a location due to lack of information, in those cases the data was removed from the analysis. The resulting count of incidents assigned was 17,447.

According to the count table the highest count locations were SE, followed closely by NE and SW. The lowest count regions were S and E.

Model one: Count Incident of a Region. We aimed to create a model ensuring that limited security resources are distributed in an equitable and efficient manner across multiple regions. It should be interesting to see the findings for this method compared to other equitable allocation methods and possible finding an optimal method of allocation. Note - This model was built in R and using the ompr package.

First listed are the variables and decision variables.

Let x_i represent the number of officers allocated to region x_i where x_i is one of the regions.

Let S be the total number of Security officers available to allocate.

Decision Variables:

$x1$: Number of security personnel allocated to North
$x2$: Number of security personnel allocated to South
$x3$: Number of security personnel allocated to East
$x4$: Number of security personnel allocated to West
$x5$: Number of security personnel allocated to Northwest
$x6$: Number of security personnel allocated to Southwest
$x7$: Number of security personnel allocated to Northeast
$x8$: Number of security personnel allocated to Southeast

Model one: Count Incident of a Region. The objective function is to to allocate all available personnel to the regions. The next constraint ensures that the number of officers allocated to a region is proportional to the incident count associated with that region. It sets upper and lower bounds for allocation based on the total count. The next constraint establishes that the total number of officers allocated across all regions cannot exceed the total number of available officers. The next constraint aims to ensure that the sum of all officers allocated equals the total available officers. The last constraint is the Non-negativity constraint; it's not cannot be possible to allocate a negative number of officers.

$$\text{Max} \sum_i x_i \qquad \text{[Allocates all personnel]}$$

$$\frac{Count_i}{Count_{\text{total}}} \times S - 1 \leq x_i \leq \frac{Count_i}{Count_{\text{total}}} \times S + 1 \qquad \text{[Porportional constraint for each region with upper and lower bounds]}$$

$$\sum_i x_i \leq S \qquad \text{[Cannot exceed total officers]}$$

$$\sum_i x_i = S \qquad \text{[All available officers must be allocated]}$$

$$x_i \geq 0 \qquad \text{[Non-negativity constraint]}$$

Solved Allocation Plan

	North	South	East	West	Northwest	Southwest	Northeast	Southeast
Incident Count Allocation Mix	36	3	7	11	15	72	77	125

Interpretation: The highest allocation is going to Southeast, Northeast, and Southwest. While the lowest is being allocated to the South. In the next model we will take a look at the same model but using a weight crime score as the allocation metric.

Model two: Weighted Approach Based on Incident Severity. The frequency of incidents weighted by crime severity. This model is similar to the prior except the key component here is the calculated crime severity of a region. Let Crimei be the crime severity of a region.

$$\text{Max} \sum_i x_i \quad \text{[Allocates all personnel]}$$

$$\frac{Crime_i}{Crime_{\text{total}}} \times S - 1 \leq x_i \leq \frac{Crime_i}{Crime_{\text{total}}} \times S + 1 \quad \text{[Porportional constraint for each region with upper and lower bounds]}$$

$$\sum_i x_i \leq S \quad \text{[Cannot exceed total officers]}$$

$$\sum_i x_i = S \quad \text{[All available officers must be allocated]}$$

$$x_i \geq 0 \quad \text{[Non-negativity constraint]}$$

One of the first steps in implementing this model was to create a crime index. We used an index based on the Nayar 2018 report. This report looked at crime in Illinois and created a comprehensive rating system that we drew inspiration from. There was one issue that needed to be addressed with the data. There was a category description that was labeled as “Other”, this likely included many incidents that do not fit in other categories and severity could range wildly, so it was rated the lowest with a score of .01.

Crime Index

Crime Type	Rating
Suspicious Package	1
Fight	5
Shelter Misuse/Camping	1
Vandalism	1
Facility	1
Bomb	1
Theft to Gain Access	7
Assault (Customer/Employee)	1
Robbery	7
Weapon	30
Aggravated Assault	1
Rape	60
Homicide	100
Assault-Employee	1
Assault-Customer	1
[Other]	0.1

Next, each area had its crime severity score calculated so it could be used in model implementation.

