Microsoft Access and Excel for Data-Driven Crime Analysis: A 5-Part Series

Part 5: Leveraging Statistical Analysis and Integrating Tools for Deeper Insights

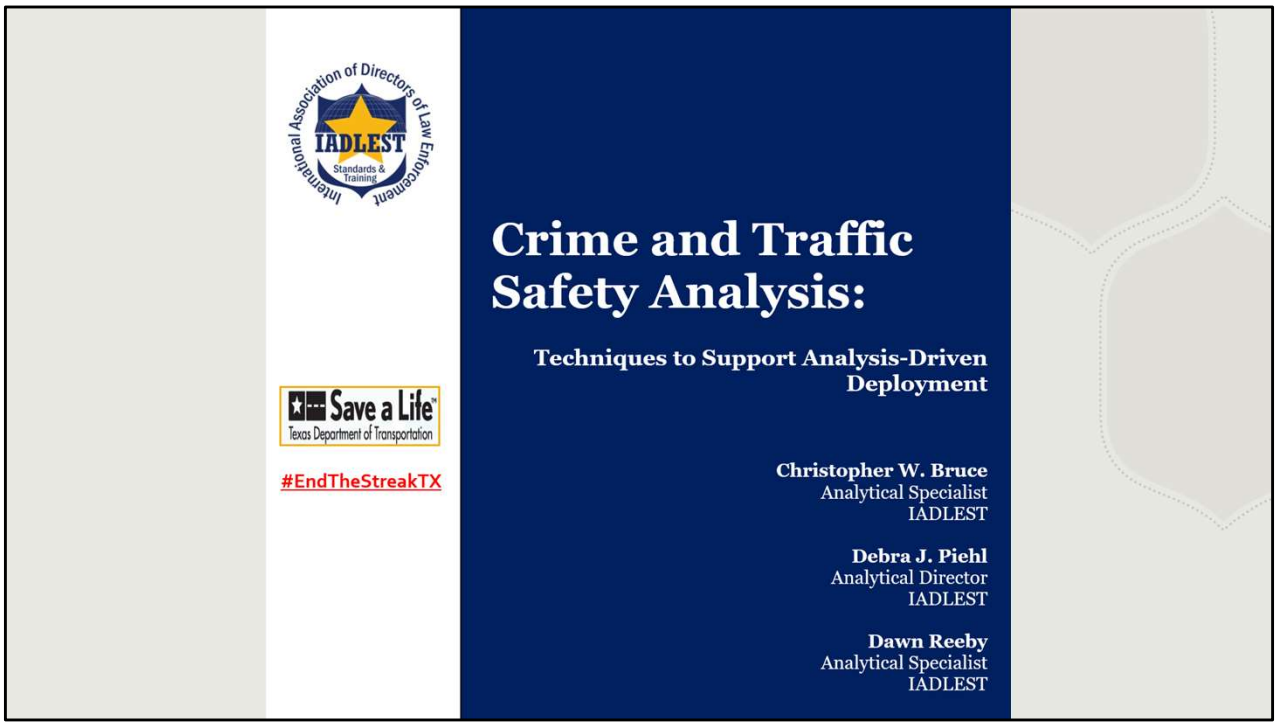
Welcome to **Part 5**, the final part in our 5-part analytical series. Today, we will explore how to apply statistical techniques like Z-scores in Excel® to uncover deeper insights into crime patterns and trends. As part of the ongoing TxDOT and IADLEST partnership, this session aims to help law enforcement agencies better understand and act on complex data to improve safety and reduce harm. By integrating Microsoft Access® with Excel®, you'll enhance your agency's ability to conduct sophisticated data analysis, providing deeper insights into traffic crashes, criminal behavior, and social harms. This session will enable you to apply statistical significance techniques to interpret patterns more effectively and leverage integrated tools for a comprehensive analysis. The partnership between TxDOT and IADLEST continues to support these efforts, ensuring that law enforcement is equipped with both the technical skills and analytical tools necessary for data-driven decisions that save lives and reduce harm.

Welcome to **Part 5: Z-Scores, Statistical Significance in Excel, and Integrating Excel with Access**

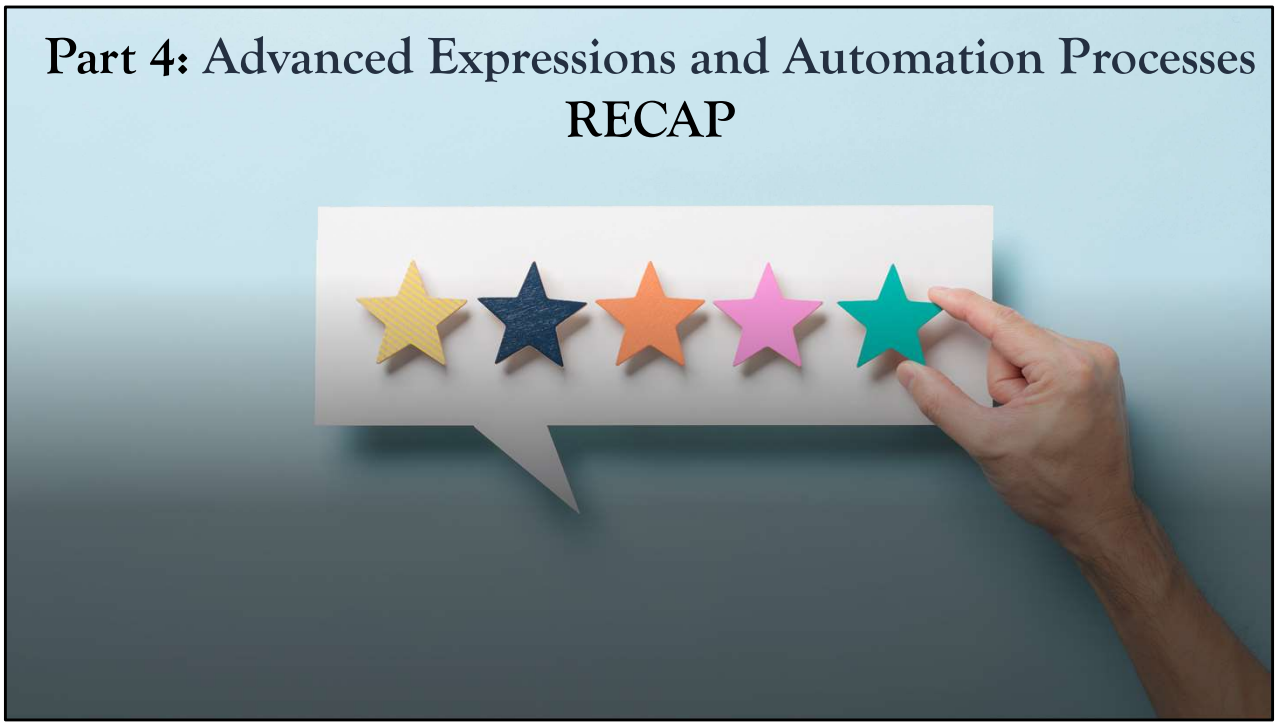
I'm Dawn Reeby, and I'm honored to guide you through this transformative training. With over 25 years in law enforcement analysis, I've spent nearly 14 of those years collaborating with IADLEST to deliver impactful analytical trainings, webinars, and technical assistance nationwide. Our work focuses on helping agencies implement smarter, data-driven strategies while fostering high-performing teams. As the author of *Bigger Than Data* and the *Building a Crime Analysis Legacy* books, my mission is to empower crime analysts and supervisors to strengthen their careers, build team capacity, and leave lasting legacies in the field.

In this session, we will apply statistical techniques, including Z-scores, in Excel® to enhance crime pattern and trend analysis.

Let’s get started!



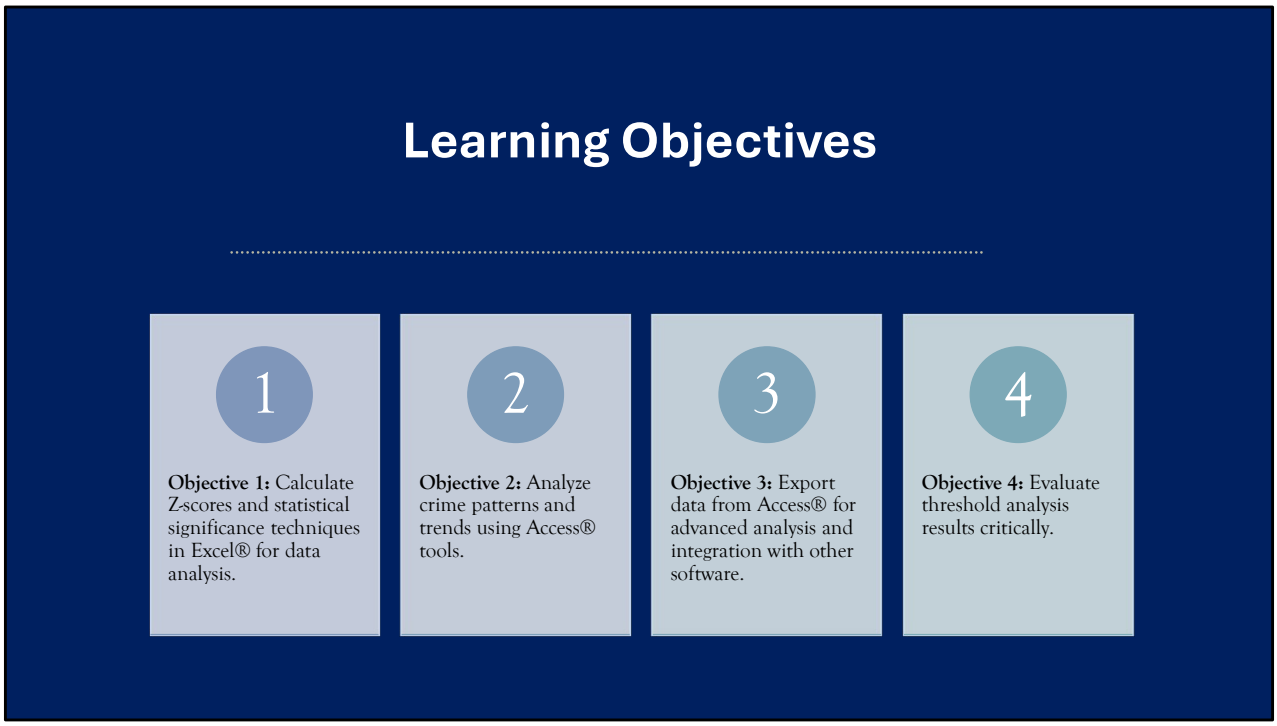
The SAFER (Strategic Analysis for Focused Engagement with Results: Crime and Crash Reduction) model, developed by the International Association of Directors of Law Enforcement Standards and Training (IADLEST) and supported by the Texas Department of Transportation (TxDOT), integrates location-based crime and crash data to create long-term strategies for reducing social harms. It builds on the earlier DDACTS 2.0 model, initially supported by the National Highway Traffic Safety Administration (NHTSA). IADLEST offers a variety of resources, including workshops, literature, webinars, and training, to help law enforcement agencies implement data-driven models like SAFER for more effective crime and traffic safety analysis and deployment.



In Part 4 of our series, we focused on advanced expressions and automation techniques in Microsoft Access. We covered how to streamline complex calculations, automate reporting processes, and create reusable templates that enhance consistency and efficiency. These tools allow you to perform more precise analysis and free up time for higher-level work, all while reducing the risk of errors.

Remember, while this is part of an ongoing series, each session is designed to stand alone, so you can always refer back to individual segments based on your needs.

Looking ahead, in Part 5, we'll explore Z-Scores and statistical significance in Excel, as well as how to integrate Excel with Access to further enhance your analytical capabilities. Let’s continue refining your skills!



Welcome to Part 5 of this session, where we dive into applying statistical techniques to enhance your crime pattern and trend analysis. This section is designed to equip you with practical tools and methods to take your data analysis to the next level.

Here's what you'll be learning today: First, we'll explore **Z-scores** and how to use them in Excel® to measure statistical significance. This will help you identify patterns and trends that are outside the norm—those that warrant further investigation.

