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Research on Offender Decision-Making Utilizing Geo-Narratives: Final Report

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Table of Contents

BACKGROUND

Like many American cities, Akron witnessed a steady decline across and within its different neighborhoods as a result of the steep downturn in the national economy that led to the foreclosures crisis in 2008. This increase in urban decay resulted in a complex and dynamic landscape that contains geographies of vulnerability, including crime attractors.

Although the link between urban blight and crime is commonly perceived by both citizens and police, and although it has been described by other academics (Dalton, Gradeck and Mercaldo 2008, Lee and Wilson 2013); it has traditionally been hard to quantify from the perspective of individuals' perceptions, including ex-offenders and neighborhood residents.

Capturing all relevant factors that contribute to crime is important to decision makers who want to apply principles informed by the Environmental Criminology, Social Disorganization, Broken Windows, and CPTED theories. In addition to traditional data, such as crime locations and 911 call-out data, other variables of interest include vacant properties, high grass, overgrown bushes, graffiti, and neighborhood disrepair. However, vitally important spatial data, that of crime-geography experience and perception are often ignored because of the difficulty in data collection and analysis. Yet the need to develop translational methods to include these "insights" is compelling - - to know which streets and buildings are important to criminals, both the *where and why*, might provide vital for neighborhood crime reduction planning. This project sought to address this data deficiency for several neighborhoods of Akron, Ohio, while also providing a methodological frame suitable for implementation by other police departments for a range of different city sizes.

The project aimed to answer the following research questions:

- To what degree is there spatial consistency in neighborhood "crime" insight maps created by ex-offenders match with existing crime and 911 call-out data hotspots?

How do these perceptions fit with non-offenders and neighborhood police officers?

- Do these neighborhood “crime” insight maps reveal environmental signatures that can be translated to other Akron neighborhoods in order to explain and predict crime patterns?

To answer these questions, ex-offenders, neighborhood officers, and key community members provided geonarratives of three Akron neighborhoods for one year. Simultaneously data from three other Akron neighborhoods were collected using the spatial video system.

In keeping with the Scanning-Analysis-Response-Assessment (SARA) framework, especially as detailed in the publication “Crime Analysis for Problem Solvers” (Clarke and Eck 2005) the identification of crime hotspots are an invaluable policing strategy, but are in and of themselves limited. Additional context is required to understand the hotspots. For example, although a neighborhood may be identified as a hotspot, this clustering of crimes will involve multiple micro-spaces where crime is indeed elevated, while along connecting streets no crime occurs (Groff, Weisburd and Yang 2010). Over-policing for the entire area may be detrimental to community relations because of this fine-scale geography. In addition, even within the hotspot micro spaces, temporal fluctuations will occur, while other beat-level insights (for example, key houses or corners, escape routes) should also be used to contextualize the crime space.

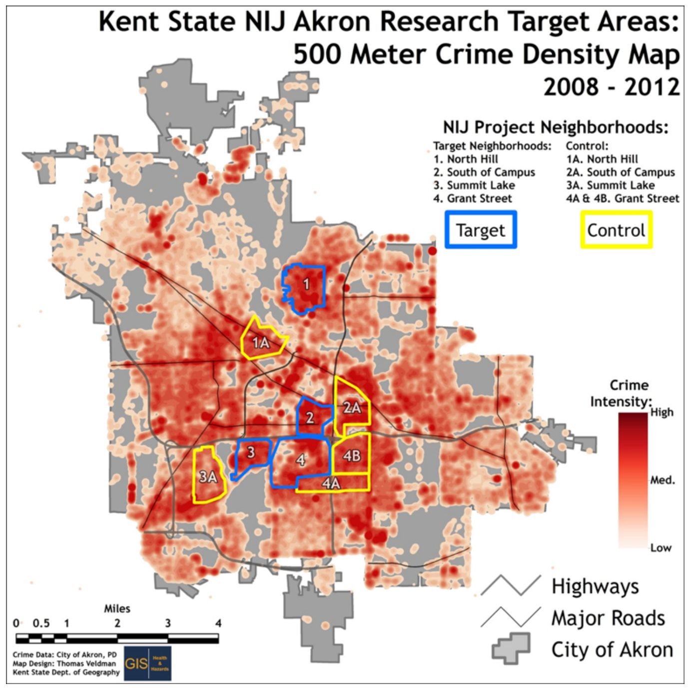
This project contextualizes neighborhood crime geography as seen through the eyes of local law enforcement, ex-offenders, and community residents. The novel method utilized here, spatial video, is also used to assess the implementation of Crime Prevention through Environmental Design (CPTED) principals such as the impact of land clearing on the revitalization of neighborhoods. From the subsequent coding and analysis of physical visible data, and the ride-along narratives we coded houses for blight and examined the impact of house razing on local criminal activity.