Crime Severity Rating Table

Row Labels	Sum of Crime Severity Rating
E	243
N	1,381
NE	3,233
NW	418
S	106
SE	4,802
SW	2,034
W	380
Grand Total	**12,599**

Solved Allocation Plan

	North	South	East	West	Northwest	Southwest	Northeast	Southeast
Crime Allocation Mix	38	2	6	11	12	56	89	132

Interpretation: Based on the calculated crime scores, Southeast, Northwest, and Southwest had the top three crime scores and they also had the larger allocation of security personnel. While again, South and East had the lowest two scores and therefore the lowest security personnel allocation.

Model three: Population Size. This model is similar to the prior two except the key component here is the population of an area.Let Pi be the population proportion of an area. The data collected for this model used best estimates of population size from online search engines.

$$\text{Max} \sum_i x_i \qquad \text{[Allocates all personnel]}$$

$$\frac{P_i}{P_{\text{total}}} \times S - 1 \leq x_i \leq \frac{P_i}{P_{\text{total}}} \times S + 1 \qquad \text{[Porportional constraint for each region with upper and lower bounds]}$$

$$\sum_i x_i \leq S \qquad \text{[Cannot exceed total officers]}$$

$$\sum_i x_i = S \qquad \text{[All available officers must be allocated]}$$

$$x_i \geq 0 \qquad \text{[Non-negativity constraint]}$$

Solved Allocation Plan

	North	South	East	West	Northwest	Southwest	Northeast	Southeast
Population Size Allocation Mix	52	20	123	57	7	62	7	18

Interpretation: Based on the population allocation model, the highest allocation of security officers went to the East, Southwest and West locations. A slightly different allocation mix than the other two models.

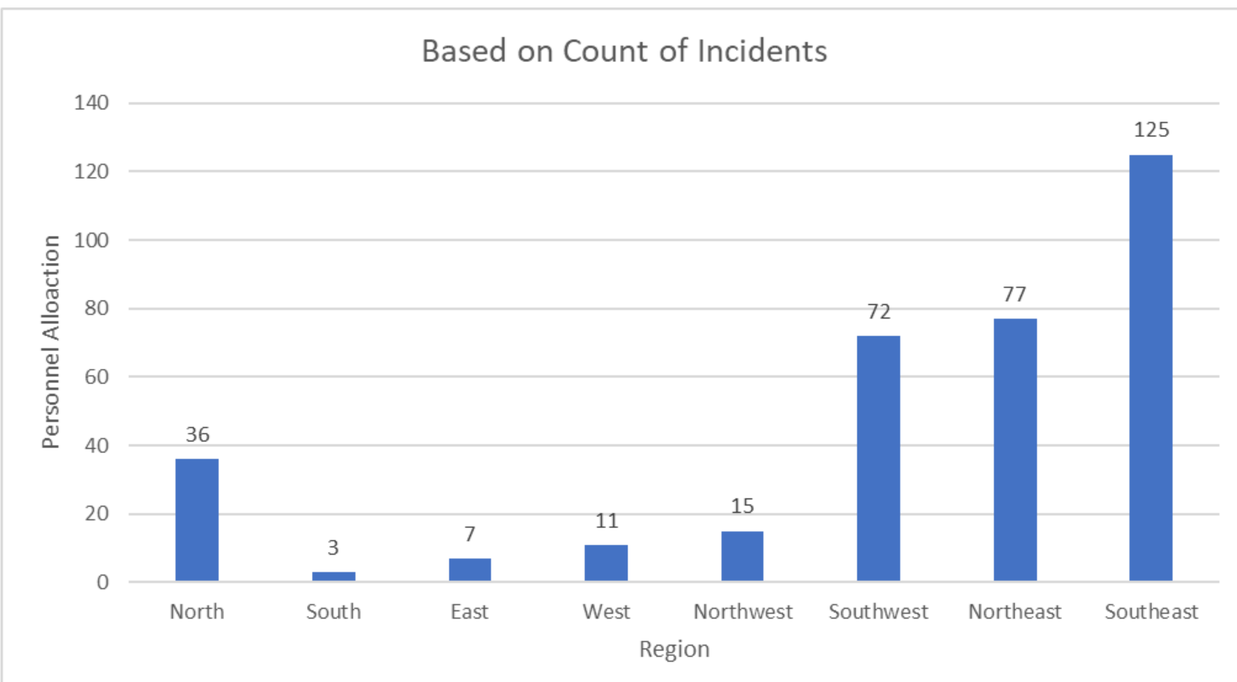
6. Findings

Our team focused on optimizing Trimet's security personnel to reduce the number of safety incidents across the regions served. We looked at three unique models to determine the optimal solution. This section gives the results of our models highlighting the optimized security resource allocation.

