Crime Mapping & Analysis News
A Police Foundation Publication

First Issue July 2014

Crime analysis symposium for law enforcement executives
Crime analysis on demand
Risk terrain modeling for strategic & tactical action
Crime mapping for DDACTS
Using GIS to problem solve across public safety agencies
Utilization of officer locations for strategic crime analysis
From the Editor

By Shefali Tripathi | Issue 1

It gives me great pleasure to welcome you to the relaunch of our newsletter - Crime Mapping & Analysis News. We have redesigned the newsletter to make it more readable and to provide advancements and innovations in crime mapping and analysis to our readers. Our web designer has created an elegant and user-friendly design that is easy to navigate. We hope you like it.

The field of Crime Mapping and Analysis has made tremendous progress since our previous newsletter was last published. The advancements in policing and technology, and the reduction in cost of computers and their increased use in law enforcement agencies, have led to the demand for more proficient and skilled personnel. More and more police agencies are relying on data-driven concepts and applied evidence-based research for crime prevention and reduction. During the last decade, crime mapping and analysis has also become an integral part of the law enforcement agencies across the US and globally.

Crime Mapping & Analysis News provides a forum for law enforcement professionals, practitioners including crime analysts, researchers and crime prevention managers and executives, and criminologists to share their ideas to improve and strengthen the law enforcement community and to better serve our citizens. The newsletter seeks to publish articles that advance our knowledge and offer innovative scholarly solutions to the problems law enforcement agencies are facing these days. The newsletter focuses on four areas—scholarly articles, practical applications, book reviews, and original research summaries, which includes innovative student research in the field of law enforcement and criminal justice from across the globe with specific focus on crime mapping and analysis. This issue of the newsletter includes articles on Risk Terrain Modeling, the Role of GIS and its importance in problem-solving and enhancing multi-agency collaboration to provide public safety, Data-Driven Approaches to Crime and Traffic Safety and a Case study from the Milwaukee, Wisconsin Police Department on the application of officer location for strategic crime analysis.

I would like to express my thanks to the contributors of the first issue of the relaunched Crime Mapping & Analysis News. I would also like to extend my gratitude to the people who have been instrumental in relaunching the newsletter and making it a reality. Dr. Karen Amendola and Jim Buermann have been the guiding force behind this initiative. I thank them for their continued guidance and suggestions in this process. I thank Jim Specht and Karen for assisting in reviewing the articles. Thanks also to Travis Taniguchi for designing the webpage for the newsletter. I welcome you all to share your comments with me.

I encourage you to participate in the newsletter as a reader and as a contributor of articles. Please feel free to contact me at editors@policefoundation.org.

Sincerely,
Shefali Tripathi
Editor

Front cover image art provided by Phil Mielke, Envisioning Team Lead, Esri.
From the Police Foundation President

By Jim Bueermann | Issue 1

Dear Friends,

We are delighted to begin a new phase in the Police Foundation’s commitment to crime analysis and crime mapping. The original Crime Mapping News, which was published by the Police Foundation for nearly a decade, had a strong following and highlighted many innovative concepts in a new and exciting field. Although the field has grown and expanded, there is still a pressing need for a clearinghouse for these innovations and insights.

The original Crime Mapping News received significant support from the Community Oriented Policing Services Office, to whom we are grateful.

With this issue, we launch a new format of the Crime Analysis & Mapping News, which recognizes that mapping is now part of a greater universe of crime analysis and crime data management. The project has been led by Editor Shefali Tripathi, PhD of the Gainesville, Florida Police Department, who is a Senior Research Fellow at the Police Foundation. In this first issue, we highlight a wide range of works from scholars and practitioners, and report on the continued work the Foundation is doing in this area with support from the Bureau of Justice Assistance. We are also pleased to include the International Association of Crime Analysts as a partner in this effort. You will find a report from President Susan C. Hammen (Smith) in this and subsequent issues.

The Police Foundation is dedicated to advancing policing through innovation and science, and we expect this online publication to provide innovative ideas from the field and from scientific inquiry that can be put to practical use in agencies worldwide. We are committed to developing technologies and tools to support innovation, data collection, and evidence-based practices. We welcome our readers’ input, and encourage submissions for subsequent issues.

Finally, we would like to extend our gratitude for support for this effort provided by ESRI, the world’s leader in geographic systems software, and by the Omega Group, the industry-leading developer of geographic software for public safety agencies.

Sincerely,

Chief James Bueermann (ret.)
President
Police Foundation
IACA Welcomes the New Crime Analysis and Mapping News

By Susan Hammen (Smith) | Issue 1

On behalf of the IACA, I would like to start by expressing our appreciation to the Police Foundation for including a column from the IACA President in the Crime Analysis & Mapping News newsletter. We are grateful to have been included in this very important endeavor and affirm the full support of the IACA for the Police Foundation moving forward with developing a timely and useful publication for those interested in this field. I recall the original publication from the Police Foundation back in the day and eagerly receiving and reading each and every issue. I stored them all in a file folder in my desk (the good ol’ days!) and remember lending them out (and praying I’d get them back!) to colleagues who had an interest in a particular topic, article or just wanted to read a copy of the current issue. The newsletters were well written, practical and always on timely topics! I remember a couple of “special issues” and being so excited to hear for the first time about geographic profiling, regional crime analysis and other “breaking” topics. Fast forward to today - readers will be treated with timely topics that are well written and practical for application - perhaps even written by some of you reading this column!

For those of you receiving the newsletter, but not familiar with the IACA, I encourage you to visit our website (www.iaca.net) and to consider joining the professional association. Dues are a low $25 annually and with the membership, you also have access to the membership roster (over 2,500 members from over 50 countries!) and to the IACA’s discussion list. You also receive discounts and/or waivers to conferences, training, webinars and other IACA services. The IACA IS the professional association for crime analysts and its mission includes furthering the profession of crime analysis, providing quality training and resources for analysts, supporting analysts and aspiring analysts worldwide, educating law enforcement and citizens on our capabilities, standardizing crime analysis approaches and techniques and leveraging our networking capabilities to strengthen our profession. The IACA Board, elected by the members to represent them in 3-year terms, ensures that the efforts, finances and direction of the IACA supports the mission at all times. If you have any questions about the IACA, please email board@iaca.net and all board members will receive your inquiry and respond in a timely manner.