The method implemented here, where neighborhood insight is mapped as part of contextualized hot spot identification, is translatable allowing police departments from regions with different urban landscapes and challenges to develop and improve location-specific policing strategies. The practical innovative methods developed here will help inform decisions on which specific areas within neighborhoods are most likely to decrease crime and disorder if attended to using environmental principles to make better informed decision.

METHODS

A spatial video geonarrative system (SVG) is utilized. The spatial video set-up includes two cameras mounted on side windows of a car, one pointed horizontally, the other angled slightly downward. The use of four cameras is designed to maximize the field of view, but also to build in redundancy on either side in case one camera fails. Each camera is charged from the cigarette lighter power supply of the vehicle (through a four way splitter). Each camera contains a 32GB micro SD card which holds approximately 4 hours of data. A dual microphone cable and splitter box has also been developed by the project team in order to capture within car commentary which is then recorded by each camera (Mills et al. 2010, Curtis, Duval-Diop and Novak 2010, Curtis and Mills 2011). In this way, once transcribed, any comments made during the drive can be mapped to exact locations using the camera's internal GPS.

The spatial video consists of a global position system (GPS)-encoded video that can be used to collect high definition video for multiple angles (depending on the number of cameras used) and can be viewed in freeware (Contour Storyteller) to display both the image and collection pathway. The technology employed allows for the data collectors to travel at normal city road speeds (up to 35 mph) while still capturing HD images. By developing project specific coding systems, these data can be translated into a geographic information system (GIS) for visualization and analysis, including combination with other (crime) data layers. For Akron, an extreme sports camera kit field-tested in Youngstown, Ohio was utilized. Four target and four comparison neighborhoods were in Akron were selected based on their comparable crime rates and demographics.

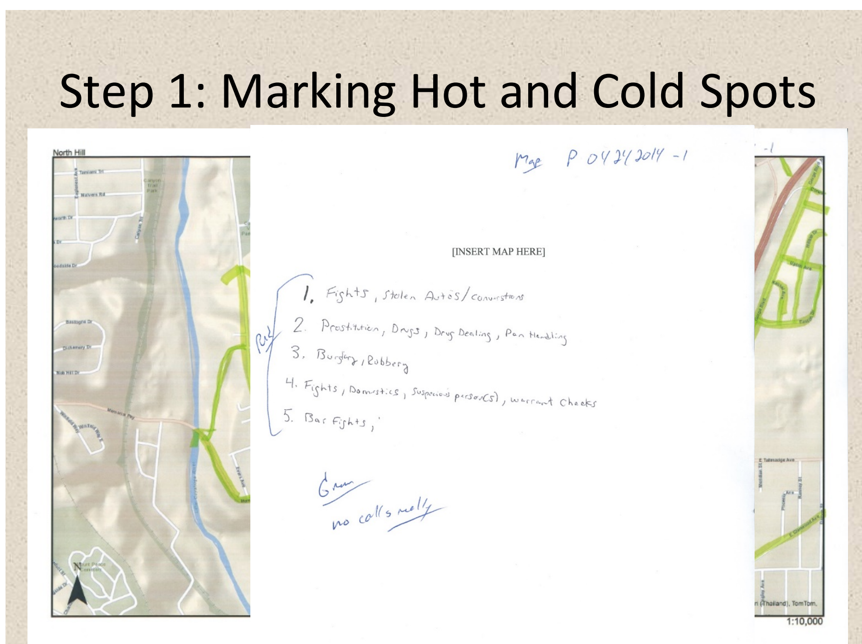


While the primary focus of using spatial video is for collecting ex-offender insight, the entire neighborhood was also collected and coded to generate maps to supplement these insights. Coding employed in pre-tests for Youngstown, OH included the modification of a classification scheme of houses developed by Kent State University professor Andrew Curtis, whereby 1 = non occupied, 2 = cleared lot, 3 = rebuilding and 4 = occupied (Curtis and Mills 2011). In addition, other important, theoretically informed variables such as signs of blight, pride in the home, "crime" indicators (such as youth or multiple cars), security measures etc. were also coded. Through this technique, other previously unknown environmental signatures were able to be revealed.