Findings from Model one: Count Incident of a Region

Model one focused on the frequency of incidents in different locations. The analysis revealed that some regions have higher incidence rates than others, indicating the need for increased security deployment. The model assigns the most officers, 125, to the Southeast, which has the highest incident rates. Northeast and Southwest are next, with 77 and 72 officers, reflecting their incident counts, respectively. South, on the other hand, receives the smallest allocation of only three officers, reflecting its lower incident frequency.

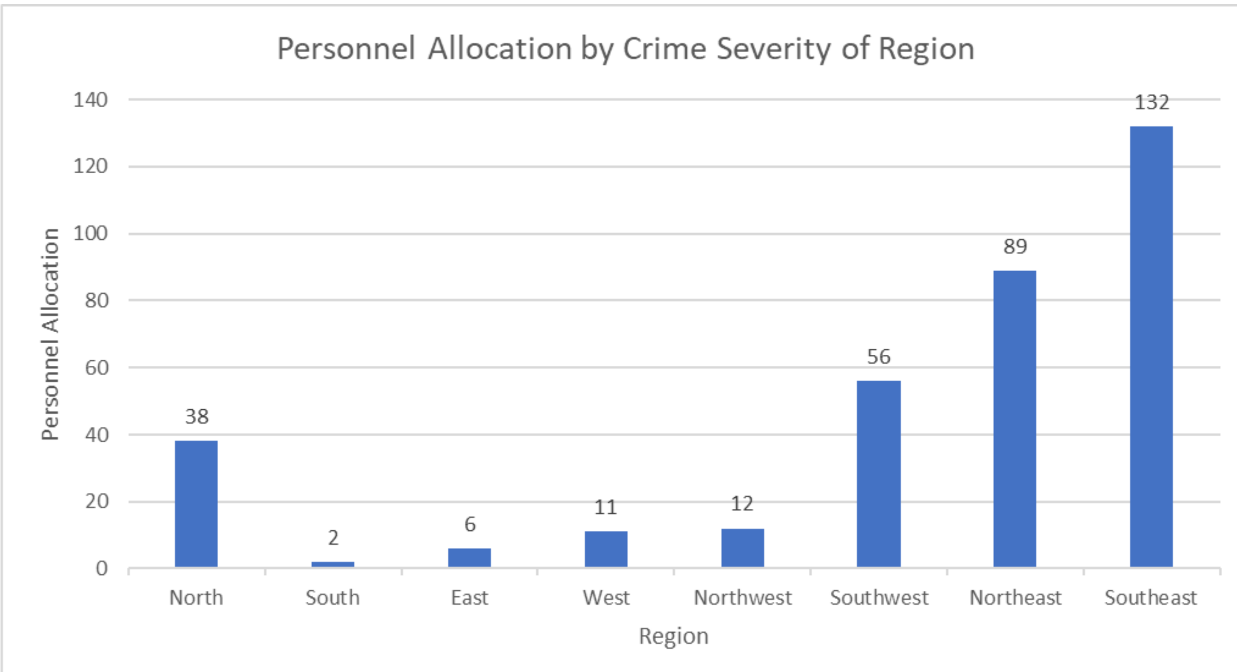
In practice, the model's allocation means that Trimet can deploy security officers in areas where incidents are most likely to occur. Southeast, for instance, receiving the most officers translates to a greater security presence in an area with a high number of reported incidents, potentially deterring crime and increasing safety. In contrast, areas with fewer incidents, such as the South, will have fewer officers, indicating a lower perceived risk.



Findings from Model two: Weighted Approach Based on Crime Severity

Model two employed a weighted approach, giving greater weight to severe incidents. The model determined that Southeast, with the highest incidents, should be allocated the most security officers at 132. Both Northeast and Southwest had a significant crime rate, but lesser in severity then Southeast, these locations were allocated 89 and 56 officers respectively. The South and the East areas had the least severe incidents so were allocated only two officers.