I would once again like to commend the Police Foundation for re-vitalizing this important publication and publically provide full support on behalf of the IACA for the Police Foundation’s efforts in providing timely, relevant and practical information to the field. I encourage recipients to spread the word about the newsletter, leverage the information and resources provided and to consider contributing to its content. Together, we continue to build and grow the foundations of our field.

Sincerely,
Susan C. Hammen (Smith)

IACA President
Welcome From the former editor of Crime Mapping News

By Greg Jones | Issue 1

As the former editor of the Crime Mapping News, it is my distinct pleasure to contribute to the new Crime Mapping & Analysis News. The Police Foundation has been a significant contributor to the understanding, importance, and practical implications of policing in the United States and abroad since its inception in 1970. It has contributed to the field of policing in a variety of ways, including but not limited to scientific evaluations of routine preventative patrol, shift work practices, community policing, and responses to domestic violence. Other contributions covered the provision of ethical and management studies, culture and climate surveys; and comprehensive review and analysis of national policies, such as immigration and its impact on policing services in specific geographies and communities. Besides a long list of other notable publications, the Police Foundation has continued to maintain an innovative approach to policing by staying attuned to evolving trends in policing such as less-lethal technology (i.e., Tasers), early warning systems (EWS), geographic information systems (GIS), automated vehicle locator technology (AVL), and crime mapping and crime analysis.

Crime mapping and crime analysis have grown expansively over the past quarter century and become an integral component of policing practices. Law enforcement leaders and researchers alike have increasingly recognized the amount of skill and levels of training (see also Amendola & Jones, 2010) involved in becoming a proficient crime analyst. Furthermore, through efforts of numerous scholars and practitioners in the field, the International Association of Crime Analysts (IACA) and regional crime analysis associations, as well as the production of crime mapping and crime analysis publications such as the former Crime Mapping News and Crime Analysis Case Studies (both Police Foundation products), it has been made clear that crime analysis can provide critical support for crime prevention and crime reduction strategies. However, it is important to recognize that in order for this support to occur and be consistent, analysts must have access to comprehensive training, a variety of data sources, and support from their supervisors, managers, and leadership (see also Boba, 2003 and Ratcliffe, 2007).

In my opinion, crime analysis is a profession that has been taken “far too lightly” in policing. In the early days, crime analysts were characterized as “the data people” who were typically tasked with managing the department’s police data, responding to data requests, providing basic crime bulletins, and fixing computer and/or software issues similar to what IT professionals were trained to do. As a result, their knowledge and skills were not being maximized to provide analytical support in a tactical, investigative, or strategic manner. However, the mischaracterization did not stop there. Not only were their skills and abilities minimized, but also crime analysts were often finding themselves and/or their unit placed on the fringes of the police department’s operations. In other words, they were not placed in units or divisions that demanded significant attention or a high level of respect so to speak. To make matters worse, analysts were and still are being used as “Compstat junkies” – where all their time is spent generating reports for Compstat meetings each and every week. Thus little to no time is dedicated to proactive or strategic analysis, which are both important aspects of having an efficient and effective crime analysis unit. Even today, the misinterpretation of the appropriate role of crime analysts continues to infringe on the overall mission of crime analysis that, I believe, is to be the “engine of analysis” that effectively drives the efficient distribution of limited police resources and maximizes police strategy, when applicable, on a recurring basis. As such, it is important that a police
department utilize its CAU in the most effective and efficient way possible. The Police Foundation’s publication entitled “Integrated Intelligence and Crime Analysis: Enhanced Information for Law Enforcement Leaders” (Ratcliffe, 2007) provides a comprehensive overview of the issues commonly perceived in police departments regarding crime and intelligence units. Moreover, it provides recommendations for departments to improve their operational and analytical efficiency with respect to criminal intelligence gathering and creating intelligence products, and how to minimize the duplication of effort that may often arise based on some of the overlapping objectives of each unit.

Over the past fourteen years, including my time serving at the Police Foundation and recently in my volunteer capacity serving with the IACA, I have witnessed and been able to be a small contributor to the tremendous growth in the use of crime mapping and crime analysis. Some of the more recent growth is reflected in the growing number of certification programs across the country, crime analysis courses being offered at colleges and universities including online courses, training courses being offered by various vendors, numerous publications that have been dedicated to the field of crime analysis including a scholarly journal (i.e., Crime Mapping: A Journal of Research and Practice), and the increase in membership of analyst organizations such as IACA over the years. For example, IACA membership has grown by 55% just in the past four years, from 1,659 in 2010 to 2,575 in 2014[1]. In addition, there have been significant developments on the computer software and program side of crime mapping and crime analysis. In the early 1990s there were only a handful of programs available to support crime analysis work, but now there are too many to count. These programs range from sophisticated statistical applications such as CrimeStat, whose development was supported by the National Institute of Justice, to pre-packaged crime mapping and analysis programs offered from different vendors around the United States. Even some of the most widely used GIS mapping programs (e.g., ArcGIS, MapInfo) have evolved to include toolboxes and features that can specifically support crime mapping and crime analysis work.

It is my hope that this newsletter continues to highlight the importance of crime mapping and crime analysis in policing and furthers the push for crime analysts who work tirelessly to support their departments in combating crime, disorder, and other community-oriented problems in their respective jurisdictions. I encourage analysts to read this newsletter with a deep appreciation for all of those practitioners, scholars, and leaders who have paved the way for crime mapping and crime analysis to be where they are today - and where they can go tomorrow as they continue to push those boundaries.

References


Notes
[1] This is current membership information as of March, 2014. Information was provided by IACA.
Crime Analysis Symposium Presented to Law Enforcement Executives

By Police Foundation | Issue 1

More than 40 law enforcement executives attended the first in a series of symposiums presented by the Police Foundation and International Association of Crime Analysts (IACA) designed to help police departments integrate the use of crime analysis to increase effectiveness and reduce crime.

The symposium, presented July 16 in Cambridge, Massachusetts, drew police chiefs and other executives from throughout the Northeastern United States and beyond. The other regional locations and dates for the series will be announced later this year.

The free day-long symposium was one of a series that is supported by the Bureau of Justice Assistance. The series is entitled “Advancing Policing Through Innovation and Science: A Crime Analysis Symposium for Law Enforcement Leaders.” It was developed based on the best practices of crime analysis and draws on the expertise of the Police Foundation, the IACA, policing and crime analysis researchers and experts.