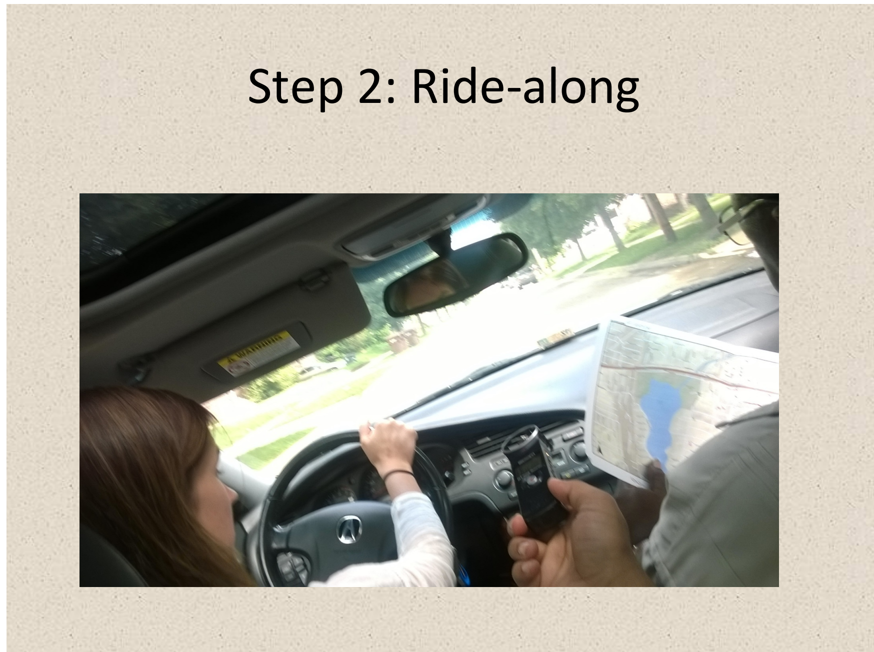
Once coding was complete, including entry into a GIS, spatial analysis was performed. For example, kernel density surface heat maps and spatial statistical maps were created for the analysis of blighted homes. Another analytical approach modified from spatial epidemiology is the use of a spatial filter to calculate overlapping rate surfaces where video extracted codes act as both numerators (blighted homes) and denominators (all buildings).

During spatial video collection, ex-offenders, police officers, and neighborhood residents accompanying the Kent State team narrated the neighborhood. This semi-structured process allowed for free-form descriptions of anything he/she believed to be important. The narrative, which also has GPS locations attached to it, is then transcribed and digitized as polygons on the neighborhood map. Points, lines and polygons will be mapped in Google Earth and then imported into ArcGIS. In this GIS, comments will be broken into attribute columns (for example, gangs, drugs etc), while any other important spatial information is extracted.