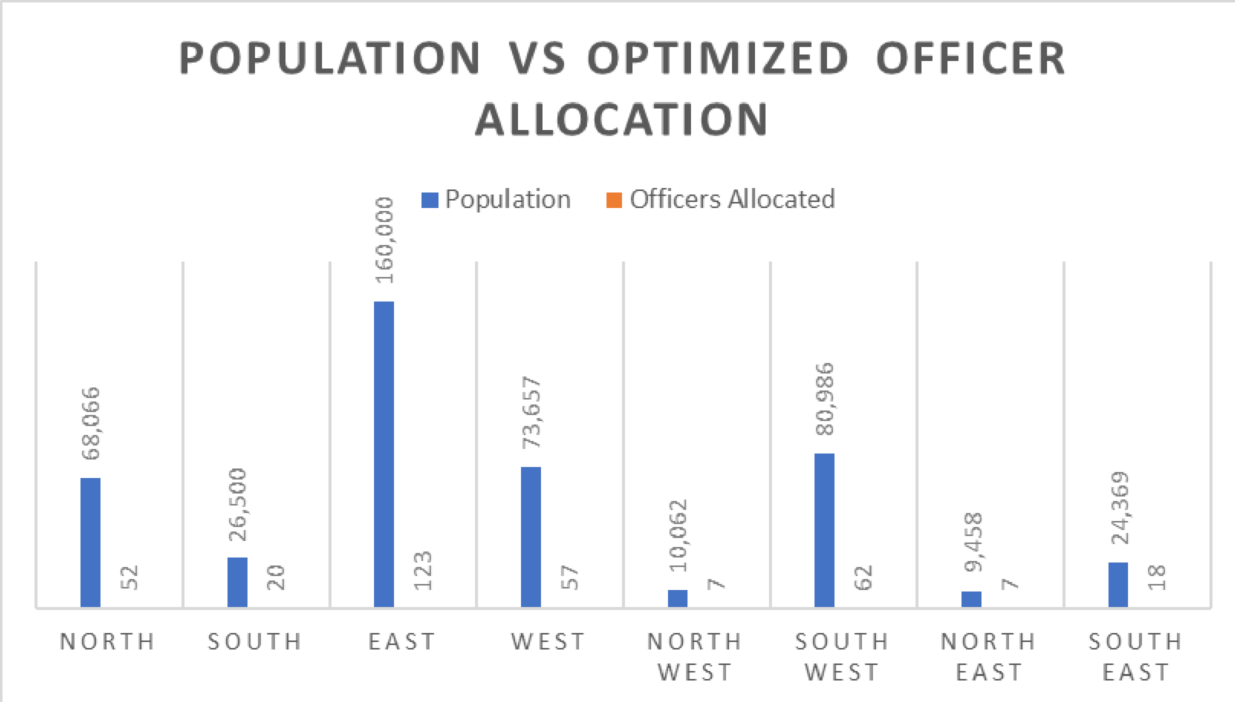
The model prioritizes the most critical situations, ensuring a more targeted and efficient use of security personnel for enhanced public safety across the network. Our data shows Trimet can have a significant impact on lowering serious crimes by allocating more security resources to Southeast, where incidents tend to be most severe.