Bureau of Justice Assistance Director Denise O’Donnell kicked off the symposium, speaking to the importance of integrating evidence-based practices into policing, and using crime analysis as an important component of that integration.

Presenters at the first session included Dr. Rachel Santos, an Associate Professor at Florida Atlantic University, Dr. Roberto Santos, a Commander with the Port Saint Lucie, Florida Police Department, Dr. Laura Wyckoff, a Bureau of Justice Assistance Crime Analysis Fellow and a Police Foundation Science Advisor, and Dawn Clausius, IACA Secretary and a Police Intelligence Analyst with the Olathe, Kansas Police Department.

The presenters explored how agencies of all sizes can integrate crime analysis into approaches such as problem-oriented policing, hot-spots policing, community policing, predictive policing and intelligence-led policing. They discussed “what works,” and made recommendations based on nationally recognized best practices.

“There is a significant amount of research that indicates what works in reducing crime and that crime analysis plays an important role,” said Commander Roberto Santos. “However, if the evidence-based findings cannot be translated into police practice effectively, there is no true benefit of the research and crime analysis to our communities. When evidence-based practices and crime analysis are integrated to everyday police practice, it ultimately improves police service, and the end result is trust, legitimacy, and long-lasting partnerships between the community and the police.”

Police executives who attended said they appreciated learning how to use crime analysis on an agency-wide basis.

“Mayors, city legislators, budget directors and community members are expecting police executives to provide analytical support for their deployment, tactics and strategy,” said Deputy Commissioner Nola Joyce of the Philadelphia Police Department. “The Police Foundation’s Symposium on Crime Analysis provides Chiefs with the information needed to build and enhance their departments’ analytical capacity. “

“I found tremendous value in the symposium,” said Chief John Fisher of the Carlisle (MA) Police Department. “Our field, like many professions, is changing at a frantic pace. The Police Foundation continues to identify subject matter experts in our field and facilitate access to police executives.”
Crime Analysis On Demand

By Gregory Joy | Issue 1

The Bureau of Justice Assistance (BJA), a component of the Department of Justice’s Office of Justice Programs, serves as a national leader in developing, supporting, and implementing effective criminal justice policies and programs. To further this goal and its overall mission, BJA has implemented a strategic plan to help focus and direct the programs and initiatives that it supports. BJA sees its efforts to develop, support, and implement effective crime analysis within the criminal justice field as an essential component of implementing the major focus areas identified within its strategic plan. In furtherance of these efforts, BJA currently funds a number of programs that support crime analysis. The following are just a few representations of those programs.

Institute for Intergovernmental Research (IIR) – Building a Nationwide Crime Analysis Capability Training and Technical Assistance Award: Under the program supported by this award, IIR is working to identify, assess, and leverage best practices and lessons learned for existing crime analysis centers in order to develop standards and strategies that can be replicated within law enforcement agencies across the nation. IIR has already completed extensive outreach to law enforcement agencies and conducted a limited number of site visits to representative agencies, where it has viewed operations and related crime analysis programs.

IIR recently issued a request for funding proposal to support a limited number of sites where subject matter experts (SME) will work to develop and enhance crime analysis capabilities. From the strategies, trainings, and technical assistance that are developed and implemented within each site, IIR intends to compile a comprehensive implementation guide and toolkit that can be used by law enforcement agencies seeking to enhance their own crime analysis capacity.

National Training and Technical Assistance Center (NTTAC) – Crime Analysis on Demand: Under this program, BJA’s NTTAC offers training and technical assistance support to law enforcement agencies that are seeking to enhance their existing capabilities and capacity to analyze and use data. This program has tasked a number of service providers with delivering high-quality services and products that address the existing gaps in analytical capacity and related crime analysis needs of the applying law enforcement organizations.

For the initial funding period, NTTAC’s Crime Analysis on Demand is seeking to complete 15 onsite engagements. During these engagements, the service providers will perform a range of functions at each selected site, including providing a needs assessment to better identify the analytical gaps, presenting formal recommendations for corrective actions, and providing training and technical assistance that will incorporate promising models and evidence-based practices. At the conclusion of each engagement, the SMEs will document the outcomes for their training and technical assistance efforts, and these lessons learned will help to inform future engagements. Agencies interested in applying for assistance from NTTAC’s Crime Analysis on Demand should visit www.bjatraining.org for information on how to apply.

BJA Visiting Fellows Award to the University of Maryland: Under this award, BJA has engaged Dr. Laura Wyckoff, PhD, as a visiting fellow within BJA to focus on assisting BJA with building crime analysis capacity within police agencies across the nation. Dr. Wyckoff brings a wealth of expertise and experience in working with law enforcement agencies to improve their crime analysis capabilities, engage them in problem solving,
and help them to increase accountability. This has often involved hands-on assistance working directly with police command staff, line-level officers, and crime analysts housed within these agencies.

Dr. Wyckoff’s fellowship is focusing on the following main goals. She is working to identify and produce case studies of agencies that can serve as models for the application and integration of crime analysis. Dr. Wyckoff is also addressing an apparent need within the field by developing a presentation geared specifically toward educating local government leaders about the importance of crime analysis for crime reduction, operations, efficiencies, and decision making. Dr. Wyckoff has already provided extensive support to NTTAC’s Crime Analysis on Demand program in support of the field and is actively providing crime analysis expertise and guidance to law enforcement agencies and other related BJA initiatives. Finally, Dr. Wyckoff is working to disseminate the lessons learned under this project to both practitioners and academics.

The following two awards were made in Fiscal Year 2014 under BJA’s Law Enforcement: National Training and Technical Assistance – Increasing Analytical Capacity: Training for the Law Enforcement Executive award. The two recipients of this funding will equip BJA to more broadly support the field. They are the International Association of Directors of Law Enforcement Standards and Training (IADLEST) Award and the Police Foundation/International Association of Crime Analysts partnership Award.

International Association of Directors of Law Enforcement Standards and Training (IADLEST) Award: Under this program, IADLEST is working to address gaps that exist between data and analysis, analysis and response, response and evaluation, and what law enforcement leaders want, what operational units need, and what analysis can actually provide.

Specifically, IADLEST will bring together a team of SMEs to moderate workshops addressing this issue. The SMEs plan to conduct 10 such workshops, produce a workbook for the field, and host webinars—all designed to enhance the capacity of law enforcement agencies on a national basis. The first workshop took place July 10-11, 2014, in Camden, NJ. For additional information, please contact Ms. Yvonne Pfeifer at (208) 288-5491 or Yvonne@iadlest.org.