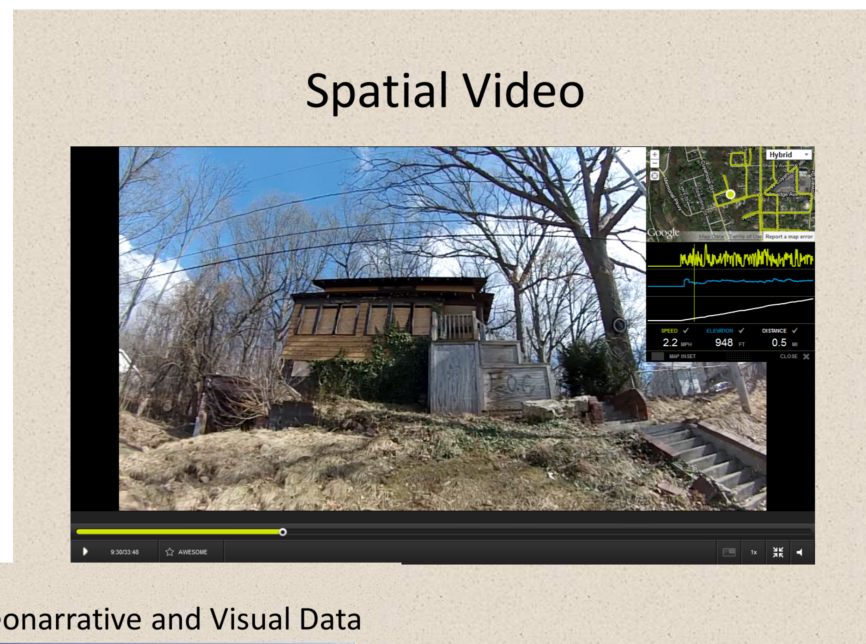
Prior to engaging in the ride-along, the participants were asked to complete a task of describing the neighborhood on a map – indicating the “good” and “bad” areas and the types of activities they believe happen in those areas. These perceptual maps are utilized in Curtis et al. (2018). A total sample of 107 riders were performed with ex-offenders, police officers, and neighborhood members.

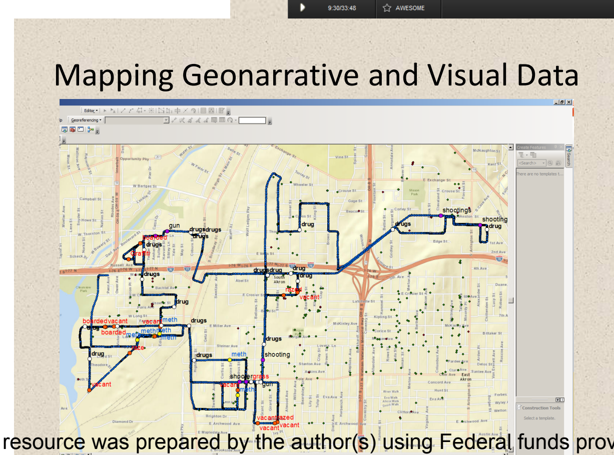


The following images depict the steps involved in translating a spatial video geonarrative to a GIS system and coding the data. This researchers drove the vehicles and controlled the recording devices from the rear seats. Images of the participants were never captured on video and audio was transcribed to protect their identity. The Kent State University IRB reviewed and approved the research protocol.

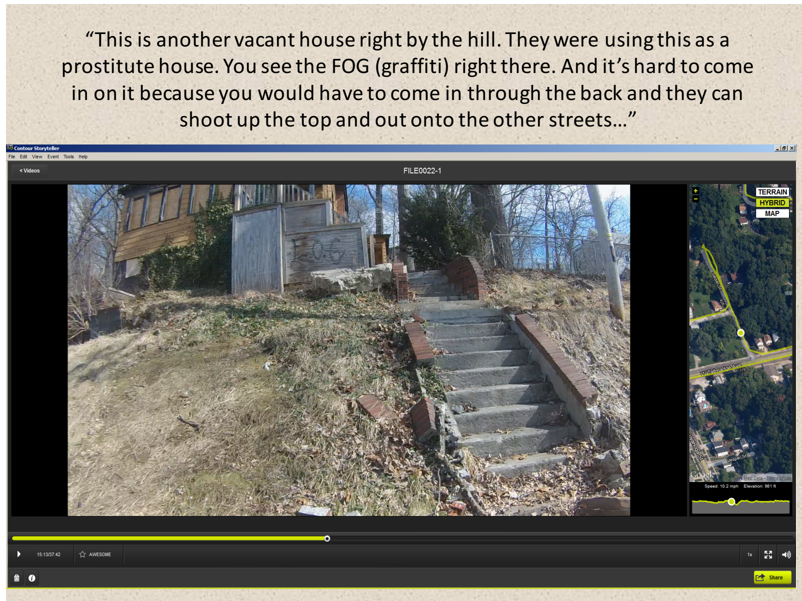


The blighted house shown here is associated with a precise geographic coordinate on the map in top corner and the narrative is tagged with a precise time-stamp and associated geographic location.