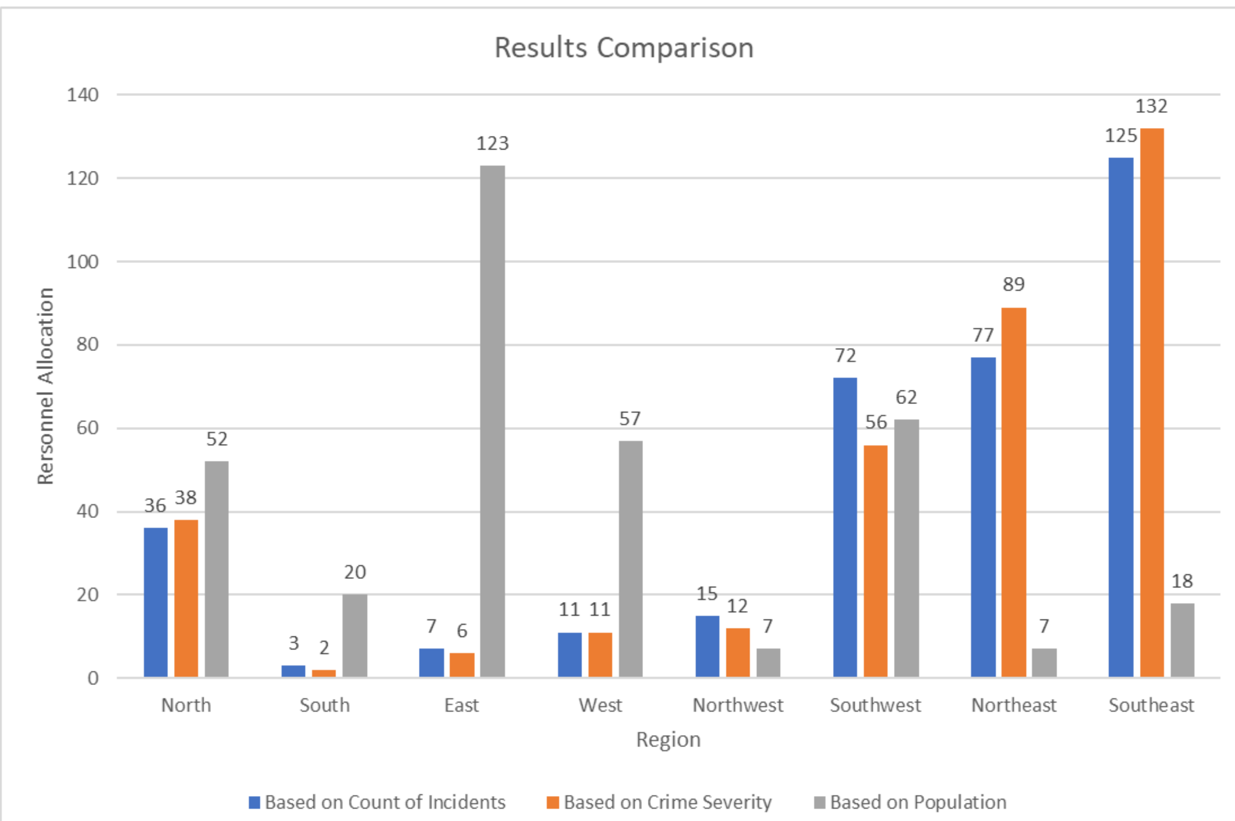
Findings from Model three: Population Size

Model three took into account the population size of each region and assumed linear increase in crime proportional to population increased. The model allocated the officers per our assumption based on population size.

In this model, with 123 officers, the East receives the most officers. Based on population size other locations, such as the North and West, are assigned 52 and 57 officers, respectively. Because of this model's unique focus on population rather than incident frequency or severity, the distribution pattern is different, potentially highlighting the need for additional analysis that includes actual crime rates to refine the allocation furthur.



Comparative Analysis of the three models:



When all of these models are put side by side, you can see that there are different results depending on the model used. One thing to note, the population model allocated significantly more resources to the South, then the crime and count models. Also, the crime and count models have similar outputs in their allocation. So which could be the optimal model to effectively allocate security personnel? We aim to address this in our recommendations.

7. Recommendations

Based on the comparison results of the three models, we suggest the weighted crime severity model that assigns varying weights to crimes based on their severity. This model implements a prioritization of incidents severity in its methodology which is similar in method to what some police departments use for patrol allocation, we also acknowledge the need to incorporate other factors in this model. Overall, this model will help the department indicate practical practices as a realistic framework for resource allocation.

Patrolling officers to prevent crime is a very challenging process that requires strategic planning and resource allocation due to types and levels of criminal activities in different regions, making it complex to have a systematic approach. It is important for the department to conduct regular reviews of the crime severity model. Quarterly and annual evaluations can help assess its effectiveness and identify any necessary adjustment.

The primary purpose of this model is to make a positive impact on crime rates. The department should review whether the model is achieving its intended outcomes or not. If the review identifies areas for improvement, the model can be adapted accordingly.

Patrolling personnel to prevent crime is a complex process. I think our weighted crime severity model might be the most reasonable approach. It seems to be the model that most closely resembles actual police allocation models that were discussed earlier. If that approach were to be selected to implement then a quarterly or annual review of crime score should be considered to evaluate the performance of the model and to address if it is making an impact on crime.