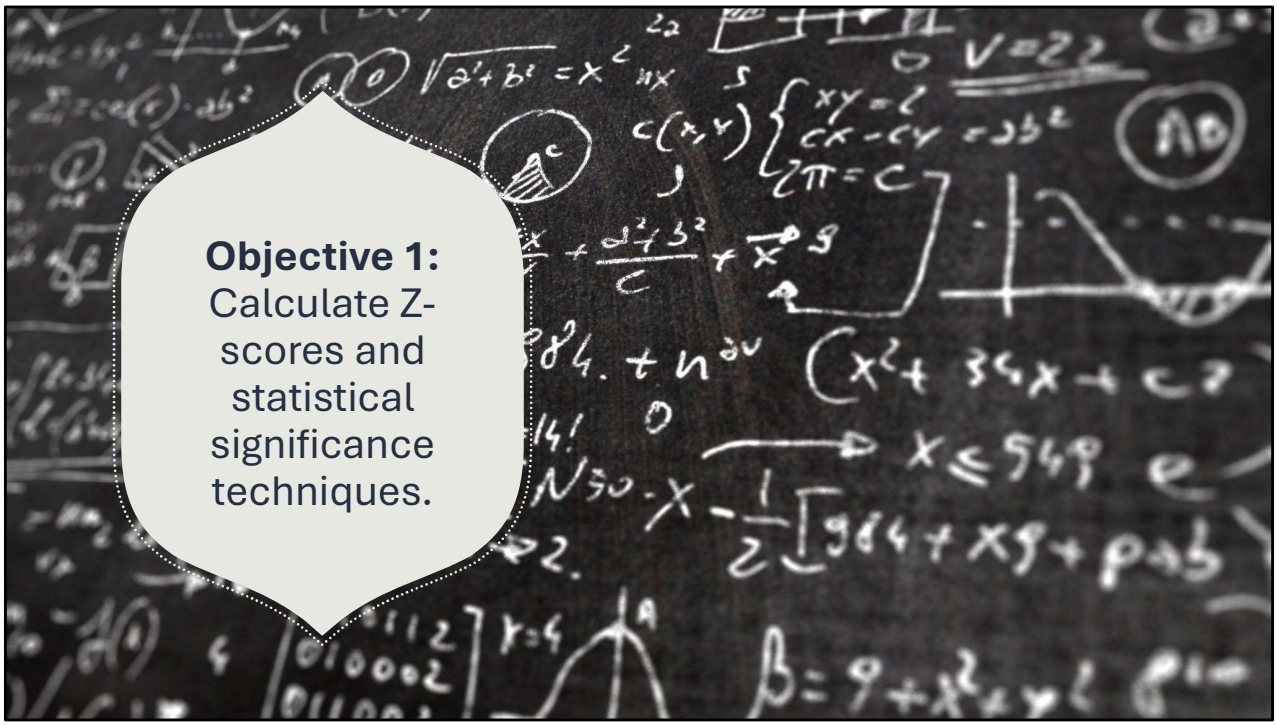
Next, we'll discuss how to **identify and analyze crime patterns and trends** using Excel's powerful analytical capabilities. You'll learn step-by-step techniques to uncover actionable insights in your data.

We'll also cover how to **export data from Access® and integrate it with Excel (and vice versa).** This will allow you to perform advanced analyses by leveraging the strengths of both tools seamlessly.

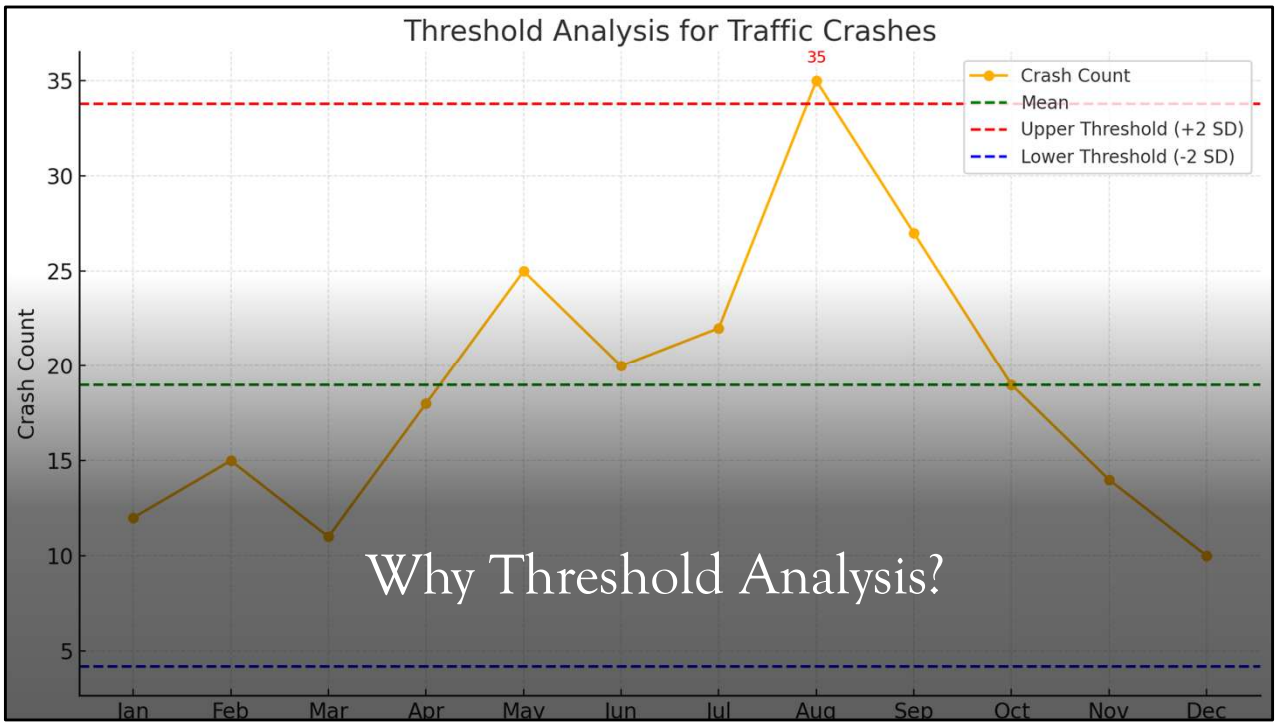
Finally, we'll bring it all together by encouraging you to **think critically about**

threshold analysis results. What do the numbers really mean? What should your next steps be? We'll emphasize the importance of interpreting your findings in a meaningful and impactful way.

By the end of this session, you'll have practical skills and strategies to apply statistical techniques in your daily work, making your analysis more precise and actionable.



Objective 1: Calculate Z-scores and statistical significance techniques in Excel® for data analysis.



(Image generated by Chat GBT)

Threshold analysis is a powerful tool for identifying unusual activity—whether it's crashes, crimes, social harms, or other incidents—that stands out based on the available data. These anomalies often signal patterns or trends that require immediate attention and deeper analysis. By identifying these activities early, we can help implement focused and effective strategies to address them quickly, whether it's disrupting a crime pattern, deterring traffic crashes, or mitigating social harm.

As analysts, our primary role is to provide actionable intelligence to officers and detectives, enabling them to succeed in their missions. Whether it's arresting criminals, deterring incidents, or reducing harm, threshold analysis is a method that equips us to measure crime patterns and trends with precision. By running thresholds multiple times a week, analysts can spot potential patterns as they emerge, allowing for targeted investigation and the development of impactful strategies.

Tactical Focus:

Threshold analysis shines in its tactical applications, focusing on short-term responses rather than long-term trends. It pinpoints geographic areas and target types—like drug stores, parks, or large apartment complexes—that demand immediate attention due to rising activity. This method enables agencies to:

- Conduct highly visible directed patrols,
- Engage in community contacts, and
- Perform field interviews in identified hot spots.

These targeted efforts aim to suppress activity or apprehend offenders quickly. By utilizing daily or weekly analyses of emerging patterns and hot spots, this approach supports a dynamic, proactive response to crime and safety concerns.

Threshold analysis is a tool that empowers analysts to make a tangible impact on public safety by turning data into actionable insights that drive results.

What is Threshold Analysis?

	A	B	C	D	E	F	G	H	K	L	M
1	IncidentType	2020	2021	2022	2023	2024	2025	Avg	Normal Range	Change	Z Score
2	Rape	2	1	2	1	2	1	1.6	1-2	-38%	-1.22
3	Indecent Assault	6	1	1	4	5	1	3.4	1-5	-71%	-1.17
4	Peeping & Spying	0	0	1	0	0	2	0.2	0-1	900%	4.50
5	Aggravated Assault	11	14	6	5	8	11	8.8	5-12	25%	0.66
6	Simple Assault	44	41	40	33	33	49	38.2	34-43	28%	2.43
7	Robbery	5	0	3	2	3	2	2.6	1-4	-23%	-0.37
8	Threats	32	23	26	12	16	31	21.8	15-29	42%	1.29
9	Violation of RO	15	14	9	14	9	4	12.2	10-15	-67%	-3.11
10	Housebreak	11	12	16	16	18	18	14.6	12-17	23%	1.28
11	Commercial Break	15	11	12	14	12	8	12.8	11-14	-38%	-3.27
12	Larceny from MV	61	73	67	62	43	90	61.2	51-71	47%	2.87
13	Larceny from Building	28	24	19	23	21	35	23	20-26	52%	3.96
14	Larceny from Person	11	11	12	4	2	3	8	4-12	-63%	-1.21
15	Larceny from Residence	15	13	8	8	24	9	13.6	8-19	-34%	-0.78
16	Larceny of Bicycle	15	9	13	9	9	17	11	8-14	55%	2.37
17	Larceny of Services	4	9	7	2	7	2	5.8	3-8	-66%	-1.53
18	Shoplifting	51	58	55	77	63	72	60.8	52-70	18%	1.24
19	Auto Theft	14	28	14	11	17	13	16.8	11-23	-23%	-0.64

Let's look at this graphic. It helps us indicate which incident types fall outside the range. See those incidents that show significant percent increases or decreases to the average to the right? They are highlighted in yellow and blue.

Christopher Bruce shares the key takeaways that analysts identify crime patterns in his paper "Identifying Crime Patterns". You can download this article in your student materials. He reports that analysts can determine the possibility of patterns through 3 methodologies:

- Modus Operandi Commonalities found through a careful review of incident reports and their narratives - daily
- Exceptional Volume, found through some brand of threshold analysis, either deliberate or unconscious
- Geographic Proximity found through crime mapping.

"Threshold analysis describes the process by which the analyst identifies potential patterns through exceptional volume. The theory behind threshold analysis is that when crime in a particular geographic area reaches a level that is significantly higher than usual, some type of crime pattern is probably to blame. The analyst can use a statistical method to determine when crime has reached a level that is "significantly

higher than usual”—in other words, when crime crosses the threshold from average volume to exceptional volume.”

In statistics, a Z-score, or standard score, measures how far a specific value is from the mean, expressed in terms of standard deviations. Think of it as a tool for determining whether something is "normal" or "unusual."

- **If a value is more than two standard deviations above or below the mean**, it suggests something unusual is happening and warrants further investigation.
- For example, if crime incidents exceed two standard deviations beyond the mean, it may indicate pattern activity. Similarly, a significant drop below the expected range also calls for further analysis.

What is Statistical Significance?

A category is considered statistically significant if it falls outside the normal range of what typically occurs.

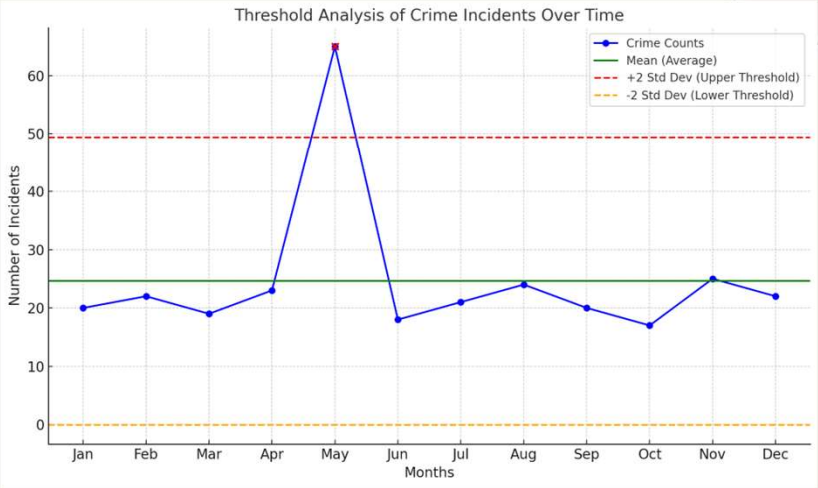
- Let’s say your department normally sees 20-25 car crimes per month. If 65 car breaks occur in one month, that’s far outside the norm and raises a red flag for further investigation. This is the “bell-ringing” moment for analysts to dig deeper.

Important Note:

The term "significance" here doesn’t mean “important”; instead, it refers to whether the value is statistically outside the expected range.

Bruce, Christopher. (Undated) Identifying Crime Patterns. Unpublished Work, PDF.

Example of Threshold Analysis?



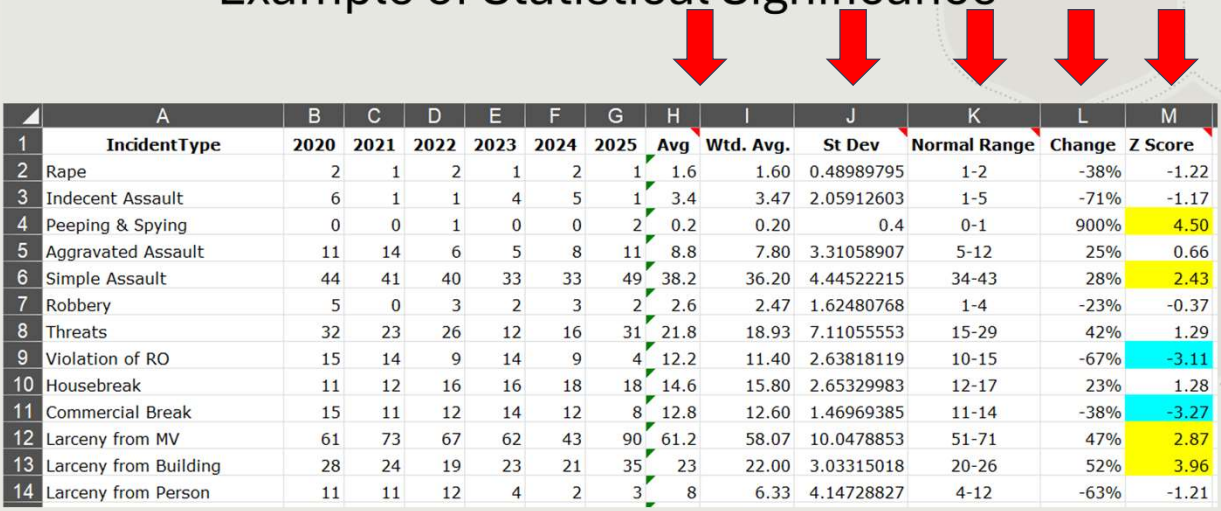
(Image generated by Chat GBT)

Here we have a visualization of threshold analysis in action. The chart shows monthly crime counts, represented by the blue bars, over a specified period. The yellow line marks the average crime count, while the upper and lower thresholds, calculated using Z-scores and standard deviations, are shown in green and red respectively.