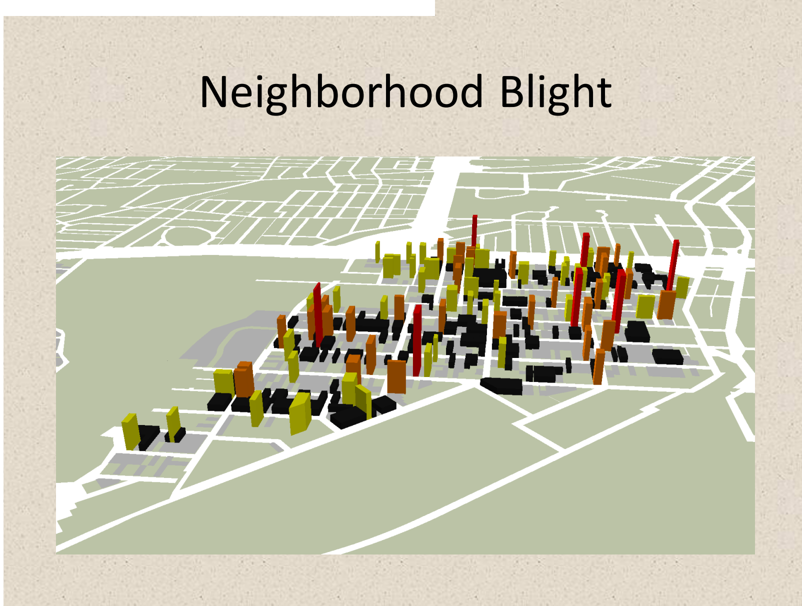




An illustration of the richness of just one geonarrative interview.



Example of coding from spatial video to GIS. In this case, a "blight" scale is being coded, but any visually identifiable variable can be coded and analyzed systematically and routinely utilizing the geospatial video cameras.



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FINDINGS

This project has been successful in a number of ways. Perhaps foremost, it has advanced a methodology that will benefit a number of fields, including: criminal justice, public health, and geography. The use of SVG has been found to be possible utilizing off-the-shelf cameras in combination with typical GIS systems. While we wrote code to automate various processes, the basic tasks of SVG can be accomplished on a small-scale with basic tools. The process requires careful redundancies to overcome occasional technical difficulties, but we succeeded in interviewing 107 individuals without any substantial loss of data due to our use of multiple cameras and backup audio recordings. More importantly, the utility of SVG for capturing nuanced data has been demonstrated. Collecting data in the field - where people live and work - provides visual cues that can't be replicated on a paper map in a neutral setting.

Multiple journal articles have been published as a result of this grant and numerous additional articles will follow that will continue to explore the micro-nuances of place and crime. Also, we hope to publish a book detailing our project, given its complexity and depth. The citations and abstracts for published articles are presented below. One article that is still under review, but is particularly relevant, is also listed as a product. In the section that immediately follows, additional products that emerged from this grant are listed.

Curtis, A., Curtis, J., Porter, L., Jefferis, E., & Shook, E. (2016). Context and spatial nuance inside a neighborhood's drug hotspot: Implications for the crime-health nexus. *Annals of the American Association of Geographers.* DOI: 10.1080/24694452.2016.1164582

Abstract: New geographic approaches are required to tease apart the underlying sociospatial complexity of neighborhood decline to target appropriate interventions. Typically maps of crime hotspots are used with relatively little attention being paid to geographic context. This article helps further this discourse using a topical study of a neighborhood drug microspace, a phrase we use to include the various stages of production, selling, acquiring, and taking, to show how context matters. We overlay an exploratory data analysis of three cohort spatial video geonarratives (SVGs) to contextualize the traditional crime rate hotspot maps. Using two local area analyses of police, community, and ex-offender SVGs and then comparing these with police call for service data, we identify spaces of commonality and difference across data types.

