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Abt Associates Inc.

A Methodology for Evaluating Geographic Profiling Software

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Draft Final Report

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Contents

1. Introduction

This report describes a methodology for evaluating geographic profiling software. Following a brief overview of geographic profiling (Section 1.1), Section 1.2 describes how the methodology was developed. The key component of the methodology was convening an expert panel that met in August 2004; a summary and full transcript of the panel's discussions are in Section 2 and the Appendix, respectively. The panel focused on four geographic profiling software applications, which are described in Section 3. The actual evaluation methodology is outlined in Section 4.

1.1. Background on Geographic Profiling

Geographic profiling is a criminal investigative technique that attempts to provide information on the likely "base of operations" of offenders thought to be committing serial crimes. The base of operations could be the offender's home, place of employment, a friend house, or some other frequented location. The predictions are based on the locations of these crimes, other geographic information about the case and the suspect, and certain assumptions about the distance offenders will travel to commit crimes.

Canter (2003) argues that geographical profiling was "born" in 1980 when a UK police investigator analyzed the locations of crime scenes of the Yorkshire Ripper and computed the "center of gravity" of the crime scenes thought to be linked to the case. It turned out that the offender lived in the town that the investigator predicted. No doubt other investigators and crime analysts have approximated such information by visual inspection ever since the advent of paper "pin maps."

In the mid-1990s, more sophisticated models for predicting an offender's home address were developed, building on the work of Brantingham and Brantingham (1981) and other studies of offender travel behavior (e.g., Rhodes and Conly, 1981). As summarized in Rossmo (1999), key results of these studies include:
- Most crimes occur in relatively close proximity to the offender's home.
- Crime trips follow a distance-decay function, with the number of crime occurrences decreasing with distance from the offender's home.
- Juvenile offenders exhibit less mobility than adult offenders
- Patterns in crime trip distances vary by crime type.

Rossmo (1995, 1998, 1999), in particular, extended the work of the Brantinghams and developed a "criminal geographic targeting" algorithm, which was later patented and incorporated into the Rigel software application. Levine (2002, p. 357) indicates that the journey-to-crime routines in CrimeStat "builds on the Rossmo framework, but extends its modeling capability." Canter (1999, 2004) developed his Dragnet software in the mid-1990s based on his work with police investigators in the UK.

While Rigel, CrimeStat, and Dragnet are based on different types of distance-decay functions, they produce the same general type of output. In contrast to a single spatial mean (used in the Yorkshire Ripper case), these software applications create a grid over an area and then calculate the probability that the offender's base of operations is in each grid cell based on the specified crime-related

locations. As Harries (1999) points out, law enforcement officials could use this information for: (a)
suspect and tip prioritization, (b) address-based searches of police record systems, (c) patrol
saturation and surveillance, (d) canvasses and searches, (e) mass DNA screening prioritization, (f)
department of motor vehicle searches, (g) zip code prioritization, and (h) information request mail-
outs.

It is clearly convenient to display the output of geographic profiling software on a Geographic
Information System (GIS) that also shows streets, landmarks, political boundaries, and other
geographic features of the areas around the crimes.   The two- and three-dimensional diagrams in
Exhibit 1.1 illustrate how output from geographic profiling software appears in a GIS, with color
shadings (and, in the case of three-dimensional diagram, the height of the surface) representing the
offender's likely base of operations.   As such, interest in geographic profiling software has grown
with advances in computer mapping software and the increased use of GIS by law enforcement
researchers and practitioners. Geographic profiling represents an important step in moving
computerized crime mapping beyond static displays of crime locations (electronic "pin maps") and
toward more analytical mapping that help analysts interpret spatial data.