This analysis helps us quickly identify outliers in the data—months where crime activity is unusually high or unusually low. For example, in Month 7, we see a spike in crime that exceeds the upper threshold. This would signal to us that something unusual is occurring and warrants further investigation. Similarly, Month 3 dips below the lower threshold, which might suggest a significant decrease that also merits attention. By flagging these anomalies, we can focus our analysis on specific periods, ensuring that we provide actionable intelligence to our officers and decision-makers. This tool not only highlights potential patterns but also saves time by directing resources to where they're needed most.

Threshold analysis is a powerful method for pinpointing statistical outliers and uncovering patterns, helping us take a more targeted and efficient approach to crime analysis.

Example of Statistical Significance



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	IncidentType	2020	2021	2022	2023	2024	2025	Avg	Wtd. Avg.	St Dev	Normal Range	Change	Z Score
2	Rape	2	1	2	1	2	1	1.6	1.60	0.48989795	1-2	-38%	-1.22
3	Indecent Assault	6	1	1	4	5	1	3.4	3.47	2.05912603	1-5	-71%	-1.17
4	Peeping & Spying	0	0	1	0	0	2	0.2	0.20	0.4	0-1	900%	4.50
5	Aggravated Assault	11	14	6	5	8	11	8.8	7.80	3.31058907	5-12	25%	0.66
6	Simple Assault	44	41	40	33	33	49	38.2	36.20	4.44522215	34-43	28%	2.43
7	Robbery	5	0	3	2	3	2	2.6	2.47	1.62480768	1-4	-23%	-0.37
8	Threats	32	23	26	12	16	31	21.8	18.93	7.11055553	15-29	42%	1.29
9	Violation of RO	15	14	9	14	9	4	12.2	11.40	2.63818119	10-15	-67%	-3.11
10	Housebreak	11	12	16	16	18	18	14.6	15.80	2.65329983	12-17	23%	1.28
11	Commercial Break	15	11	12	14	12	8	12.8	12.60	1.46969385	11-14	-38%	-3.27
12	Larceny from MV	61	73	67	62	43	90	61.2	58.07	10.0478853	51-71	47%	2.87
13	Larceny from Building	28	24	19	23	21	35	23	22.00	3.03315018	20-26	52%	3.96
14	Larceny from Person	11	11	12	4	2	3	8	6.33	4.14728827	4-12	-63%	-1.21

Now it's time to dig into what statistical significance models look like, how to use them efficiently, and how to automate the entire process!
Here's an example of a threshold analysis using incident types.

We have data by year from 2020 to 2025, with 2025 being the current year. Let's take **Simple Assaults** as an example:

- In 2020, there were 44 incidents.
- In 2021, 41 incidents.
- In 2022, 40 incidents.
- In 2023, 33 incidents.
- In 2024, another 33 incidents.
- And in 2025, the number climbed to **49 incidents.**

The Average: The calculated average of incidents for these years is **38.2.** The **average** is the baseline that we'll compare future counts to, helping us understand what's 'normal' for that category.
By calculating the average, we create a foundation for spotting trends, patterns, and, importantly, **unusual activity**. Keep this calculation in mind as we move forward, because it's the starting point for deeper statistical analysis like standard deviation and Z-scores.

Standard Deviation: Next, we see the "scary" column, *Standard Deviation,* which calculates how far the values are spread from the average. Here, the standard deviation for Simple Assaults is **4.45.**

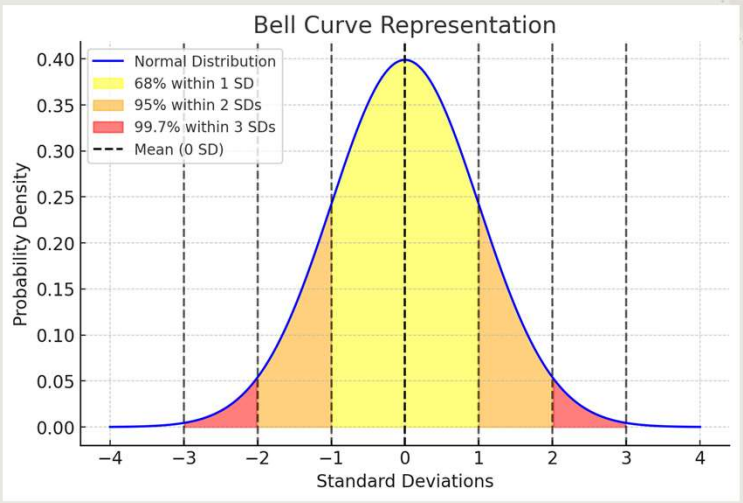
Normal Range: Using the average and standard deviation, we calculate the *Normal Range,* which in this case is **34 to 43 incidents.**

Percent Change: Represents the percent difference between the current time period and the average of the last 3-5 years of the same time period (i.e. Quarter 1).

Percent Change from Average: The percent change for Simple Assaults in 2025 compared to the average is **28%**, showing a notable increase in activity.
Since the Z-score exceeds **±2.0**, this indicates **statistical significance**, meaning this count is unusual and warrants further analysis.

The Z-Score: The Z-score measures how far the current year's data deviates from the average. For 2025, the Z-score for Simple Assaults is **2.43**, which indicates the count is **2.43 standard deviations above the mean.** Z-Score - The z-score shows us how many standard deviations we are from the average, or mean, and on which side of the mean it is (negative or positive). How does this translate into law enforcement? We might think of -1 to +1 as "normal," -1 to -2 as "cool," +1 to +2 as "warm," less than -2 as "cold," and more than +2 as "hot." Conditional Formatting highlights those values that are greater than 1.9 or less than -1.9

Breaking it down



Standard Deviation – tells us how measurements of a group are spread out from the average. Here the average is signified by “x”. The Standard Deviation markers indicate how far away from the average, or x, a variable is.

Essentially, 68% of all variables fall within 1 SD of the mean. 95% of all variables fall within 2SD of the mean. And 99% of all variables fall within 3 SD of the mean. It isn’t often that we use 3 SD in criminal justice as this would include the majority of all our cases or calls for service. Instead, we play with 1-2 standard deviations.

Normal Range –Normal range is actually a complicated function-within-a-function that subtracts the standard deviation from the average to get the "low" threshold, adds the standard deviation to it to get the "high" threshold, then puts a dash in between. It signifies where your data normally will remain. The normal range indicates the “range” of activity that would be expected based upon historical data.

The Bell Curve
Here’s a simple bell curve to illustrate:

- The middle 95% of the curve represents what's considered "normal."
- For car crimes, 20-25 incidents per month fall within this range. However:
    - **Counts above 65** or significantly **below the normal range** signal a deviation.

As analysts, your role is to identify and analyze these deviations—whether high or low. These patterns may point to emerging trends or anomalies worth investigating.

Takeaway: When a category "rings the bell" by falling outside the normal range, your next step is to dig in, analyze the data, and uncover the story behind the numbers.

Populate Z-Score Formula

AVERAGE FORMULA
=AVERAGE(B2:M2)
Columns B through M represent the past 3-5 years

STANDARD DEVIATION FORMULA
=STDEVP(B2:M2)
Columns B through M represent the past 3-5 years

CONCATENATE FORMULA
=CONCATENATE(ROUND(N2-O2,0),".",ROUND(N2+O2,0))
Column N represents the Average. Column O represents SD

Z-SCORE FORMULA
=(Q2-N2)/O2
Column N represents the Average. Column Q represents the current year. Column O represents the Standard Deviation

PERCENT CHANGE FORMULA
=(Q2-M2)/M2
Column M represents the previous year. Column Q represents the current year

	A	B	C	D	E	F	G	H	I	J	K	L	M
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8	Threats	32	23	26	12	16	31	21.8	18.93	7.11055553	15-29	42%	1.29
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11	Commercial Break	15	11	12	14	12	8	12.8	12.60	1.46969385	11-14	-38%	-3.27
12	Larceny from MV	61	73	67	62	43	90	61.2	58.07	10.0478853	51-71	47%	2.87

GO TO YOUR VIDEO LIBRARY: "Z-SCORE CALCULATIONS"

The calculations shown are essential for conducting threshold analysis and Z-score evaluations, allowing crime analysts to detect trends and outliers efficiently. Here's how each formula contributes:

AVERAGE Formula:
=AVERAGE(B2:M2)

This calculates the mean value of data across the past 3-5 years, providing a baseline to measure current-year data against. For example, it could establish the average number of thefts at a specific location annually, serving as the foundation for comparison.

STANDARD DEVIATION Formula:
=STDEVP(B2:M2)

The standard deviation measures the variability of your data over the same 3-5 years. A smaller value indicates consistency, while a larger value suggests greater fluctuations. It helps define the range within which data is considered "normal," which is crucial for spotting unusual activity.

CONCATENATE Formula:
=CONCATENATE(ROUND(N2-O2,0),"-",ROUND(N2+O2,0))

This combines the calculated lower and upper boundaries (average ± standard deviation) into a single text value for easy reference. For instance, it might produce a range like "20-40," which indicates the expected bounds for thefts in a typical year.

Z-SCORE Formula:
=(Q2-N2)/O2

The Z-score determines how far a current value (e.g., incidents this year) is from the average, measured in terms of standard deviations. This is a powerful tool for highlighting anomalies, such as whether a spike in crimes is statistically significant or within normal variation.

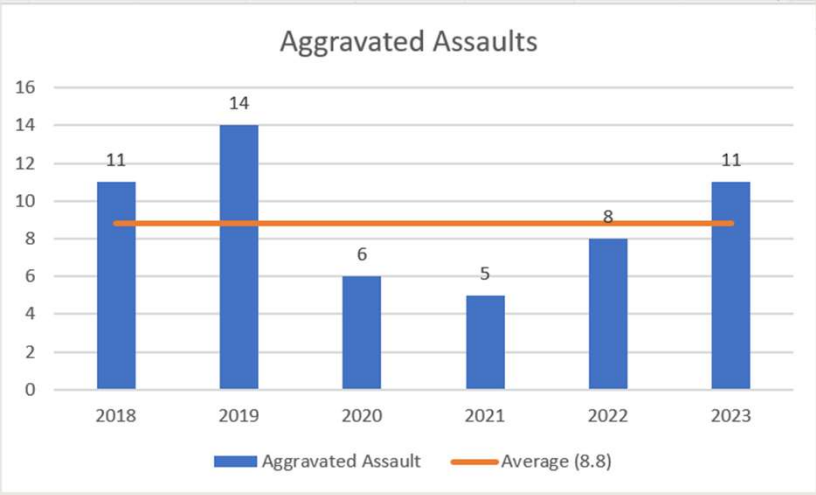
PERCENT CHANGE Formula:
=(Q2-M2)/M2

Percent change compares the current year's data to the previous year's, quantifying increases or decreases. This is especially useful for monitoring trends, such as identifying whether crime is rising or falling at a given location.

Why These Calculations Matter
These formulas provide analysts with a robust statistical toolkit to uncover patterns, anomalies, and significant changes in crime data. For instance, a Z-score analysis might reveal that a certain neighborhood has experienced a statistically significant rise in burglaries, prompting deeper investigation. Similarly, percent change can be used to evaluate the impact of crime prevention initiatives year-over-year.

To make these calculations accessible, the accompanying video will guide participants through the setup process step-by-step. Additionally, a downloadable template is available to streamline implementation, enabling analysts to focus on interpreting results rather than building formulas from scratch.

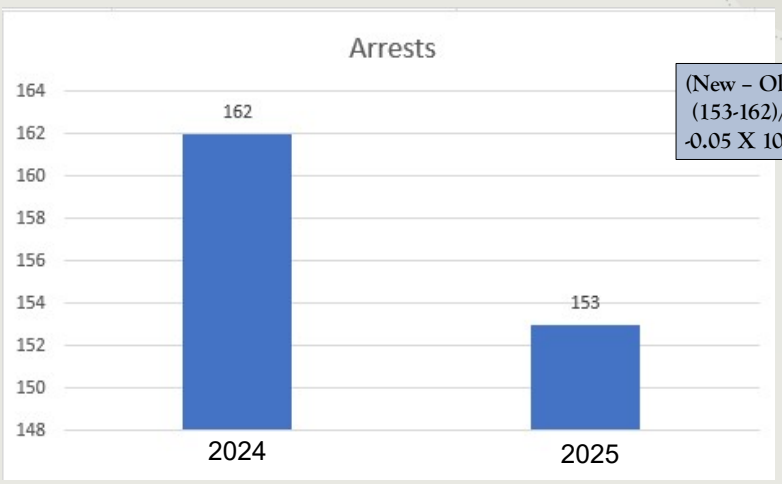
Percent Change from Average



Percent change from the average – basically you are calculating the difference between the current year and the average. The calculation is new minus old, divided by old.

We always want to compare the current time period to the average of 3-5 years of the same time period. Why? Because often there may be a fluctuation from year-to-year data. Maybe there was a flood – such as with New Orleans – or perhaps a bad winter or new construction. There are so many variables that can alter year-to-year stats. As a general rule, average comparisons should be used.