Curtis, J., Curtis, A, Ajayakuma, J., Jefferis, E., & Mitchell, S. (Forthcoming). Same Space – Different Perspectives: Comparative Analysis of Geographic Contexts through Spatial Video Geonarratives and Sketch Maps. *International Journal of Geographic Information Sciences.*

Abstract: The importance of including a contextual underpinning to spatial analysis of social data is gaining traction in the spatial science community. The challenge, though, is how to capture these data in a rigorous manner that is translational. One method that has shown promise in achieving this aim is the spatial video geonarrative (SVG) and in this paper we pose questions that advance the science of geonarratives through a case study of criminal ex-offenders. Eleven ex-offenders provided sketch maps and SVGs identifying high crime areas of their community. Wordmapper software was used to map and classify the SVG content; its spatial filter extension was used for hotspot mapping with statistical significance tested using Monte Carlo simulations.

Then, each subject's sketch map and SVG were compared. Results reveal that SVGs consistently produce finer spatial scale data and more locations of relevance than the sketch maps. SVGs also provide explanation of spatial-temporal processes and causal mechanisms linked to specific places, which are not evident in the sketch maps. SVG can be a rigorous translational method for collecting data on geographic context of many phenomena. Therefore, this paper makes an important advance in understanding how environmentally immersive methods contribute to understanding of geographic context.

Curtis, A., Curtis, J., Schook, E., Smith, S., Jefferis, E., Porter, L., **Schuch, L**., Felix, C., & Kerndt, (2015). Spatial video geonarratives and health: Case studies in postdisaster recovery, crime, mosquito control and tuberculosisin the homeless. *International Journal of Health Geographics 14*(1). 10.1186/s12942-015-0014-8

Abstract:
Background: A call has recently been made by the public health and medical communities to understand the neighborhood context of a patient's life in order to improve education and treatment. To do this, methods are required that can collect "contextual" characteristics while complementing the spatial analysis of more traditional data. This also needs to happen within a standardized, transferable, easy-to-implement framework. Methods: The Spatial Video Geonarrative (SVG) is an environmentally-cued narrative where place is used to stimulate discussion about fine-scale geographic characteristics of an area and the context of their occurrence. It is a simple yet powerful approach to enable collection and spatial analysis of expert and resident health-related perceptions and experiences of places. Participants comment about where they live or work while guiding a driver through the area. Four GPS-enabled cameras are attached to the vehicle to capture the places that are observed and discussed by the

participant. Audio recording of this narrative is linked to the video via time stamp. A program (G-Code) is then used to geotag each word as a point in a geographic information system (GIS). Querying and density analysis can then be performed on the narrative text to identify spatial patterns within one narrative or across multiple narratives. This approach is illustrated using case studies on post-disaster psychopathology, crime, mosquito control, and TB in homeless populations. Results: SVG can be used to map individual, group, or contested group context for an environment. The method can also gather data for cohorts where traditional spatial data are absent. In addition, SVG provides a means to spatially capture, map and archive institutional knowledge. Conclusions: SVG GIS output can be used to advance theory by being used as input into qualitative and/or spatial analyses. SVG can also be used to gain near-real time insight therefore supporting applied interventions. Advances over existing geonarrative approaches include the simultaneous collection of video data to visually support any commentary, and the ease-of-application making it a transferable method across different environments and skillsets.

Porter, L., Curtis, A., Jefferis, E., & Mitchell, S. (Under Review). Hidden Hot Spot? The Case of the Corner Store. *Criminology.*

Abstract:

Scholars typically use calls to the police to study geographic crime patterning. However, crime reporting may be systematic across space. In the present study we generate perceptual hot spots from the crime insights of 36 ex-offenders, police, and residents of a high crime neighborhood in Ohio. We overlay perceptual hot spots of drugs and violence with those gleaned from calls for service. As expected, we find that areas identified by participants versus those identified from calls for service do not map neatly onto each other. One micro-place in particular - a corner store - emerges as a perceptual hot spot across all groups, but not in calls for service. Utilizing spatial and narrative data, we delve deeper to understand the dynamics of this "hidden hot spot." First, we find that the corner store is relatively isolated. There are few occupied residences around it and our participants actively avoid it. Second, the storeowners and local criminals have an arrangement which helps to insulate the store from police intervention. Research relying solely on call data may risk missing hot spots that elicit few calls. As such, our methodology can help to illuminate and understand the dynamics of these micro-places.