Police Foundation Award: Similarly, BJA has awarded funding to a partnership between the Police Foundation and International Association of Crime Analysts (IACA) to disseminate to law enforcement executives the importance of crime analysis practices within evidence-based policing strategies. The Police Foundation and IACA are developing and delivering 1-day regional crime analysis symposiums and a number of webcasts. The initiative will also assist two leadership academies integrate this curriculum into their regular training sessions. Finally, the initiative partners will deliver presentations at national-level conferences.

The first regional symposium titled “Advancing Policing through Innovation and Science: A Crime Analysis Symposium for Law Enforcement Leaders” took place on July 16th in Cambridge, Massachusetts. Executives who would like to attend future symposiums should contact Adam Kaufman at 202-833-1460 or akaufman@policefoundation.org.

These programs represent only part of BJA’s efforts to actively support crime analysis on a national level. BJA’s goal to proactively support efforts to enhance crime analysis within the criminal justice field continues to be a priority, and BJA will continue to dedicate resources and seek new opportunities to reduce the existing gaps and support the development and implementation of crime analysis and other best practices that are based on and informed by evidence.
Risk Terrain Modeling for Strategic and Tactical Action

By Joel Caplan | Issue 1

There are several ways to make sense of the forces that affect the locations or spatial patterns of crime and, ultimately, create risky places. Evaluating the “spatial influences” of features of the landscape on the occurrence of crime incidents, and assessing the importance of each feature relative to one another is a viable method of assessing such risk (Caplan, 2011). Spatial influence refers to the way in which features of a landscape affect places throughout the landscape. For an example that is much more benign than criminal offending, consider a place where children repeatedly play. When we step back from our focus on the cluster of children, we might realize that located where they play repeatedly exists swings, slides and open fields. These features of the place (i.e. suggestive of a playground) attract children instead of other locations that lack such entertaining qualities. Features of a landscape can influence and enable playful behaviors. In a similar way, spatial factors can influence the seriousness and longevity of illegal behaviors and associated crime problems (Caplan, Kennedy, & Piza, 2012). Risk terrain modeling (RTM) identifies the risks that come from features of a landscape and models how they co-locate to create unique behavior settings for crime (Caplan & Kennedy, 2010).

Risk Terrain Modeling

RTM is an approach to risk assessment whereby separate map layers representing the spatial influence of features of a landscape are created in a geographic information system (GIS). Then risk map layers of statistically validated features are combined to produce a composite “risk terrain” map with values that account for the spatial influences of all features at every place throughout the landscape. Within the context of RTM, modeling refers to the process of attributing qualities of the real world to places throughout a landscape, and combining multiple landscapes together to produce a single composite map where the newly derived value of each place represents the compounded risk of that place. RTM offers a statistically valid way to articulate crime-prone areas at the micro-level according to the spatial influence of many features of the landscape, such as bars, parks, schools, ATMs, or fast food restaurants. Risk values in a risk terrain model do not create absolute scenarios where crimes will ensue. They simply point to locations where, if the conditions are right, the risk of illegal behavior will be high.

Risk terrain modeling was developed at the Rutgers University School of Criminal Justice where resources for performing RTM are freely available online (see www.rutgerscps.org). Risk terrain modeling is not difficult. Many police agencies are using it on a regular basis. But, to make it more accessible for people with limited GIS and statistical abilities, Rutgers developed the Risk Terrain Modeling Diagnostics (RTMDx) Utility, a software app that automates RTM (also available for free online). The RTMDx Utility diagnoses spatial attractors of crime and communicates actionable information to identify where new crime incidents will emerge or cluster, and to strategically and tactically allocate resources (Caplan, Kennedy, & Piza, 2013). There are no ‘black boxes’ to the analytical and statistical methods in the RTMDx Utility, and all details are included in the user manual for replication and manual production. The Utility is simply intended to help automate the RTM process, not hide it.
Strategic Example of RTM

Current strategic applications of risk terrain modeling are exemplified by ongoing projects in seven cities across the United States that are funded by the National Institute of Justice (NIJ) and led by our team at Rutgers University. Partner police departments include New York, NY; Newark, NJ; Chicago, IL; Kansas City, MO; Arlington, TX; Colorado Springs, CO; and Glendale, AZ. A key objective of the projects is to inform police-led interventions that address a designated priority crime type at target areas, respectively, for each city. Using the RTMDx Utility, RTM diagnoses the underlying spatial factors of crime at existing high-crime places. Then activities are designed to suppress crime in the short-term and mitigate spatial risk factors at these areas to make them less attractive to criminals in the long-term.

Outcome evaluations of the impacts of these risk-based interventions are still ongoing, and it is too early to discuss results at this time. But, a preliminary process evaluation suggests that intel produced from risk terrain modeling was pragmatic and meaningful for police officers when developing and implementing risk-based intervention strategies at target areas. RTM products also directly informed steps to mitigate spatial risks and advance overall short- and long-term objectives. The objectives were to constructively change the frequencies and spatial distributions of crime events at micro-places. Notably, the interventions were designed in a manner that did not place an undue burden on police department resources or finances. The intervention strategies are considered to be reasonably sustainable and repeatable under “normal” (i.e., non grant-funded) conditions. This is especially important if they are proven to yield statistically significant outcomes.

Tactical Example of RTM

A tactical example of risk terrain modeling was recently inspired by the federal government’s challenge to reduce injuries and fatalities among law enforcement officers (LEOs). In the past several decades, research has examined situational, offender, and individual characteristics of the risks of non-accidental injury and death to LEOs in the line-of-duty. But the influence of specific features of the physical environment has remained largely absent from empirical study. With data obtained from the Chicago Police Department, we used RTM to identify features of the physical landscape that constitute significantly higher risk of felonious assault/battery to police officers handling calls-for-service.