Percent Change from Last Year

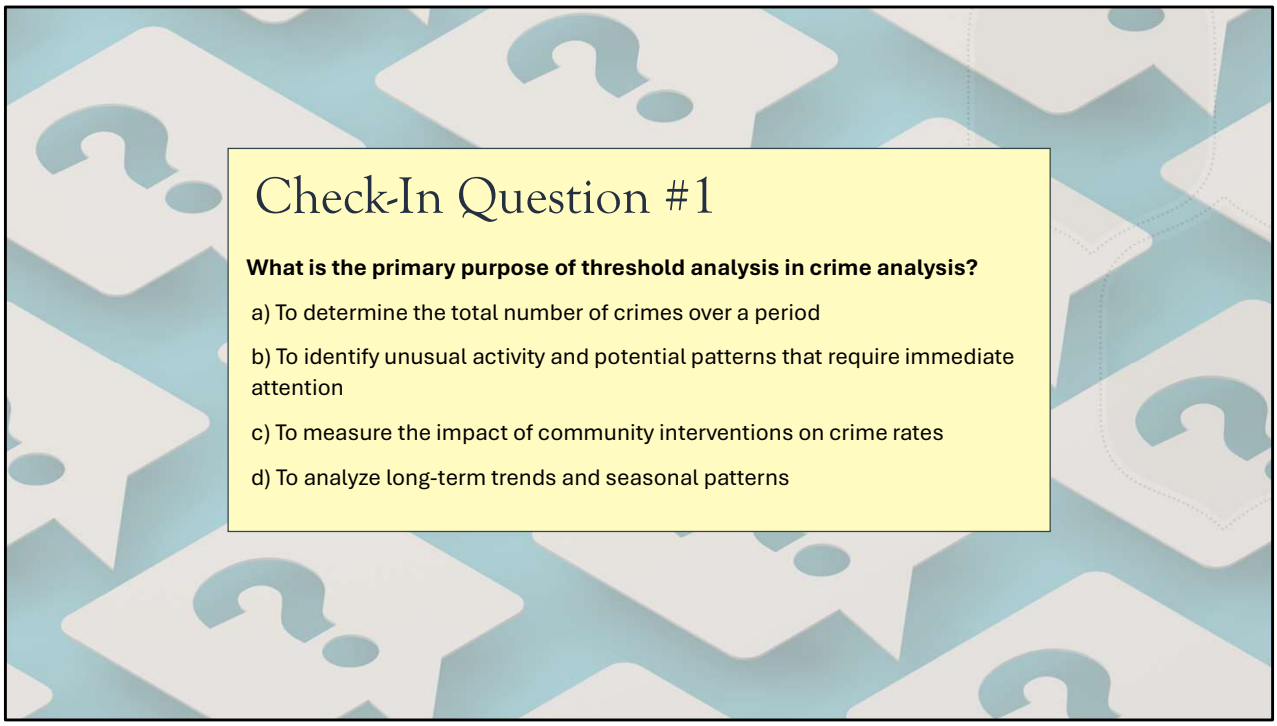


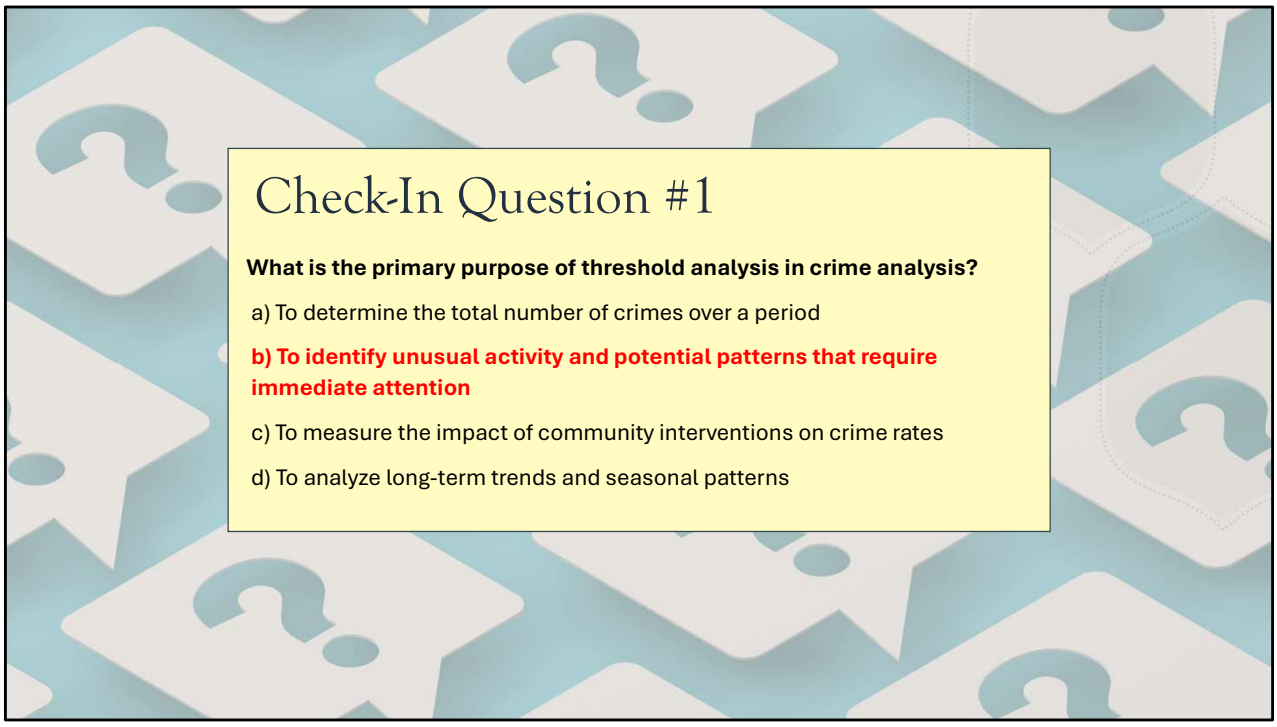
However, many departments still want to compare to last year. So, it's ok to add an additional column that represents **the percent change from last year**.

(New – Old)/Old X 100

(153-162)/162 = -0.05 X 100 = -5% change

Note that you only use the X 100 to convert the decimal number to the percent change. So, when your answer returns -0.05, to see the percent change, X your answer by 100. In this case, when we do so the percent change is -5%.


Check-In Question #1
What is the primary purpose of threshold analysis in crime analysis?
a) To determine the total number of crimes over a period
b) To identify unusual activity and potential patterns that require immediate attention
c) To measure the impact of community interventions on crime rates
d) To analyze long-term trends and seasonal patterns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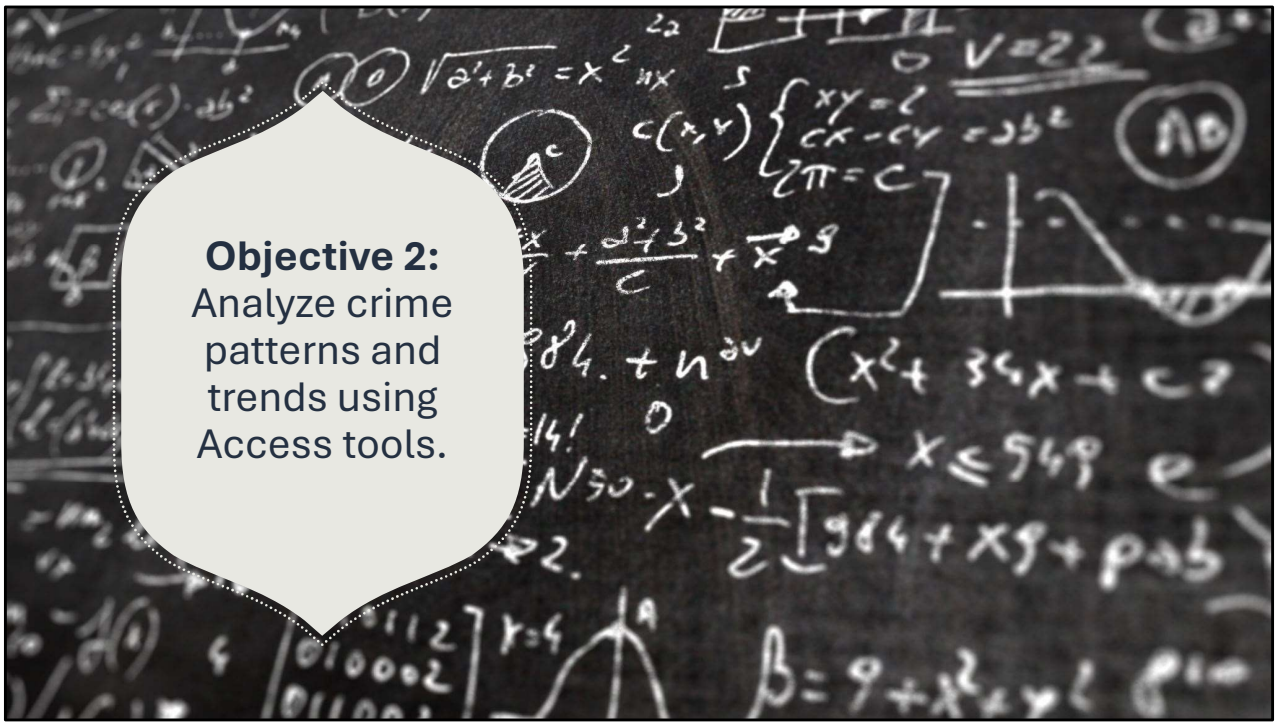
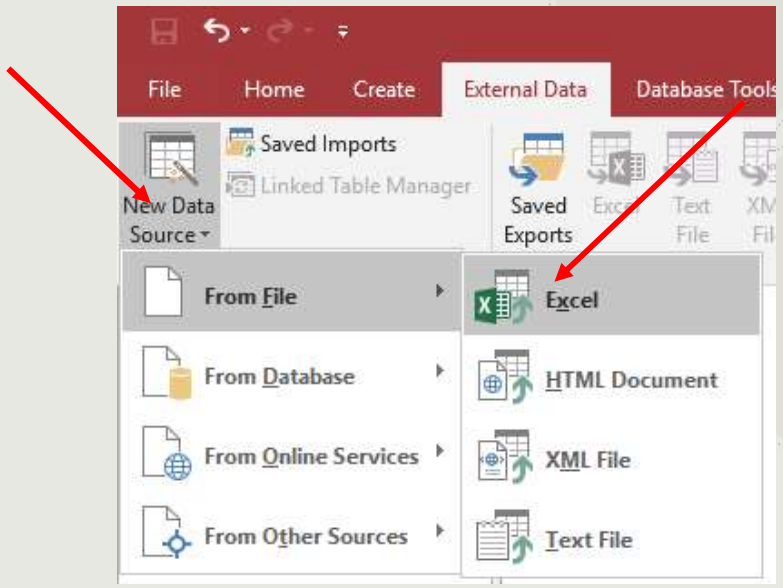


Objective 2: Analyze crime patterns and trends using Access® tools.

Import Crime Data

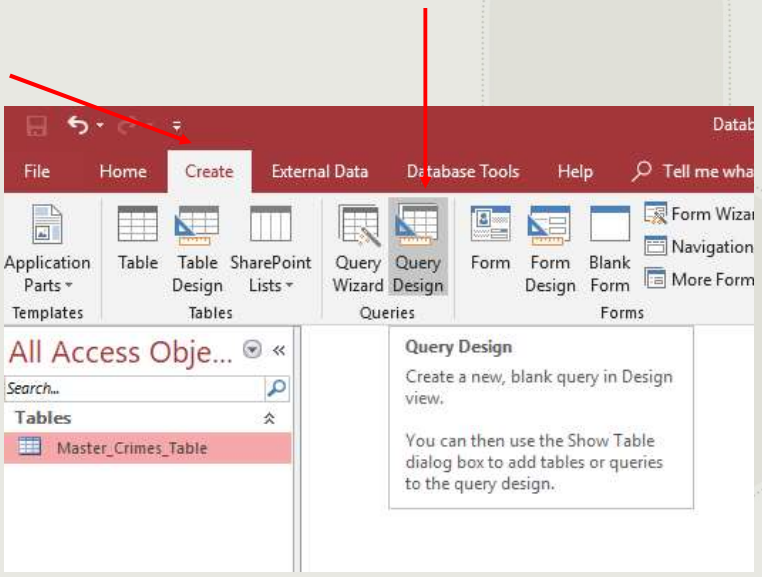


GO TO YOUR VIDEO LIBRARY: "IMPORTING EXCEL INTO ACCESS"

Drawing on the lessons you learned in the earlier parts of these series, the first step is to create your crosstab queries. In order to do this, you will need to add the student data into your Access database. My hope is that you work to create the live links in Access so that you don't have to import data. But for now, go ahead and import the class data called "Master Crimes Table Upload".

Review the video "Importing Excel into Access" video from Part 2.