8. Limitations

The limitations of this investigation are primarily related to data sensitivity and availability. TriMet was unable to provide complete access due to the confidential nature of their operational data. Because of this gap, assumptions and estimates were used to fill in the missing information, which could affect the reliability of the findings.

The process of assigning incidents to particular regions or sectors added a new layer of complexities. The initial dataset lacked precise details on incident locations, requiring the use of additional data and methods for accurate regional classification. Vlookups were used to match incidents to regions, classifying the majority of the data.

Yet, since not all data could be matched using automated methods, some incidents had to be located manually using Google Maps. This process is done by hand, which means that there is a chance of bias and mistakes. This could affect how accurate the incident-region associations are and the analysis that is based on them.

9. Conclusion

An Optimization model in crime prevention is a very helpful tool to allocate resources, however, the optimization model alone is not sufficient to create a crime prevention plan. The model can provide valuable insights but it should be seen as one component of a larger strategy.

Collaborative efforts and community engagement have an important role in the effectiveness of crime prevention plans. Collaborative efforts involve bringing key stakeholders together, such as; law enforcement agencies, community leaders, local organizations, and policymakers. These stakeholders will help TriMet, gather valuable insights, tailor crime prevention strategies that address the unique characteristics of each locality, and most importantly build community trust.

In light of the findings from the current models and the complexity of the issue at hand, it is imperative that further research be conducted. Future studies are recommended to incorporate goal programming as a means to enhance the model's robustness. As an extension of linear programming, goal programming would allow for the simultaneous pursuit of multiple objectives, minimizing the aggregate of deviations from a set of predefined targets. This approach aims to achieve a more optimal allocation that not only distributes resources effectively but also meets several operational goals concurrently. Such a multi-objective optimization framework could yield a more nuanced and effective allocation strategy.

Optimization models can be powerful tools in developing a crime prevention plan. However, we need to consider these models are just one part of a broader process. More research needs to be conducted to learn from past decisions and strategies based on performance metrics and feedback. Collaborative efforts involving community engagement, real-time monitoring, and preventive measures are equally important to create a comprehensive and effective solution to the problem.

10. Appendices

Email to PPB

email to PPB External Inbox x

Wallo-Strauss, Terri <Terri.Wallo-Strauss@police.portlandoregon.gov> Wed, Nov 29, 3:31 PM (23 hours ago)

to me

Hi Mario—I wish I had a hard and fast answer for you. We used to have a model that took into account calls for service and priority type per precinct. With our current staffing shortage, we have continued to keep those models. But there are some things we can't predict with personnel. Required training, vacation time, days off, are all things we can control. But officers can be off for injuries, on administrative leave, on personal leave or FMLA, etc. That can really shift the balance of a precinct and we try to make adjustments and remain fluid. We have a Lt. who monitors our personnel. I know there is talk of doing a staffing study in the future, but I don't have any specifics at this point. I hope this is helpful. Terri

Terri Wallo Strauss
Public Information Officer (nonsworn)