In 2012, there were 919 batteries and 72 assaults with a firearm against Chicago police officers. In order of relative risk values, the spatial risk factors of these incidents are: foreclosures, problem buildings, bars, schools, gang territories, banks, apartment complexes, liquor stores, 311 service requests for street lights all out, grocery stores, and retail shops. All places may pose risk of assault/battery to officers when dealing with a variety of types of calls-for-service, but because of the spatial influence of certain features of the landscape, some places are riskier than others.
Places where more than one of these features co-locates pose even higher risks. Relative risk values for each micro place (e.g., a street block) in the risk terrain map shown in Figure 1 ranged from 1 for the lowest risk place to 582.5 for the highest risk place. A place with a value of 582.5 has an expected rate of assault/battery to police that is 582.5 times higher than a place with a value of 1. The mean risk value is 15.33, with a standard deviation of 23.60. This micro level map shows the highest risk places symbolized in black (i.e., greater than 2 standard deviations from the mean risk value). The likelihood of experiencing assault/battery on police officers at the highest risk places are 62.53% greater than the risk presented to police officers managing calls-for-service at other locations. Albeit, there are many other factors that could be taken into account to assess personal risks to officers responding to calls-for-service. For instance, additional research is needed to assess the temporal dynamics of assault/battery incidents, as well as the situational factors (i.e., uniform or plain-clothes officer, multi-person/car first responders, etc.). Within the scope of RTM, though, it can be said with statistical confidence that such events occur at places with particular features of the landscape.

Conclusion

Predicting crime is a tall order. We are not at the point where we can predict specific events by particular offenders at certain moments in time. But, with RTM we can identify the most vulnerable areas in a jurisdiction which allows us to predict, with a certain level of confidence, the most likely places where crimes will emerge—even if they haven’t occurred there already. RTM is being used to help explain why spatial patterns of crime exist in a jurisdiction, and what can be done to mitigate risks, not just chase the “hotspots.” Certain features of the built environment can increase the risk of crime, and places with high relative risk values as defined by a risk terrain model are behavior settings that present exceptionally strong likelihoods of criminal events.

Utilizing environmental factors for crime analysis has many benefits. One benefit is an emphasis on intervention activities that focus on places, not just people located at certain places – which could jeopardize public perceptions and community relations. Another is that RTM is a sustainable technique because past crime data are not needed to make valid forecasts. Our researcher-practitioner collaborations, using RTM, have led to new approaches to police productivity that go beyond a heavy reliance on traditional law enforcement actions such as stops, arrests or citations. Police departments around the country are using RTM to be problem-oriented and proactive, to prevent new crimes without concern that a high success rate (and no new data) will hamper their ability to make new forecasts.

RTM contributes to the law enforcement mission by providing evidence-based spatial intelligence that police can employ to mitigate the risk of crime and violence at micro places throughout urban, suburban or rural jurisdictions. Our research suggests that there are empirically important spatial risk factors whose presence or absence structures the potential for crime to emerge and cluster. RTM provides information for police agencies and other stakeholders to incorporate into actions that yield meaningful and measurable results.
References


Data-Driven Approaches to Crime and Traffic Safety (DDACTS) is a partnership between the National Highway Traffic Safety Administration, the National Institute of Justice, and the Bureau of Justice Assistance. It features a series of workshops at which analytical, supervisory, and executive representatives of police agencies create models for analysis and enforcement specific to their jurisdictions and traffic and crime problems. DDACTS is not itself a model, nor a single strategy, but rather a philosophy, process, and a set of guiding principles under which more specific models are developed.

These models share in common a focus on both collision and crime hot spots, and the use of highly-visible enforcement as one tactic (National Highway Traffic Safety Administration, 2009, p. i). In DDACTS, we encourage synthesis of analysis and response to both crime and traffic safety issues. In some agencies, this takes the form of enforcement at literally overlapping crime and collision hot spots; in others, it is more complicated, with considerations of remote enforcement and offender travel patterns. There are hundreds of variations of DDACTS depending on the goals of the agencies, their resources, and the nature of their jurisdictions.

The totality of DDACTS is often mistaken for the particular models developed under the DDACTS name, but we mean the term “approaches” quite literally. Effective DDACTS models can and do draw from best practices in crime analysis, hot spots policing, evidence-based policing, problem-oriented policing, predictive policing, and other progressive, data-driven models. For this reason, blanket statements such as “our agency does DDACTS” or “DDACTS works” are somewhat meaningless without a solid understanding of the specific models that agencies have chosen to develop. What we can say definitively is that “the right sort of DDACTS models ‘work,’” and “for those that don’t—well, monitoring, evaluation, and adjustment is one of the core guiding principles of DDACTS.”

Mapping in DDACTS

Where DDACTS primarily focuses on hot spots, mapping is a vital part of any model. We use DDACTS maps for four primary purposes:

1. Identify hot spots. As I discuss below, several techniques are useful for identifying hot spots for both collisions and crimes.

2. Designate target areas. Agencies combine one or more hot spots—for collisions, crimes, or both—into one or more target areas. These target area polygons serve as the basis for deeper analysis, enforcement, problem-solving, and evaluation.

3. Identify enforcement points. Within each target area, agencies identify one or more enforcement points—places where traffic enforcement, directed patrols, and other tactics are likely to have the most impact.

4. Evaluate results. A GIS helps us measure changes in the target areas, compare them to control areas, and test for displacement and diffusion of benefits.
Unique Geocoding Challenges

Most analysts have extensive experience geocoding crime locations, but geocoding collision locations can present some unique challenges. First, since they occur on the street, address-matching routines that place points on parcels or buildings, or offset them from the street centerline, create confusing and nonsensical maps for collision analysis. Second, address fields for collisions are often more complicated than are those for crimes, with indicators that include direction of travel and distance offsets. It can be difficult to incorporate these fields into an address-matching scheme despite their importance in identifying the specific location of the collision.

Precision in geocoding is arguably more important for traffic collisions than for crime, especially when attempting to identify roads and intersections that require engineering (rather than enforcement) solutions. Default address matching routines might locate all collisions at a complex “intersection” in the literal center of the two streets, ignoring the specifics of ramps, lanes, and directions—specifics that we need to truly understand what is occurring at collision hot spots. Using the distance offsets from collision data (e.g., “Main Street 300 feet west of Elm Street”) to adjust coordinates can help improve geocoding precision, but the only way to achieve true precision is through GPS coordinate collection (which is rare) or digitizing the collision location based on the officer’s diagram (which is time-consuming).