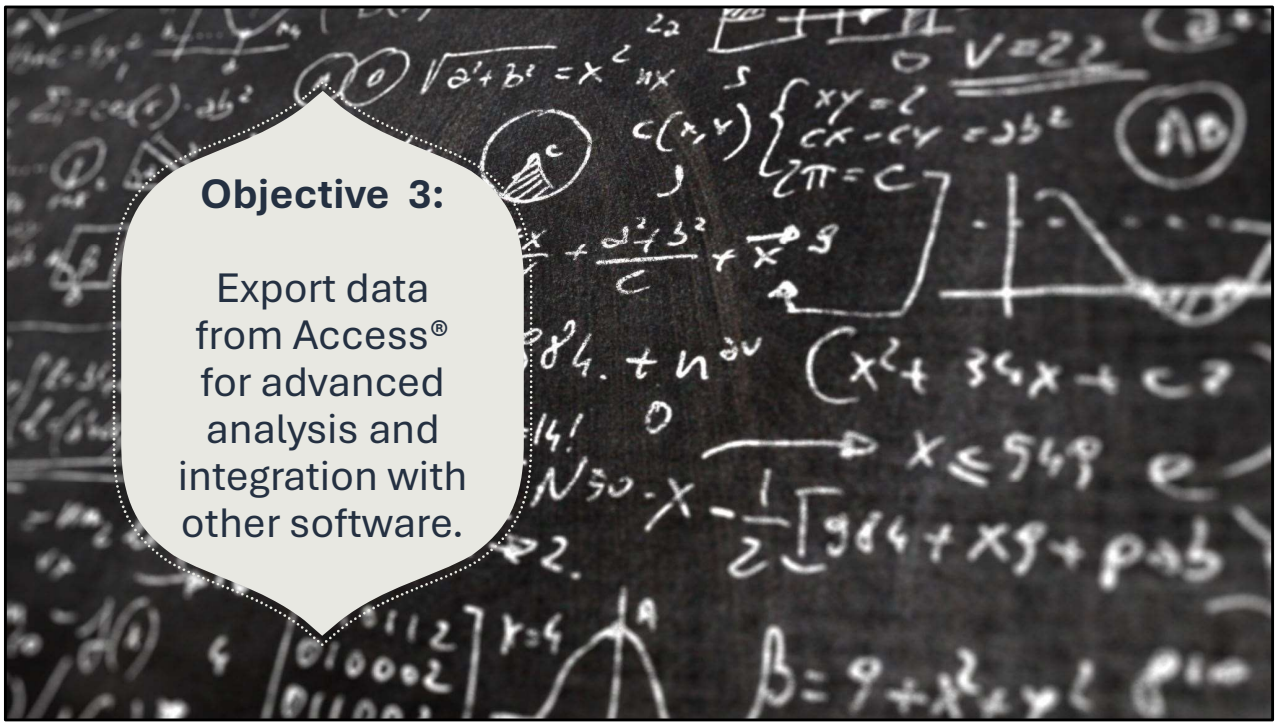
Create Crosstabs



GO TO YOUR VIDEO LIBRARY: "CROSSTAB QUERIES"

Create crosstab query. See Part 8 for a refresher on how to create crosstab queries. We are going to use this crosstab in Excel to populate your average, percent changes, z-score, etc. You can set the calculations up here in Access. But I find it easier to do it in Excel.

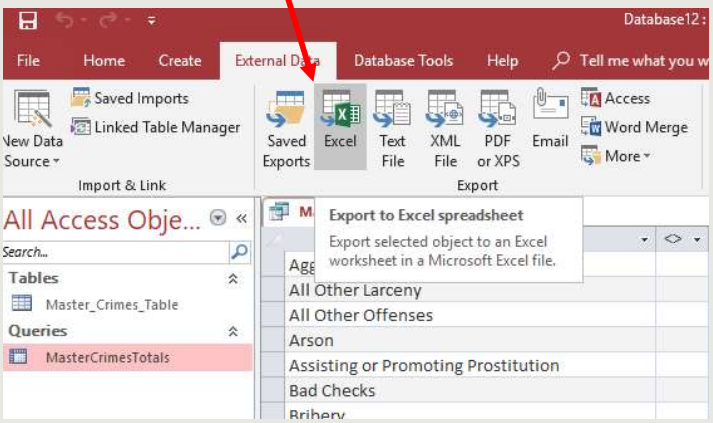
Review the Cross Table Queries video from Part 4.



Objective 3: Export data from Access® for advanced analysis and integration with other software.

Export Crosstabs

Follow EXPORT WIZARD



GO TO YOUR VIDEO LIBRARY: "EXPORT DATA FROM ACCESS"

Export your new statistics by using the Export Wizard.

View the Export Data From Access video here.

Statistical Significance Indicator

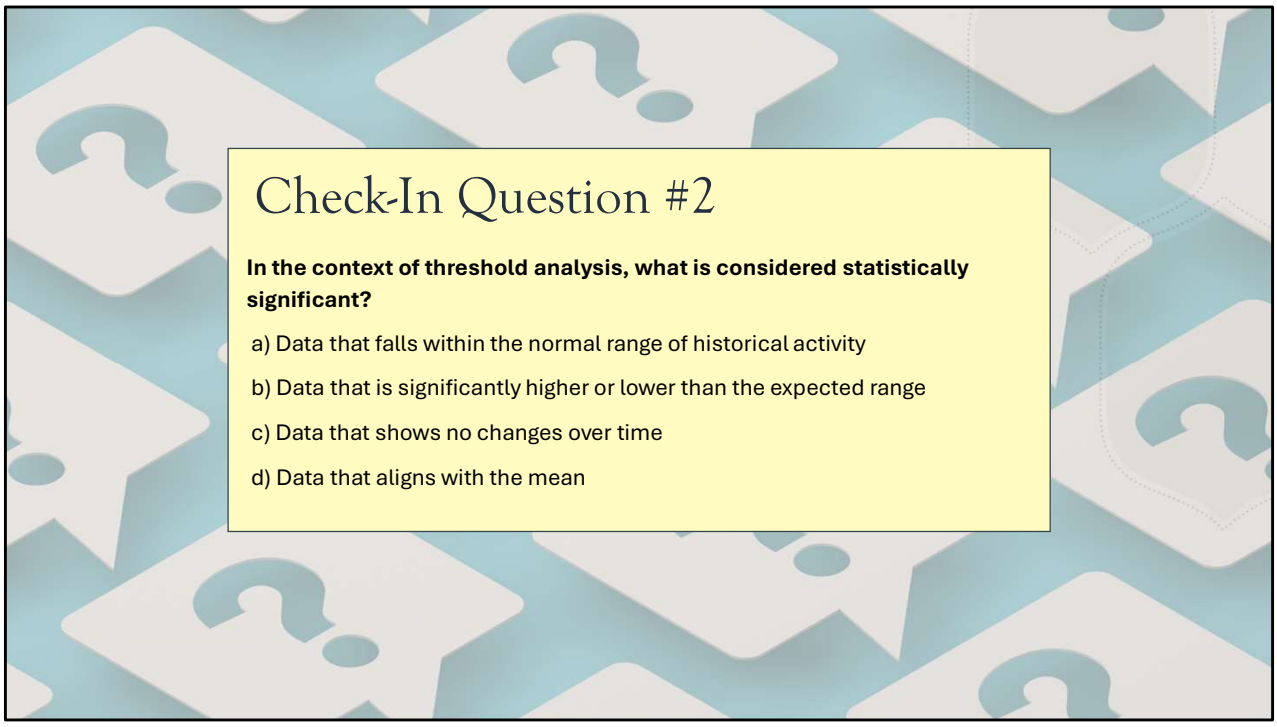
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	IncidentType	2018	2019	2020	2021	2022	2023	Avg	Wtd. Avg.	St Dev	Normal Range	Change	Z Score
5	Aggravated Assault	11	14	6	5	8	11	8.8	7.80	3.31058907	5-12	25%	0.66
6	Simple Assault	44	41	40	33	33	49	38.2	36.20	4.44522215	34-43	28%	2.43
7	Robbery	5	0	3	2	3	2	2.6	2.47	1.62480768	1-4	-23%	-0.37
8	Threats	32	23	26	12	16	31	21.8	18.93	7.11055553	15-29	42%	1.29
9	Violation of RO	15	14	9	14	9	4	12.2	11.40	2.63818119	10-15	-67%	-3.11
10	Housebreak	11	12	16	16	18	18	14.6	15.80	2.65329983	12-17	23%	1.28
11	Commercial Break	15	11	12	14	12	8	12.8	12.60	1.46969385	11-14	-38%	-3.27
12	Larceny from MV	61	73	67	62	43	90	61.2	58.07	10.0478853	51-71	47%	2.87

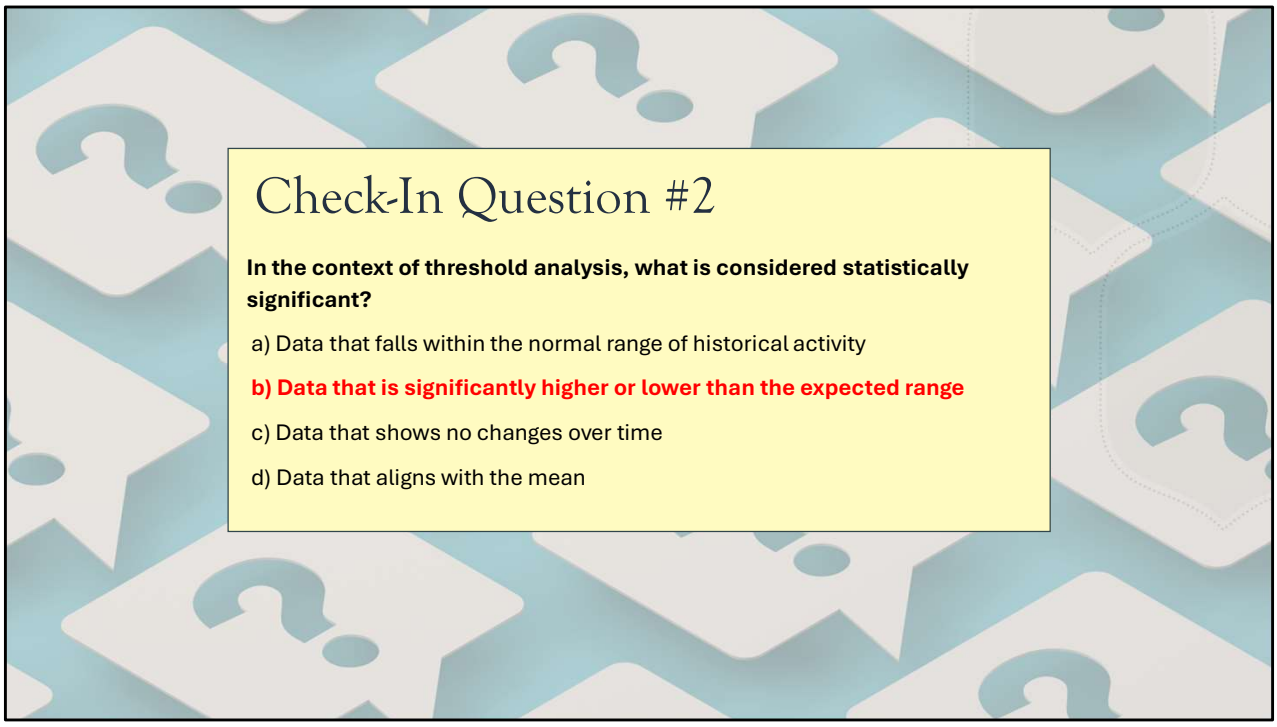
Threshold analysis and Z-scores are essential tools for crime analysts, enabling you to identify significant deviations or anomalies in your data. These techniques help detect unusual patterns, monitor trends, and allocate resources more effectively. For example, a sharp increase in vehicle thefts that exceeds the normal standard deviation could signal an emerging issue requiring immediate intervention. Similarly, setting thresholds for shoplifting incidents in a retail district can reveal spikes that might indicate organized theft operations. By identifying these variations, analysts can proactively address underlying issues rather than merely reacting to them.

These methods are especially valuable for analyzing crash data. For instance, monitoring increases or decreases at the top five crash locations can help pinpoint areas where interventions, such as improved traffic control measures, are needed. This approach not only highlights anomalies but also emphasizes more meaningful outcomes, such as reducing crash frequency or severity. Using Z-scores, analysts can compare trends across locations, days, or times to determine where resources can have the greatest impact.

Incorporating threshold analysis and Z-scores into your workflow provides clarity,

allowing you to focus on actionable insights rather than being overwhelmed by raw data. These tools are not just about detecting anomalies—they're about ensuring your analysis leads to better decisions, targeted strategies, and measurable improvements for your agency and community.