STRATEGIC COMMUNICATIONS

Data Screenshot

incident_id	type_code	division	type_desc	subtype_c	subtype_desc	incident_date	Region	location	intersection	direction	lift_locatior	comments	subtype_t	count_t	Crime Severity Rati
907751	INJY	B	Injury	ASST	Aggravated Assault	2017-11-09 23:17:47	NE	Sandy	20th	W		Operator hit in t	Incident SubType	Count	1
930598	INJY	B	Injury	ASST	Aggravated Assault	2018-05-28 22:27:12	N	Trenton	Newman	W		operator picked	Incident SubType	Count	1
973147	INJY	B	Injury	ASST	Aggravated Assault	2019-05-30 11:20:00	SE	Harold	128th	W		Passenger spit	Incident SubType	Count	1
978207	INJY	B	Injury	ASST	Aggravated Assault	2019-07-16 03:07:17	SE	Burnside (East)	12th Ave	E		passenger on b	Incident SubType	Count	1
1014310	INJY	B	Injury	ASST	Aggravated Assault	2020-07-29 02:21:51	SE	122nd	Division	N		Operator asked	Incident SubType	Count	1
1065378	INJY	B	Injury	ASST	Aggravated Assault	2022-02-01 18:40:24	SE	Highland	Powell	S		Operator was M	Incident SubType	Count	1
1076205	INJY	B	Injury	ASST	Aggravated Assault	2022-05-23 00:27:58	SW	Beaverton Tc		E		supervisor reque	Incident SubType	Count	1
1103768	INJY	B	Injury	ASST	Aggravated Assault	2023-01-27 08:34:20	SW	5th	Hall	S		Operator Brian	Incident SubType	Count	1
1105747	INJY	B	Injury	ASST	Aggravated Assault	2023-02-14 18:32:00	NE	Killingsworth	Cesar Chavez Blvd	W		@18:32 Operat	Incident SubType	Count	1
1122838	INJY	B	Injury	ASST	Aggravated Assault	2023-07-31 11:46:21	SW	Barnes	Cedar Hills Blvd	E		Operator Tinnon	Incident SubType	Count	1
1124194	INJY	B	Injury	ASST	Aggravated Assault	2023-08-14 19:03:43	SE	Se Powell Blvd		N		@19:03 Operat	Incident SubType	Count	1
873454	ASST	B	Security	ASLTCUST	Assault-Customer	2017-01-04 08:32:33	SE	Powell	Milwaukie	W		Passenger requ	Incident SubType	Count	1
875989	ASST	B	Security	ASLTCUST	Assault-Customer	2017-01-26 08:41:32	NW	Bethany	Bronson	N		Loud and verbal	Incident SubType	Count	1
876422	ASST	B	Security	ASLTCUST	Assault-Customer	2017-01-30 11:42:18	E	Burnside	74th	W		Fight on bus.	Incident SubType	Count	1
877106	ASST	B	Security	ASLTCUST	Assault-Customer	2017-02-05 15:59:10	NE	Glisan	41st	W		Op reporting a f	Incident SubType	Count	1
877123	ASST	B	Security	ASLTCUST	Assault-Customer	2017-02-05 18:46:00	NW	185th	Bronson	S		operator called i	Incident SubType	Count	1
877185	ASST	B	Security	ASLTCUST	Assault-Customer	2017-02-06 10:53:24	SW	Commercial	Tigard Tc	S		Op stated that t	Incident SubType	Count	1
877186	ASST	B	Security	ASLTCUST	Assault-Customer	2017-02-06 11:00:21	NE	Gateway Tc		S		3 young bm thr	Incident SubType	Count	1
877554	ASST	B	Security	ASLTCUST	Assault-Customer	2017-02-09 09:25:16	N	Fremont	Gantenbein	W		Male on the bus	Incident SubType	Count	1
877771	ASST	B	Security	ASLTCUST	Assault-Customer	2017-02-10 22:55:00	SE	82nd	Division	S		Operator states	Incident SubType	Count	1
878828	ASST	B	Security	ASLTCUST	Assault-Customer	2017-02-20 13:06:30	NE	Rose Quarter Tc	B2 Inbound	S		Operator states	Incident SubType	Count	1
879361	ASST	B	Security	ASLTCUST	Assault-Customer	2017-02-24 17:23:12	N	Lombard	Huron	E		OP called in sta	Incident SubType	Count	1
880553	ASST	B	Security	ASLTCUST	Assault-Customer	2017-03-06 23:05:52	SE	Cesar Chavez Blvd	Powell	S		Woman waiting	Incident SubType	Count	1
880608	ASST	B	Security	ASLTCUST	Assault-Customer	2017-03-07 08:21:00	W	Willow Creek Tc		E		mentally ill pass	Incident SubType	Count	1
881246	ASST	B	Security	ASLTCUST	Assault-Customer	2017-03-12 11:43:22	SW	5th	Columbia	S		Police and med	Incident SubType	Count	1
881655	ASST	B	Security	ASLTCUST	Assault-Customer	2017-03-15 14:40:45	SE	Woodstock	46th	E		30yr W/M gray	Incident SubType	Count	1
882524	ASST	B	Security	ASLTCUST	Assault-Customer	2017-03-23 07:07:23	NE	Killingsworth	74th	E		One person on t	Incident SubType	Count	1
883675	ASST	B	Security	ASLTCUST	Assault-Customer	2017-04-03 09:34:38	W	Burnside (West)	3rd	W		Operator reporti	Incident SubType	Count	1
884295	ASST	B	Security	ASLTCUST	Assault-Customer	2017-04-09 15:56:31	SE	Holgate		E		Op called statin	Incident SubType	Count	1
884399	ASST	B	Security	ASLTCUST	Assault-Customer	2017-04-10 15:46:22	SE	82nd		S		op reporting tha	Incident SubType	Count	1
884441	ASST	B	Security	ASLTCUST	Assault-Customer	2017-04-10 20:54:12	SE	82nd	Woodstock	S		op reporting 5 t	Incident SubType	Count	1
885162	ASST	B	Security	ASLTCUST	Assault-Customer	2017-04-17 10:51:22	NW	Glisan	3rd	W		A female passe	Incident SubType	Count	1
885791	ASST	B	Security	ASLTCUST	Assault-Customer	2017-04-23 13:21:38	SE	82nd	Otty	N		op reporting tha	Incident SubType	Count	1
886019	ASST	B	Security	ASLTCUST	Assault-Customer	2017-04-25 18:21:11	NE	Couch	M L King	W		1 female (fare e	Incident SubType	Count	1
887046	ASST	B	Security	ASLTCUST	Assault-Customer	2017-05-05 11:00:51	NE	Twc_181st Ave W/B	181st	W		887046, 8736, 3	Incident SubType	Count	1
887461	ASST	B	Security	ASLTCUST	Assault-Customer	2017-05-09 11:43:13	SW	5th	Pine	S		operator started	Incident SubType	Count	1
887999	ASST	B	Security	ASLTCUST	Assault-Customer	2017-05-14 06:31:04	SE	Stark	#21015	W		Operator states	Incident SubType	Count	1
888263	ASST	B	Security	ASLTCUST	Assault-Customer	2017-05-16 21:36:51	SE	82nd	Woodward	N		Elderly white fe	Incident SubType	Count	1