Hot Spot Methodologies

As other sources (e.g., Eck, Chainey, Cameron, Leitner, & Wilson, 2005) have covered, there are many ways to conceptualize “hot spots,” including:

- Aggregation by point, line, or polygon
- Techniques that identify clusters of points based on distance measures
- Interpolation techniques, such as kernel density estimation

Kernel density estimation (KDE) is perhaps the most popular hot spot routine; it results in an attractive map, and many commercial applications do it. But analysts need to understand the weaknesses of the technique: the nature of the hot spots it identifies may vary dramatically depending on settings; the resulting calculations are very difficult to explain to an audience; the routine will happily identify a “hot spot” at the highest-volume locations regardless of how many actual incidents occurred; and, perhaps most important, the very logic of the routine—calculating risk for every point on the map based on locations where incidents actually occurred—is simply invalid for many crime types and certainly for most collision types. That is to say that risk of collisions, for almost all causes, does not transmit in a two-dimensional manner from the collision location. At best (as in the case of speed-related collisions), it transmits in a linear manner along the street segment, but in many cases (as
in red-light collisions at intersections), no risk transmits at all.

For these reasons, I tend to favor aggregation by line segment (calculated as a rate per X linear feet) as the primary mechanism for identifying hot spots (or, more accurately, “hot lines”) for collisions, and clustering techniques for identifying hot spots for crimes. In particular, I favor CrimeStat’s Nearest Neighbor Hierarchical Spatial Clustering (NNH) routine, using either random or fixed distances depending on the nature of the likely response (see National Institute of Justice, 2013). I grudgingly admit that KDE is an acceptable alternative for crime, when the analyst knows what he or she is doing with the settings.

**Data Querying**

Of course, what to map is an equally important consideration as how to map. The choice of crimes and collisions to include in the assessment of hot spots and target areas makes an enormous difference in both the resulting maps and the likelihood of success with the DDACTS model.

The choice of crimes must make sense given the nature of the chosen solution. If the agency’s model relies heavily on visible enforcement, for instance, it makes the most sense to include in the hot spot assessment those crimes that will respond to the physical presence of a police officer on the street. These include street robberies, residential and commercial burglaries, thefts from vehicles, auto theft, and (in agencies with high enough volume) some street violence, like shootings and gang assaults. It is not, conversely, likely to affect aggravated assaults or sexual assaults in general (the majority of which take place behind closed doors between people with a prior relationship). Shoplifting is also a poor choice for identifying hot spots, particularly given inconsistencies in reporting.

With collisions, similarly, analysts must be intelligent about what they include in their hot spots maps. Many agencies find that their top collision hot spots are shopping mall parking lots or freeway on- and off-ramps where the sheer amount of congestion causes many cars to occasionally collide—but not in a way that the presence of a police officer could have prevented. Agencies often find it more valuable to map collisions with particular causes—particularly speeding, light and sign violations, and drunk driving—to identify hot spots where their enforcement efforts are likely to have the most significant result. When an agency does not have these causal factors readily available in the data, mapping injury-only collisions often serves as a good proxy.

**Conclusions**

DDACTS is a useful program that gets police agencies excited about the possibilities inherent in mapping and data analysis. Agencies that have never used analysis in the past have enjoyed significant successes with operational models—both basic and advanced—that direct resources to hot spots. Those with significant experience with crime analysis and mapping have still benefitted from the DDACTS program’s emphasis on the various guiding principles, including the setting of explicit goals, the establishment of stronger partnerships, more systematic use of analysis and mapping, more rigorous evaluation, and an analytical approach to traffic collisions specifically. Though it fuses some of the best current techniques of crime analysis and progressive policing models, there is still plenty of room for innovation. I look forward to more advanced articles on DDACTS techniques in upcoming issues of *Crime Mapping & Analysis News*.

**References**


Using GIS to Problem Solve across Public Safety Agencies

By Julie Wartell | Issue 1

How many people do you know that have had a collision with a fire truck? Not a common occurrence, but it does happen. As a matter of fact, I crashed into one a few years ago (and I’ve heard all the jokes about not seeing it!). The crash itself, while not a big deal (beyond the embarrassment and having a hole in my bumper from the hook on the back of the truck), was illuminating on a number of fronts. At this point, you’re asking, “what does this have to do with crime mapping?” Hang with me. The crash occurred with a San Diego Fire Department truck in the City of San Diego, but because there was a lot of traffic, the firefighter suggested we drive up to the next street and pull off into a lot to do the report. He contacted his supervisor who would meet us there. Because the call of a collision went out on the air, the next thing we knew, the City of Del Mar (where we were parked) Fire Department arrived – lights and sirens! Del Mar Fire also contacted the Sheriff’s Department (who has jurisdiction in Del Mar) to report the collision. When the deputy arrived, he asked us to describe the collision, and we pointed to the place where it happened. He put down his pen and said that’s not my jurisdiction; you have to call San Diego Police. Anyone see how GIS could have helped?

Beyond this experience (which was a ridiculous waste of time and taxpayer money), several things had occurred that led me to believe that Police and Fire should be working together on public safety problems. Having spent my career analyzing crime and disorder problems and worked as an advisor on a regional project for using GIS to share police and fire data, my interest was piqued. Added to this was my invitation to speak about problem solving at the Colorado Fire and Life Safety Educators Conference of the Rockies in 2009. Why would a crime analyst speak at a fire conference? An attendee at the 2008 Problem Oriented Policing Conference realized that if Police could do Problem Solving/SARA model, why couldn’t Fire? As a matter of fact, police had “borrowed” the crime triangle concept from fire.[1]

So I attempted to learn more about what fire departments do (besides drive around in shiny red trucks and run on the beach when they are not driving around in shiny red trucks). Just kidding! I educated myself by speaking with a cop friend who works on the San Diego Metro Arson Strike Team (and ended up doing a map for him on arson registrants), asking a firefighter friend to talk to his ‘mapping guy’ about things they could do, and then using my own brain and experience.

I came up with the following problems that both police and fire handle: 1) traffic collisions; 2) arson/explosives; 3) homeless encampments; 4) Serial inebriates; and 5) insurance fraud. “We” in policing deal with these all the time (to some extent anyway), right? Well, so does the fire department! So how can we use GIS to analyze these problems? As with any problem, it starts with the data. In order to respond effectively (to reduce or prevent the problem), we need to fully understand it. Most police agencies (and researchers) analyze crime and disorder problems using solely police data such as crimes, arrests and calls for service. We need to go beyond these data sources, and GIS is an ideal tool.