Check-In Question #2
In the context of threshold analysis, what is considered statistically significant?
a) Data that falls within the normal range of historical activity
b) Data that is significantly higher or lower than the expected range
c) Data that shows no changes over time
d) Data that aligns with the mean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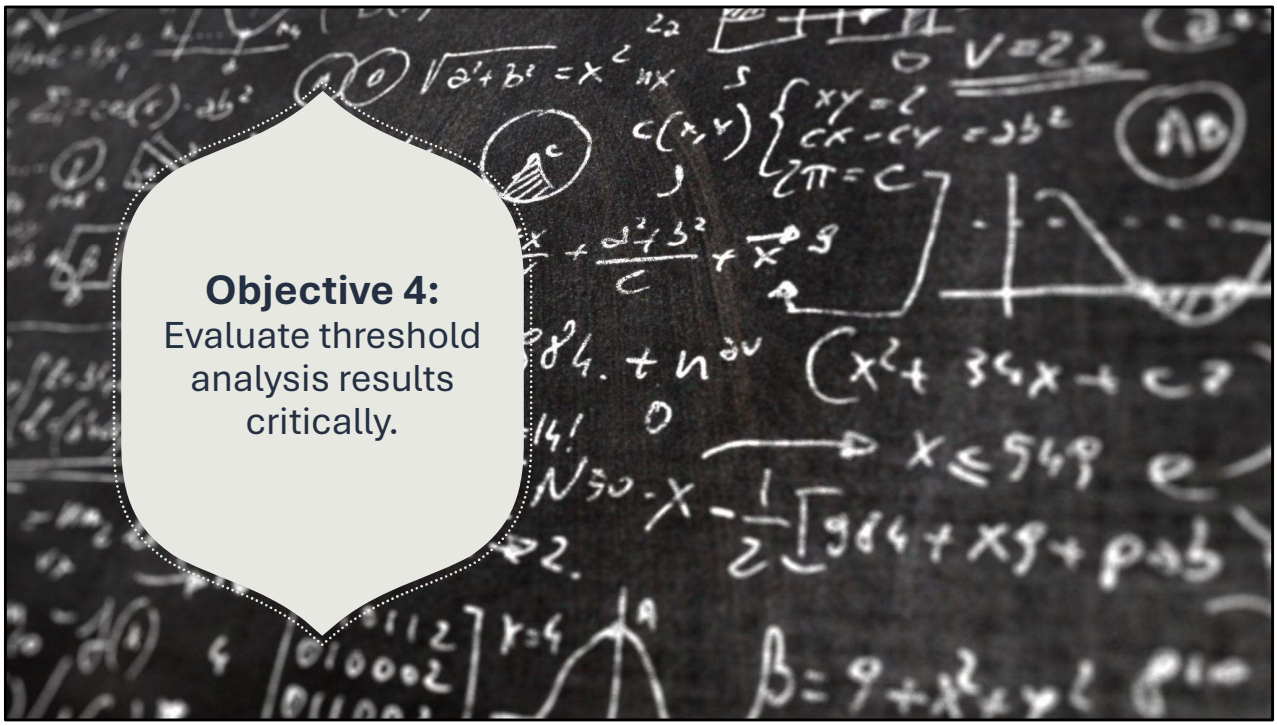
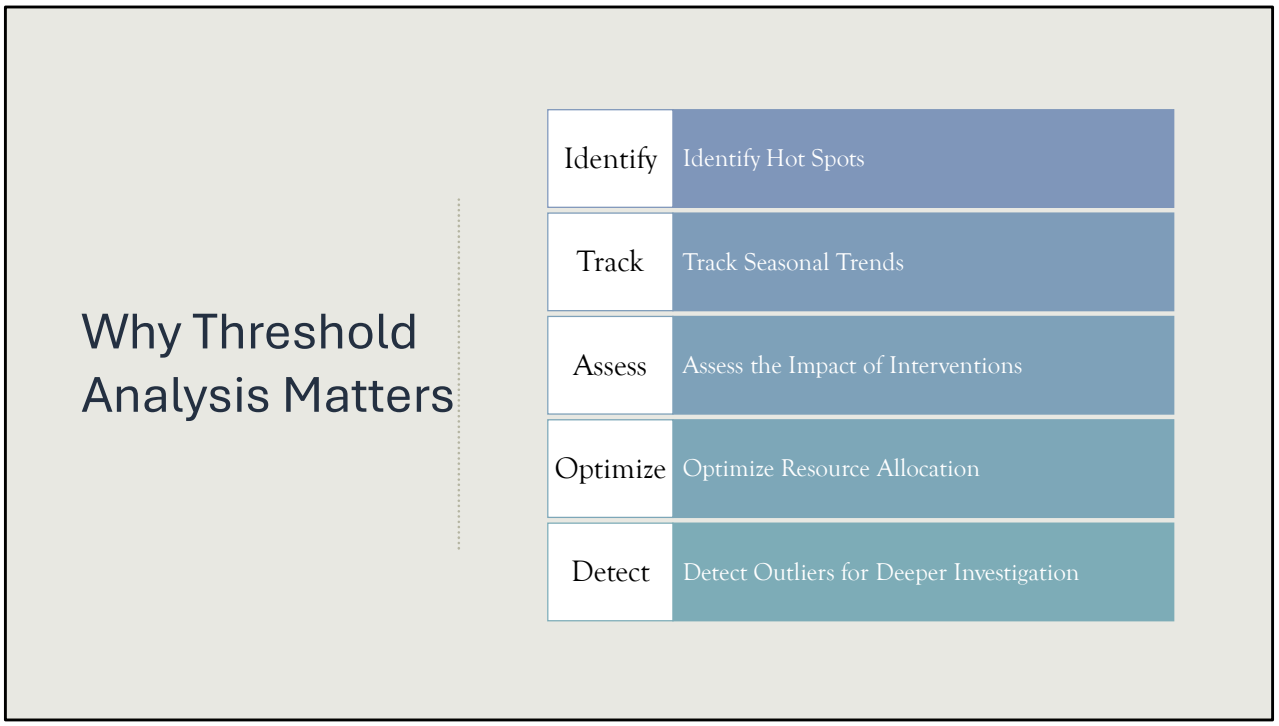


Objective 4: Evaluate threshold analysis results critically.



Why Threshold Analysis Matters:
Threshold analysis enables crime analysts to go beyond simply reporting numbers. By using statistical tools such as Z-scores and percent change, analysts can identify trends, anomalies, and areas of concern that require immediate attention. The goal is to think critically about *why* certain patterns are emerging and *how* they impact operatio

Key Applications at Your Agency:

1.Identifying Hot Spots:

1. Use threshold analysis to detect significant increases in activity at specific locations, such as thefts at retail stores or assaults in nightlife districts.
2. Example: Analyze the top five locations for crashes or disturbances. Are certain areas consistently above the threshold, warranting targeted enforcement?

2.Tracking Seasonal Trends:

1. Evaluate whether certain crimes, like burglaries or DUIs, spike during

specific months or events (e.g., holidays, summer break).
2. Z-scores can help identify if current trends deviate significantly from historical patterns.

1.Assessing the Impact of Interventions:

1. Compare pre- and post-intervention data to evaluate the effectiveness of initiatives, such as increased patrols or community outreach programs.
2. Example: After implementing a directed patrol strategy, check whether the area falls back within the expected thresholds.

2.Optimizing Resource Allocation:

1. Use anomalies detected through threshold analysis to inform resource deployment.
2. Example: If crash data shows a spike in collisions at a specific intersection, collaborate with traffic enforcement to address the issue.

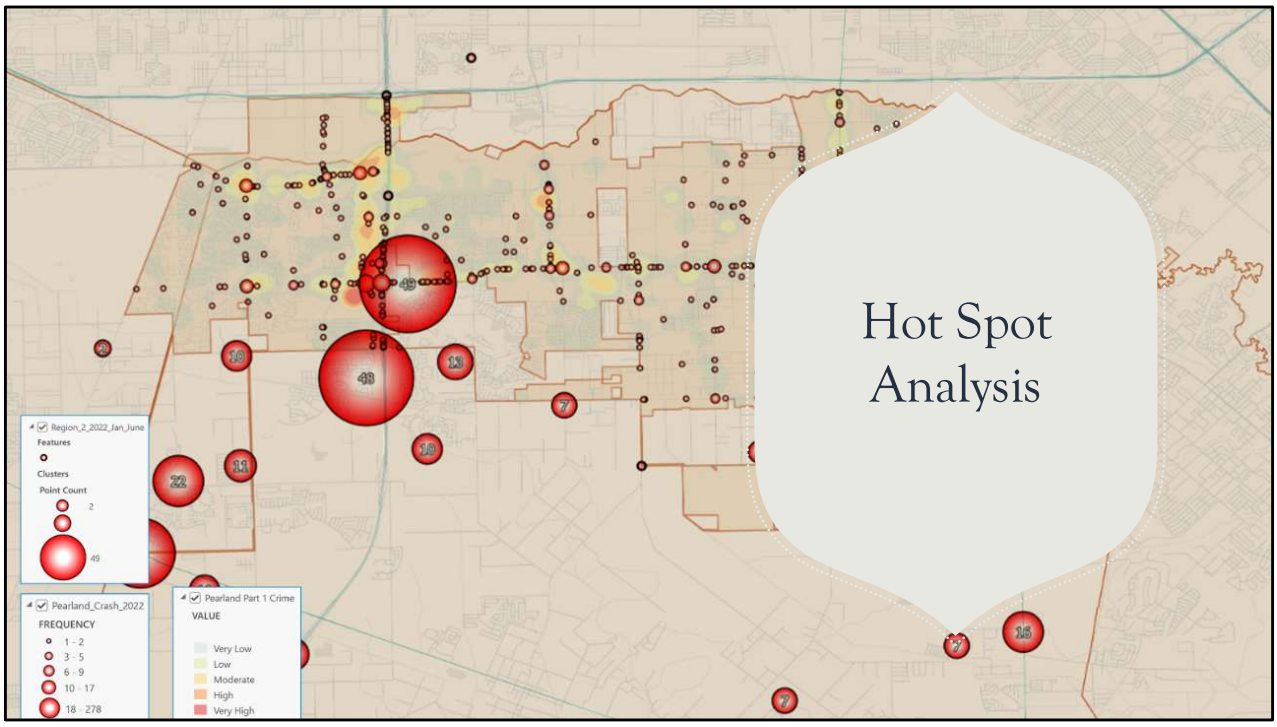
3.Detecting Outliers for Deeper Investigation:

1. Pinpoint significant deviations in crime trends that might indicate a new or evolving issue, such as an emerging drug problem or a series of linked crimes.
2. Example: A sudden Z-score of 3.5 for robberies in a normally low-activity area could signify a shift requiring further analysis.

Actionable Steps for Analysts:

•**Engage Stakeholders:** Share insights from threshold analysis with command staff to guide operational decisions.
•**Ask 'Why':** Always question the underlying causes of deviations—are they due to policy changes, environmental factors, or new criminal activity?
•**Document and Share Findings:** Consistently report anomalies, patterns, and recommendations to build institutional knowledge and improve strategic planning.

Threshold analysis is not just about numbers; it's about translating data into actionable insights. By thinking critically about your findings, you can uncover the *why* behind the numbers and drive impactful decisions that enhance public safety and agency performance.



Identifying hot spots for both crime and crashes is a key step in the SAFER model process. Hot spots are geographic concentrations of activity—small areas that hold a disproportionately large number of incidents, such as crashes or crime.

These areas could be found in places like shopping centers, major intersections, parks, entertainment districts, or retail areas. For crime, hot spots often exist because of environmental factors that lead to interactions between motivated offenders and suitable victims, without capable guardians. Similarly, high-crash locations can arise due to poor road or intersection design, high traffic flow, or patterns that encourage violations like speeding or failure to stop.

It’s important to note that identifying high-activity hot spots involves considering many factors. While timely, accurate, and complete data is crucial, the settings, parameters, and processes for hot spot identification can vary by jurisdiction and geography. Analysts must carefully determine the best parameters based on the area's specific needs. The goal is to pinpoint small, defined geographic areas with high concentrations of crime and crash activity, areas that could benefit from a visible police presence.

Depending on the size of the jurisdiction, it may be possible to analyze citywide data. However, for most cases, it's more practical to focus on administrative areas, such as beats, zones, or districts, and even break it down by patrol shifts.

Additionally, analysts should consider the volume of activity and focus on specific crime or crash types, such as crashes with injury or crimes visible to patrols. It’s important to decide on the date range of data to analyze, and in busy jurisdictions, hot spot reviews may happen weekly or every 28 days. The goal here is not necessarily to track the movement of hot spots, but rather to monitor changes in activity and intensity.
Most analysts use GIS tools to assist with identifying hot spots through spatial analysis. While other tools exist, GIS is essential for creating actionable, efficient analysis that supports operations consistently.

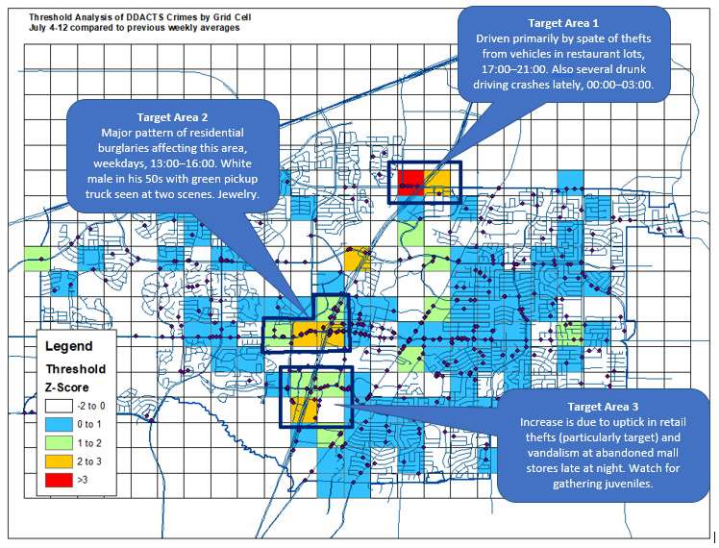
In the analysis process, comparing current data to multiple years of historical data is key. It’s valuable to understand how your most recent activity compares to the same period last week, last month, or even last year. Looking further back, say 2-5 years, can provide even greater context.

These comparisons help analysts establish “thresholds” or normal ranges of activity. Differences in crime or crash totals could be due to various factors like weather, construction, or unusual events. Understanding these factors is essential for accurate analysis.

The ultimate goal of hot spot analysis is twofold: to drive police operations through detailed analysis of hot spot locations, and to monitor, evaluate, and adjust those operations based on their effectiveness. By focusing on these identified hot spots, strategies and tactics can be better targeted to achieve desired outcomes, such as reducing vehicle crashes with injury by deploying a visible police presence at critical times in high-risk locations.