Pivot Table | ACID Results School Project | Crime Severity Index

Count: 17903

11. References

Reference:

1. *Hoping to assuage rider fears, TriMet amps up policing at certain transit stations. Willamette Week. (n.d.).* *https://www.wweek.com/news/2023/08/23/hoping-to-assuage-rider-fears-trimet-amps-up-policing-at-certain-transit-stations/*

2. Office of Policy Development and Research. (1977). *Police Allocation Methodology for Police Departments.* The Department of Housing and Urban Development. https://books.google.com/books?hl=en&lr=&id=nbXTfigum4wC&oi=fnd&pg=PA1&dq=patrol+allocation+models&ots=ut9iLkT2Kl&sig=UohyJS1SKEJsil5UEru0JZlXz3U#v=onepage&q=patrol%20 allocation%20models &f=false

3. *Wernick, M. N., Andrews, L., & Yang, Y. (2018). A Data-Driven Crime Prevention Program. Naya Prize, Illinois Institute of Technology.*https://web.iit.edu/sites/web/files/departments/nayar-prize/reports/Nayar-II-Report-Crime-Prevention.pdf

4. *TriMet. (n.d.). Ridership and performance statistics. Retrieved [date you accessed the page], from https://trimet.org/about/performance.htm#performance*

5. *Portland Police Bureau. (2023, November 9). Police staffing numbers. Portland.gov. Retrieved [date you accessed the page], from https://www.portland.gov/police/open-data/ppb-staffing-report*

6. *Strauss, T. W. (2023, November 29). Portland Police Allocation Methodology. Email to M. Ardito.*

7. *Nolan III, J. J. (2004, November). Establishing the statistical relationship between population size and UCR crime rate: Its impact and implications. Journal of Criminal Justice, 32(6), 547-555. Retrieved from https://www.ojp.gov/ncjrs/virtual-library/abstracts/establishing-statistical-relationship-between-population-size-and*

8. *Oliveira, M. (2021). More crime in cities? On the scaling laws of crime and the inadequacy of per capita rankings—a cross-country study. Crime Science, 10, Article 27.* [*https://crimesciencejournal.biomedcentral.com/articles/10.1186/s40163-021-00155-8*](https://crimesciencejournal.biomedcentral.com/articles/10.1186/s40163-021-00155-8)