Whether you’re in a large or small jurisdiction, urban, suburban or rural, traffic collisions occur. Many agencies map and analyze their collisions, whether it’s for increased enforcement, resource allocation or problem solving, but most are not integrating fire department data into the analysis which would add
to the understanding. While not using GIS, the California Highway Patrol was on the right track when they were analyzing collisions along State Routes 41 and 46; their task force and analysis included not only fire but also traffic engineers and other relevant stakeholders.[2]

Neither arson nor insurance fraud is a common police problem but do take police resources, as well as those of fire and often medical and private sector. In 2009, the Coalition Against Insurance Fraud was seeing an increase in different types of fraud such as auto giveups and arson. Howard Goldblatt, director of government affairs at the Coalition, noted “Fraud bureaus are telling us this, we’re hearing it from the state fire marshals, and we’re hearing about it anecdotally through news stories. It’s clear that as the economy has gone down, the opportunity to commit fraud, to recover monies they think they need, has increased.” Throughout the U.S., there are regional law enforcement task forces that focus on vehicle theft and insurance fraud; how many of them are analyzing their problem in conjunction with their local fire agencies? And how many people are using GIS to analyze arson and insurance fraud at all?

When speaking with my firefighter friend a few years ago, he and his co-workers were complaining about the homeless encampment fires that they were constantly responding to. I knew that police are also responding to these same encampments. Why not merge the data? Actually, the police and fire in that city had a common CAD, which made it a lot easier, but unfortunately no interest in working on the problem together. Recently, the police chief from a small city in northern California asked me to work with them to improve the crime analysis capacity. As part of that effort, I met with the fire chief and his ‘data guy’. We started comparing notes on homeless calls for police and fire and discussed how a joint analysis could help people 1) understand the problem better and 2) be used to garner resources (if police are spending 200 hours and fire is spending 50 hours annually, the real amount is 250 hours of public safety resources).

Last fall, the San Diego District Attorney asked me to speak to an organization that “has homeless data and wants to map it.” The homeless data they had was enormous – spreadsheets upon spreadsheets of survey data and piles of paper maps with x, o, and v markings. Not only did I get excited about the potential of digitizing the paper maps (ok, not me but perhaps a student?), but really started learning more about homeless issues – and that police captured only a very small percentage of the data that could be used for analysis. I learned from my colleague at the Chula Vista Police Department that she had recently analyzed homeless-related calls and found that it was their third most frequent call for service.

While the examples above relate to practitioners analyzing public safety issues, several researchers did a revealing study on this topic in Canada examining the temporal and spatial distribution of residential structure fire and residential burglary.[3] By applying environmental criminology theories to the study of fire events, they found that the spatial clustering overlapped but the temporal patterns were different. The results of this analysis could contribute greatly to prevention strategies for police and fire as well as help promote the idea of analyzing disparate data together to understand public safety issues.

So in the ideal world, how could GIS be used in a problem solving effort to reduce homeless encampments? Whether it’s the police or fire or the community who identify the problem, the analysis is key to creating effective responses.[4] We may start with mapping calls for service and supplement the data with observation or survey data (e.g. how many people and demographics in the encampment, temporary or more permanent living arrangements, etc.). We would look at topography and land use to identify patterns (e.g. are they predominantly in residential, commercial or open space; in canyons or
near water bodies). We would then add in facilities (e.g. shelters, public bathrooms/showers and food banks) and examine distances. Depending on your jurisdiction and your homeless “problem,” there may be other types of data and spatial analysis that can be done as well as using the maps to communicate the problem to the other stakeholders and community.

This type of analysis can be done for traffic collisions, arson, serial inebriates, meth labs and other public safety issues to which the police and fire respond. Instead of simply making “hot spot” maps of police crimes and doing more enforcement in those areas, people working on these problems (whether it’s the crime analyst, crime prevention specialist, city GIS analyst, or researcher) should use GIS to integrate police and fire events with the variety of relevant data to conduct the analysis. This may include demographics, code enforcement, road conditions and other risk factors. I guarantee you will discover spatial relationships and patterns

Where do you go from here? Do you currently work on a regular basis with other public safety agencies in your jurisdiction? What data is available for geospatial analysis? What data might we want to collect on a regular basis? What problems are common across agencies in your jurisdiction? Create a means to share and analyze data in a systematic way to focus on these problems. Share your successes (and challenges) with others.

1. More information about the crime/problem analysis triangle can be found at http://www.popcenter.org/about/?p=triangle.
Utilization of Officer Locations for Strategic Crime Analysis

By Daniel Polans | Issue 1

Daniel S. Polans, Milwaukee (WI) Police Department

The Milwaukee Police Department serves approximately 600,000 people and is the largest police agency in the State of Wisconsin with about 1,900 sworn personnel. Milwaukee is approximately 90 miles north of Chicago, Illinois and is located on the shore of Lake Michigan. The city is home to professional sports teams, including the Milwaukee Brewers Major League Baseball team and Milwaukee Bucks National Basketball Association team. The city contains multiple visitor attractions, including the Milwaukee Art Museum, Harley Davidson Museum, Miller Brewery, Summerfest Musical Festival and more. The University of Wisconsin- Milwaukee has its own police force, but works in partnership with the Milwaukee Police Department to protect and serve the campus and students.

The Milwaukee Police Department’s Vision Statement is: “A Milwaukee where all can live safely and without fear, protected by a police department with the highest ethical and professional standards”. The Milwaukee Police Department’s Mission Statement is: “In partnership with the community, we will create and maintain neighborhoods capable of sustaining civic life. We commit to reducing the levels of crime, fear, and disorder through community-based, problem-oriented, and data-driven policing.”

Crime Analysts in the Milwaukee Police Department are assigned to the Intelligence Fusion Center (IFC), which is responsible for tactical analysis. Crime Analysts are also assigned to the Office of Management, Analysis and Planning (OMAP), which is responsible for administrative analyses. Strategic crime analysis is performed at both work locations. The following article is an innovative, practical and strategic example of data-driven crime mapping supporting the mission of the Milwaukee Police Department.

A team consisting of a Sergeant and a Crime Analyst from the Milwaukee Police Department enabled a GPS tracking system on a smart phone to capture officer locations. The location was captured from the officer’s smart phone in the form of GPS coordinates. The officer location data was then spatially and temporally compared with Calls for Service (CFS) data. The study demonstrated how officer location can be compared with CFS data for strategic planning and effective deployment of police personnel.