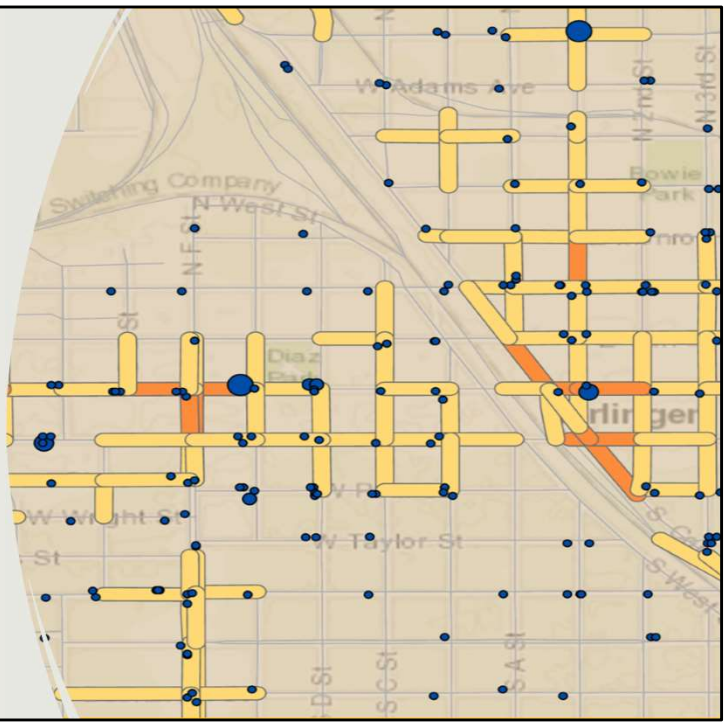
Hotspot Threshold Analysis

Develop deployment strategies relative to emerging patterns & trends that guide deployment decisions.

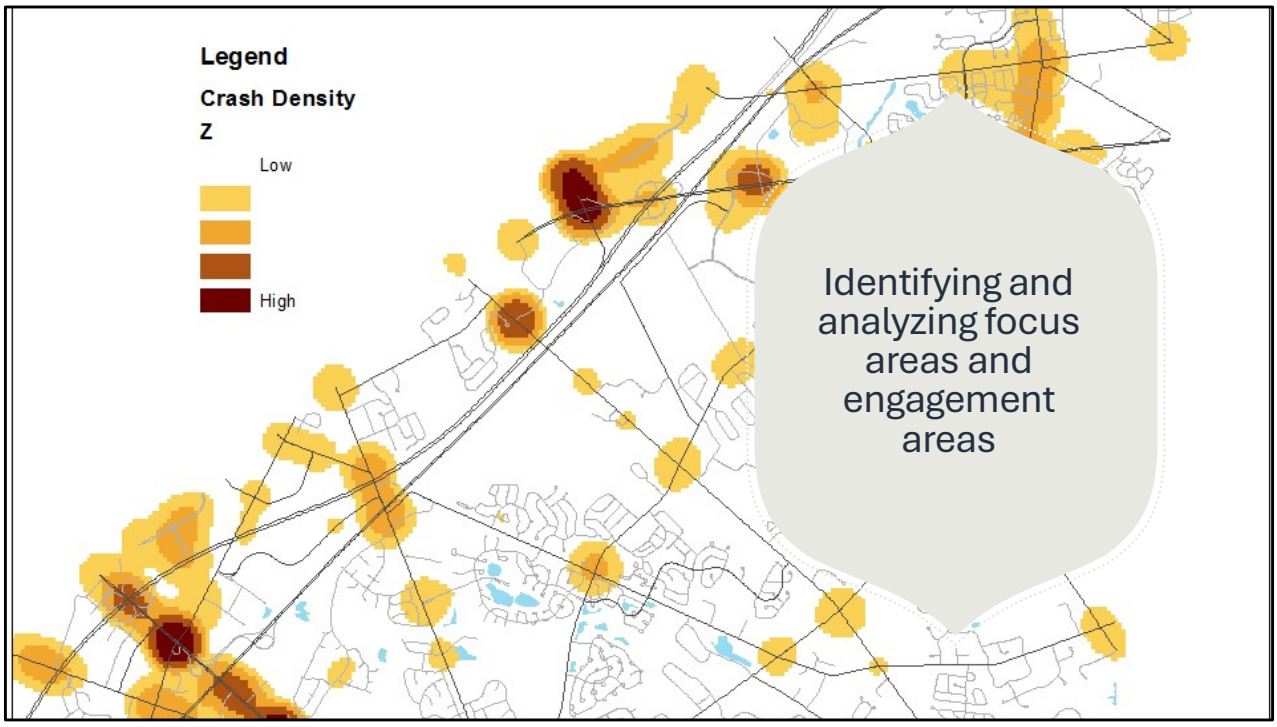


This threshold map helps define where crime is spatially located, moving to over time, and if the geographic relationship is statistically significant. The map can be used to guide operational efforts.

Use Threshold Analysis to Direct Strategies



With such data, you can ultimately do the type of analysis shown here which illustrates “hot streets” where both crashes and crimes are taking place. This information can be very helpful in identifying high activity locations where police presence may make a difference. Further analysis could also highlight street segments where injury crashes are taking place.



Agencies will want to identify multiple hot spot layers—at the very least, one for crashes and one for crime. This allows the agency to better analyze and plan focus areas.

Consideration of time and day

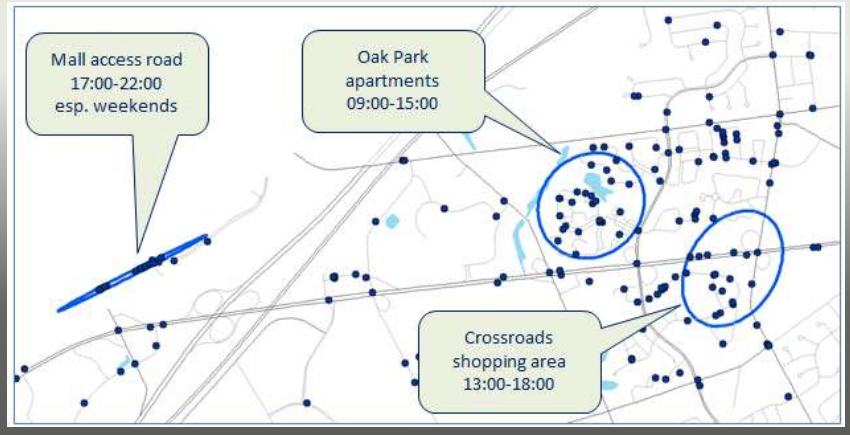
Whether to consider time during the identification phase or the analytical phase depends on the agency's approach to strategic enforcement. If the agency plans to designate one or more permanent focus areas and instruct officers to spend more time in those areas on all shifts and days, then considerations of time are best reserved for the analytical phase. On the other hand, if the agency plans to designate separate hot spots for each shift (or other time period), the analyst will need to create separate hot spot maps during the identification phase. If choosing the latter method, the agency should go through the process outlined in the section above, but make sure that the selection of data occurs *only* in the designated shift. For property crimes, this means determining the most likely time of occurrence (through midpoint or aoristic methods) before creating the initial maps.

Identifying and analyzing focus areas and engagement areas

The *SAFER zones are areas* in which the agency hopes its efforts will have a reduction effect. It may comprise a single hot spot or several hot spots depending on their proximity. It is best to designate the zones using common boundaries such as street blocks or police reporting areas so as to facilitate evaluation.

Engagement areas are where the agency intends to deploy personnel to affect the focus area. Depending on the nature of the geography and the incidents themselves, the focus areas might be larger or smaller than the focus areas, and they may be located inside or outside. When crash and crime hot spots directly overlap, identification of focus areas is often easier than when they are nearby but not directly on top of each other. Figure 49 and Table 9 give examples of how hot spots, focus areas, and focus areas might differ.

Identifying and analyzing focus areas and engagement areas



Two approaches to considering time in the strategic model. The top highlights only crash hot spots for a particular shift; the second shows all crash hot spots but recommends best focus times.

A busy intersection with a high rate of crashes and street crimes
A 1000-foot radius of the intersection
Directly within the intersection

A shopping mall parking lot with many property crimes and an adjacent (but not overlapping) crash hot spot on the busy street out front
The police reporting area including both the shopping mall and the street
Entrances to the shopping mall along the busy street

A high-traffic downtown business area
A six-city block area encompassing the business area
A saturation patrol zone of 10 city blocks, encompassing both the business area and streets leading in and out

A residential subdivision with high property crimes and limited access

located a quarter mile from a crash hot spot on a major state route
A customized polygon encompassing both the subdivision and the state route
The state route, focusing on secondary roads leading into the subdivision

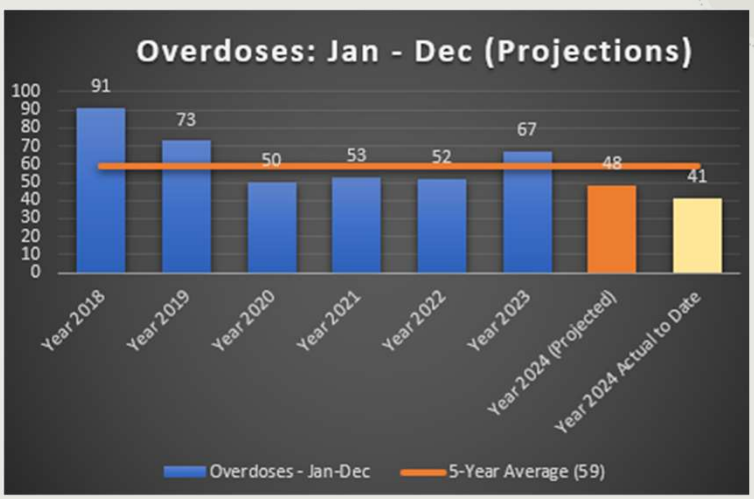
Designation of focus areas is part of an analytical process that also includes several other factors, even in the strategic model. The depth of this analysis will depend on the available data, technology, and analytical experience in the agency. Highly visible engagement can be initiated immediately upon designation of focus areas, but consideration of these other factors will help the agency refine the nature, duration, and type of enforcement.

- *Time and day:* A consideration of time of day and days of the week for various crashes and crimes can direct engagement to those times in which it is most likely to have a preventative effect.
- *Victim characteristics:* For crimes, identification of common victim or target characteristics can help officers give attention to those most likely in danger.
- *Offender characteristics*: Similarly, a consideration of common offender and offender vehicle characteristics can help officers identify those most likely to be engaged in criminal activity (with appropriate consideration for due process and civil liberties).
- *Crash types and causes*: Knowledge of crash types and causation factors can help focus specific engagement efforts rather than just general highly visible enforcement.
- *Modus operandi factors for crime*: If there are common M.O.s at work within the focus area, officers can be alert for that type of behavior.
- *Type of location:* Understanding the types of locations within the focus area at which incidents occur (e.g., parking lots, convenience stores, crosswalks) can help direct engagement efforts.

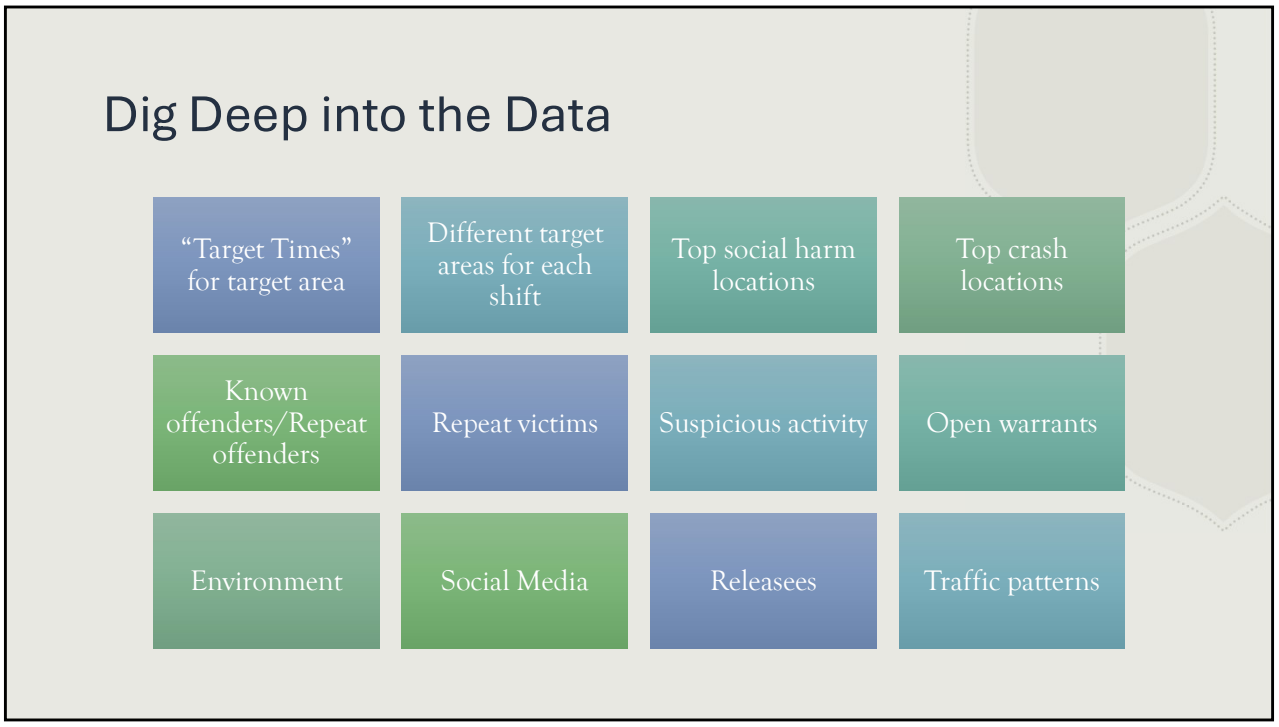
Generally speaking, the analysis phase in the strategic model is not as intensive as in the other models, but any analysis that can help tailor types of engagement is encouraged.

The difference between hot spots and focus areas. In this case, because some of the crash and crime hot spots do not directly overlap, the agency has identified engagement points that "feed" into the two hot spots.