OTHER GRANT PRODUCTS

- In 2017, Jefferis and Curtis received funding from the Ohio Office of Criminal Justice Services to collaborated with Ravenna, Ohio PD to collect spatial video data in order to develop GIS-based system to analyze opioid overdoses. This project utilized SVG and was informed by the NIJ grant. https://www.kent.edu/einside/news/walking-steps-opioid-addicts-using-gps
- The NIJ project resulted in substantial interest from our practitioner partners at the Akron Police Department. The Akron PD applied for and received a grant to assign spatial video cameras to a pilot group of officers for environmental data collection with officers narrating, to be used to supplement the crime analysis unit's available data for tactical and strategic purposes. The Kent State research team provided technical assistance to the Akron PD on the use of the cameras and data extraction. The Akron PD presented on their initiative at the IACA in collaboration with Dr. Curtis.
- A major product that has resulted from this NIJ award is a NSF grant entitled: GeoVisuals Software: Capturing, Managing, and Utilizing GeoSpatial Multimedia Data for Collaborative Field Research. Leveraging what we learned from the NIJ project, Dr.

Curtis and colleagues in Computer Science received funding from NSF to automate many of the very time-intensive data-manipulation and data-analysis methods that have been necessary to carry out the current project. The NSF project began in the spring of 2018.

Various conference presentations, including:

- Porter, L. Curtis, A. Jefferis, E. Using Spatial Video and Geonarratives to Understand Crime Hot Spots. 2014. Annual Meetings of the American Society of Criminology: San Francisco, CA
- Curtis, A., Jefferis., E., Porter, L., Shook E., and E. Paull. Using Spatial Video and Geonarratives to Map the Health and Crime Nexus on Blighted Landscapes October 2014. Autocarto, Pittsburgh
- Curtis, A., Wei-An, L., Jefferis, E., Porter, L., & Curtis, J. (2014). Adding neighborhood context to hotspot mapping: The use of spatial video as a geonarrative tool. 142nd APHA Meeting and Exposition.

CONCLUSION

We began this project nearly five years ago with the goal of examining nuances of micro-places utilizing a new method of spatial video geonarratives. This project served as a proof of concept for the SVG methodology and a springboard for multiple other projects. As mentioned above, Dr. Curtis received an NSF grant and we have received a small state award largely as a result of our success with this NIJ grant. It should be noted, however, that the spatial video method is now being used in a number of ways in the field of public health, for example, to identify lead-based paint (https://www.ohio.com/akron/lifestyle/children-at-risk-researchers-identify-hot-spots-for-lead-exposure-in-akron) and to map cholera in Haiti (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4772207/).

With regard to the original aims or our grant, the aim to determine "to what degree is there spatial consistency in neighborhood "crime" insight maps created by ex-offenders match with existing crime and 911 call-out data hotspots?" is best answered by the forthcoming Curtis et al. article and the Porter et al. article that is still under review. The answer is nuanced (as one might expect) and requires a full read of the articles. The second aim regarding whether "neighborhood "crime" insight maps reveal environmental signatures that can be translated to other Akron neighborhoods in order to explain and predict crime patterns?" is similarly complex. We were surprised during our ride-alongs by the lack of any consistent "indicators" of troubled houses being identified by our participants. On the other hand, we found that researcher-coded indicators of blight were predictive of crime in a manuscript that is yet to be published. This second aim has been the more challenging of the two, but we continue to pursue it as we dig deeper into the wealth of data that was collected during the grant period.

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Dalton, E., R. Gradeck & A. Mercaldo (2008) Using maps of home foreclosures to understand national and local problems. *Geogr Public Saf,* 1**,** 5-8.

Groff, E. R., D. Weisburd & S.-M. Yang (2010) Is it important to examine crime trends at a local "micro" level?: A longitudinal analysis of street to street variability in crime trajectories. *Journal of Quantitative Criminology,* 26**,** 7-32.

Lee, J. & R. E. Wilson. 2013. Geospatial Modeling and Simulation of Property Crime in Urban Neighborhoods: An Example Model with Foreclosure. In *Crime Modeling and Mapping Using Geospatial Technologies*, 249-267. Springer.