The Police Sergeant installed an open source GPS tracker application (Traccar) – listed for free in the Android marketplace – on his cell phone. The GPS tracker was enabled for approximately three hours from 9 p.m. to midnight while driving through the north side of the city of Milwaukee. GPS coordinates were collected approximately every 2-3 minutes during the three-hour period. Latitude and longitude coordinates and time were stored in an electronic database and exported as an Excel spreadsheet. The analyst then utilized ArcGIS mapping software from Esri to map the coordinate data, police district boundaries, and calls for service from the Milwaukee Police Department’s Computer Aided Dispatch System (CAD).

The GPS coordinates of the Sergeant (black squares) and the calls for service (red dots) were mapped (Figure 1). Military time (a 24-hour clock) was recorded for each location. The priority of the call (P1-
P4) is also listed. P1 calls are the most serious. Data was joined with calls for service, which provided time and distance data from the closest GPS coordinate. GPS coordinates for 148 instances were recorded from the tracking application and 77 calls for service were placed by citizens. Fifteen of the 77 calls for service (19 percent) were placed on the north side of Milwaukee and were sampled for the study.

![Figure 1: Police Sergeant GPS activity and calls for service mapping](image1)

The 15 calls for service were each compared with the closest GPS coordinate (Figure 2). The average distance between those calls for service and the closest GPS coordinates was 4,314 feet (less than 1 mile). Collecting GPS coordinates allows crime analysts to quantify if officers are in correct locations at accurate times. This can be achieved by measuring the difference in distance and time from officers’ positions relative to calls for service. For example, call number 6 was the call for service where the Sergeant was the closest in both distance (77 feet) and time (2 minutes).

![Figure 2: District 4 calls for service compared to closest GPS coordinate (distance and time)](image2)

The majority of calls for service between 9 p.m. and midnight occurred in the south end of the District. However, the Sergeant’s route included the northwest side of the District where no calls for service occurred. Utilizing GPS coordinates from police officers can support strategic crime analysis by evaluating the officer's GPS locations in comparison to calls for service and crime incidents to help place resources in the right locations at the right times, which is a fundamental responsibility of the Crime Analysts.

Crime Analysts should consider utilizing GPS data for strategic deployment. This study showed that it is relatively easy and inexpensive to collect officer location data utilizing open source software. As part of their daily responsibilities, Crime Analysts usually have access to other data required for analysis,
including data from Computer Aided Dispatch (CAD) system, crime data, and mapping software.

Tracking GPS coordinates through this method provides a new dataset and expands upon currently available data, including calls for service, incident reports, and proactive activity measures which can aid in tactical and strategic decision making. Current GPS on squad cars limits officer location data to vehicles, whereas GPS tracking on phones can record coordinates from officers on foot, riding bicycles, as well as while driving. Further, the GPS data collected from vehicles may not be readily available to crime analysts for reasons such as volume of data and security clearance.

Officers, especially those with supervisory responsibilities, can volunteer to install the GPS application on their phone and have control of when the GPS is tracking their locations. Even periodic use could improve efficiency when it comes to resource management. Some officers may reject the idea of GPS tracking, but many officers interested in improved technology may volunteer. Officers will be interested in receiving maps of their coordinates, calls for service, and crime incident data with symbols based on crime type. Analysts collecting the data should be willing to supply and discuss their map products with the officers who provide the coordinates and be willing to make adjustments to meet their needs.

Many open source GPS tracking applications exist and individuals interested in this type of analysis should research applications and determine which are safe to use in their work environments. Crime Analysts and IT personnel could collaborate and assist in this assessment. Multiple security concerns exist on the collection of real-time and location data for police officers. This data must be stored in a secured server and meet specific security standards to prevent misuse. The frequency of recording coordinates can be set by each officer (30 seconds, 2 minutes, etc.) to increase privacy of officers and the battery life of their phones.

Further analysis should include an entire shift (at least 8 hours) for a single sergeant. Multiple sergeants can then team up to cover major crime affected areas. A follow-up could include collecting coordinates from multiple officers of different ranks and provide a database so that supervisors can allocate officers to high crime or high calls for service locations. Analysts could use a large dataset of coordinates to create a density map that compares hotspots of calls for service or crime to officer routes throughout the jurisdiction. Collecting and mapping coordinates from officers assigned to an initiative with specific boundaries could determine if police personnel were on the right streets at the right time when crimes and calls for service occurred. A larger sample of officers is needed in order to generalize results for useful mapping purposes. Crime Analysts and other practitioners are needed to use the GPS coordinate data to improve strategic crime analysis.
Upcoming Events

By Police Foundation | Issue 1

26th ANNUAL CRIMES AGAINST CHILDREN CONFERENCE
August 11-14, 2014
Sheraton Dallas Hotel
400 N. Olive Street
Dallas, Texas
http://www.cacconference.org/dcac/default.aspx

IACA/NIJ 2014 ANNUAL TRAINING CONFERENCE
September 9-12, 2014
Hyatt Regency
Bellevue, Washington
http://www.iaca.net/conference.asp

INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE 2014
October 25-28, 2014
Orlando, FL
Orange County Convention Center
**In the News**

By Police Foundation | Issue 1

**LAPD is plunging into new technology, predictive policing**

Business Insider – The LAPD has created an entire division to develop new computer technology and software to take crime analysis to new levels. Predictive Policing is now being used in a third of the LA Police Department’s 21 geographic policing divisions, and officers on patrol are equipped with maps sprinkled with a dozen or more red boxes indicating high probabilities of criminal activity. For now, the LAPD is focusing on burglary, vehicle break-ins and car theft - three types of crime that last year made up more than half of the roughly 104,000 crimes recorded in LA. [Read more]

**Monitoring Social Media gives new data points for police looking for hot spots (and criminals)**

ABC7 Chicago – Police are increasingly monitoring social media to track where crime is occurring or might occur. Some agencies like Baltimore Police Department are plugging the information into analytic software to determine hot spots. Others, like the Chicago Police Department, still mainly use it to locate criminals and develop evidence in cases. [Read more]

**Gunfire detection software and crime mapping helping East Chicago PD focus resources**

Post-Tribune – The East Chicago Police Department has employed ShotSpotter, a high-tech system of sensors and computer analysis that provides police departments with nearly instantaneous information about where gunfire originated to within 25 meters. Coupled with a complex crime-mapping analysis by Indiana University Northwest assistant professor Joseph Ferrandino, Becker said his officers can see the relationship of gunfire, criminal activity and location of squad cars on a single screen. [Read more]