Performing Predictions



Using data-driven methods, we can effectively project trends like overdose incidents, helping us anticipate and prepare for future needs. By analyzing historical data, identifying patterns, and incorporating seasonal or external factors, we can make informed predictions. This insight allows us to allocate resources, design targeted prevention strategies, and collaborate with stakeholders to address emerging trends proactively. Remember, these projections aren't just numbers—they're actionable tools to enhance community safety and save lives.

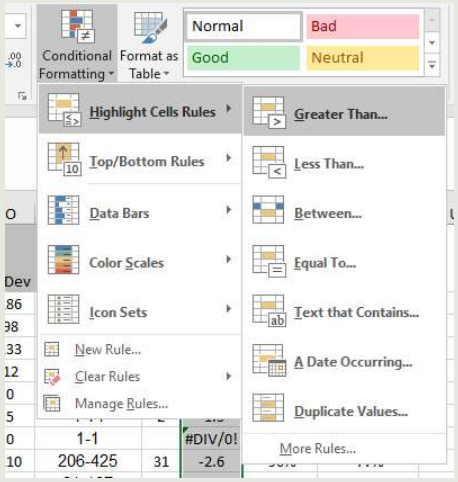


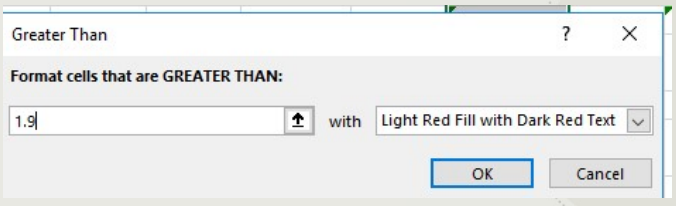
To make our efforts clear and precise, it's essential to dig deeper into the data. When analyzing zones, there are several key factors to consider:

- **Target Times:** Identify peak times for activity in a specific area.
- **Shift-Specific Targets:** Different areas may need focus during each patrol shift.
- **Top Social Harm Locations:** Focus on areas with high levels of social harm, such as public disturbances or drug-related activity.
- **Top Crash Locations:** Identify areas with a high frequency of crashes.
- **Known and Repeat Offenders:** Pay attention to locations frequented by known offenders or repeat offenders.
- **Repeat Victims:** Look for areas with a high number of repeat victims, which may indicate a pattern.
- **Suspicious Activity:** Track suspicious activities that could lead to crimes.
- **Open Warrants:** Consider locations where open warrants are prevalent.
- **Environment:** Assess environmental factors, like poorly lit areas or unsafe intersections, that may contribute to incidents.
- **Social Media:** Monitor social media for real-time tips on suspicious activities or emerging threats.

By considering these factors, you can ensure your analysis is targeted and effective, allowing for more strategic interventions in high-risk zones

Conditional Formatting





GO TO YOUR VIDEO LIBRARY: "CONDITIONAL FORMATTING"

Threshold analysis guides the analyst into intuitive analysis. Once all the statistics are calculated, it is important to use your intuition to dig deeper into each category and identify key analysis that will contribute to a better understanding of the data. This better understanding will be used to lead strategic operations. And after new strategies are implemented, threshold can help measure progress towards meeting the agency goals.

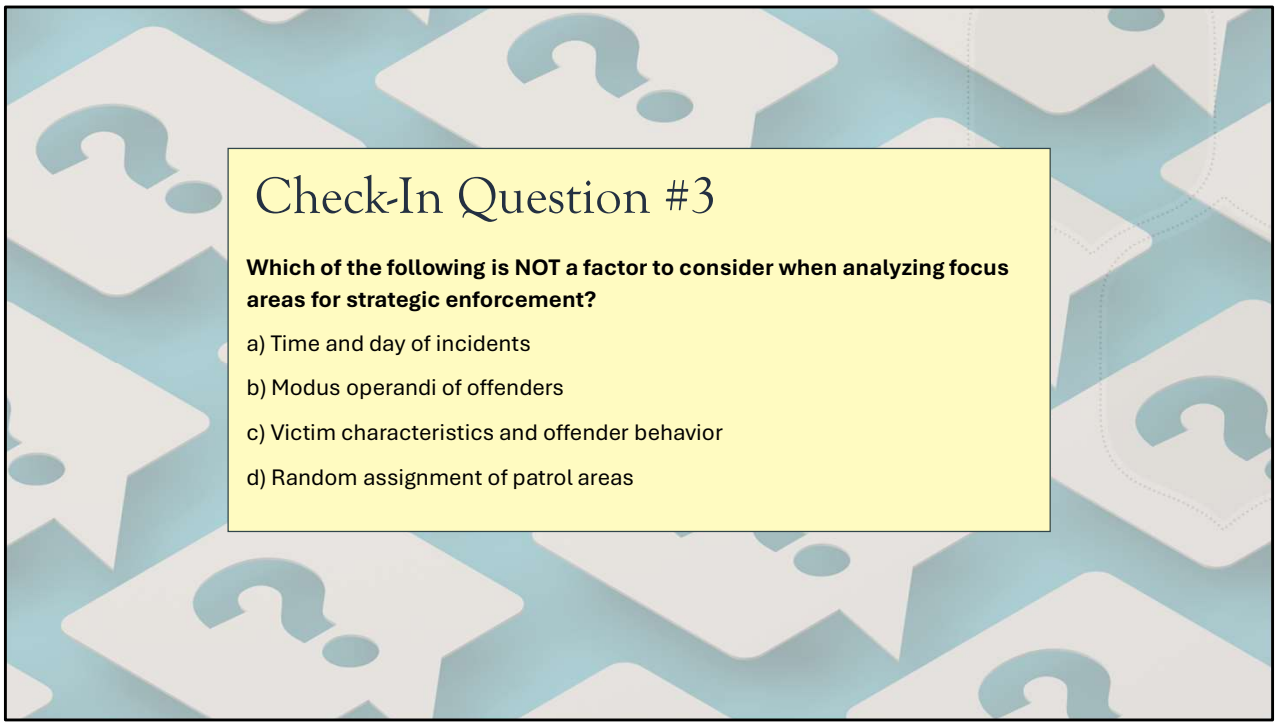
Final Analysis

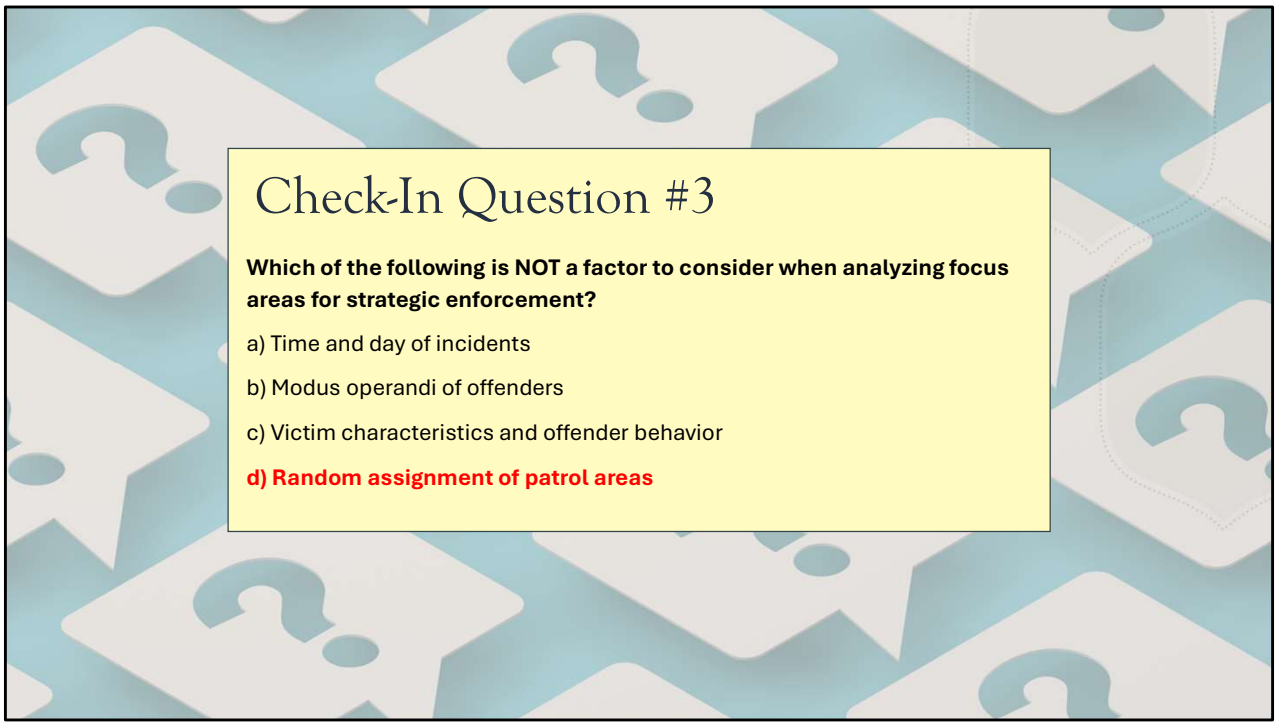
Incident Type	*Average*	Usual Range	2024	2025	Change from Avg.	Notes
PROPERTY CRIME						
↓Residential Burglary	*39.6*	32–48	36	**31**	**-22%**	Picked up a little in the fall but not enough to overwhelm low Jan-Sep.
↓Commercial Burglary	*32.1*	24–41	24	**19**	**-41%**	Dropped precipitously with copper and metal no longer hot targets.
Theft from a Vehicle	*262.9*	205–321	349	**226**	**-14%**	Back down after high 2008 as GPS market declined. Still lots of patterns.
↓Theft from a Building	*102.1*	88–116	82	**64**	**-37%**	Decreases in health club thefts and scrap metal thefts.
Theft from a Person	*26.8*	20–34	24	**23**	**-14%**	One fall pattern along Endicott Street but volume otherwise normal.
↓Theft from a Residence	*57.8*	51–65	61	**49**	**-15%**	Low with fewer domestic and yard thefts.
↓Theft of a Bicycle	*23.1*	18–28	26	**16**	**-31%**	Plummeted. No recurrence of summer 2008 patterns.
Theft of Services	*21.1*	15–27	16	**20**	**-5%**	Normal level of dine-and-ditch scams and gas drive-offs.
↑Shoplifting	*266.0*	225–307	273	**325**	**+22%**	Shot up particularly around holidays as retailers buffed security forces.
↓Auto Theft	*52.5*	36–69	33	**23**	**-56%**	Lowest level in at least 30 years. No patterns in 2009.
Arson	*2.6*	0–5	1	**3**	**+15%**	Port-a-potty, car, and dumpster, all during the fall.
↑Fraud & Forgery	*119.6*	98–141	109	**146**	**+22%**	Big increase with numerous incidents of credit card fraud and identity theft.
Employee Theft	*22.5*	16–29	22	**25**	**+11%**	Relatively normal levels. One mall kiosk reported three.

In summary, threshold analysis helps identify what to analyze by highlighting areas or types of crime and crashes that deviate from the norm. The Z-score indicates how far a data point is from the mean, showing where unusual activity is happening.

However, simply knowing that a crime or crash location is up or down isn't enough. The analyst must dig deeper to understand **why** it is happening. This is where the **notes section** becomes crucial. It allows analysts to add context—such as environmental factors, offender behavior, or external influences—that explain the changes in activity.

The narrative in the notes section serves to provide clarity and ensure that the analysis is actionable. It's not just about the numbers, but about telling the story behind them to inform effective decision-making.


Check-In Question #3
Which of the following is NOT a factor to consider when analyzing focus areas for strategic enforcement?
a) Time and day of incidents
b) Modus operandi of offenders
c) Victim characteristics and offender behavior
d) Random assignment of patrol areas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a) Time and day of incidents
b) Modus operandi of offenders
c) Victim characteristics and offender behavior
d) Random assignment of patrol areas


Recap

In this session, we explored the critical tools and techniques to elevate your analytical capabilities. Here's a quick summary of what we covered:

1.Applying Z-Scores and Statistical Significance:
We delved into how Z-scores help identify anomalies in your data, providing deeper insight into crime trends and patterns. By mastering these techniques, you can identify significant deviations that require further investigation.

2.Analyzing Crime Patterns and Trends:
Using Excel, we identified practical ways to organize, visualize, and analyze crime data. These tools are key to uncovering patterns that can inform resource allocation and strategic decisions at your agency.

3.Exporting and Integrating Data with Access:
You learned how to export datasets from Access and integrate them seamlessly with Excel. This workflow ensures a streamlined process for advanced data manipulation and analysis.

4.Thinking Critically About Threshold Results:

Finally, we emphasized the importance of critical thinking in interpreting results. Beyond the numbers, we explored *why* certain trends occur and how to translate findings into actionable outcomes.

Next Steps:

Online classes
- Basic Excel
- ArcPro Webinar

In-person classes
- Basic Analysis
- Intermediate Analysis

Analyst/Agency Specific Assistance

What's Next?

Your next steps are to apply these tools in your day-to-day work. Experiment with your agency's data to uncover hidden trends, refine your analysis techniques, and drive meaningful outcomes. Remember, the insights you uncover can make a real difference in public safety.

Please know that IADLEST is proud to support law enforcement agencies with a variety of resources designed to promote the implementation of data-driven operational policing. In addition to this training series, IADLEST offers in-person and virtual workshops, literature, webinars, and other valuable resources aimed at enhancing the effectiveness of law enforcement through data-driven strategies. We encourage you to explore these opportunities to continue your professional development and further strengthen your agency's ability to make informed, impactful decisions based on reliable data.

Thank you for your participation—your dedication to continuous learning strengthens your agency and the communities you serve!


Evaluation Survey