Exhibit 1.1: Illustrative Output from Geographic Profiling Software[1]
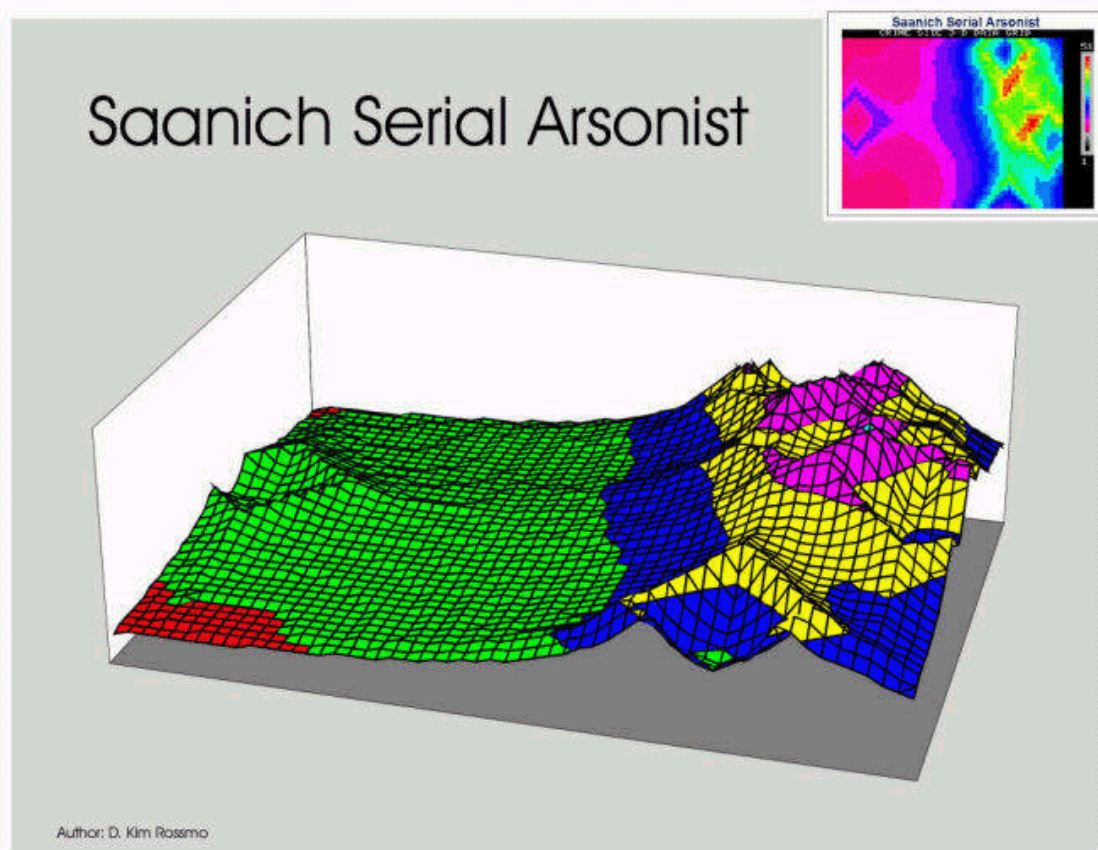
In recent years geographic profiling has received considerable media attention. As Canter (1999) puts
it, the "geographical profiling process is often presented, especially in the mass media, as an exotic,

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[1] Image available at http://www.ojp.usdoj.gov/nij/maps/briefingbook.html#tso

almost science fiction like innovation." The Washington, DC area sniper case, in particular, led to several media stories on geographic profiling (Bowman, 2002; Lewis, 2002; Onion, 2002), including an appearance on ABC-TV's "Good Morning America" by Dr. Kim Rossmo, whose research led to the development of Rigel. These and other articles on geographic profiling note the technique's role in solving specific high profile cases, including serial rape cases in St. Louis (MacKay, 1999), Louisiana (Rossmo, 1999), and Las Vegas (Canter, 2003).

While there is anecdotal evidence from specific cases of geographic profiling helping to solve cases, there has not been a thorough evaluation of any of the geographic profiling software applications. Given the significant differences among currently existing applications – for the example, the cost ranges from free to $60,000 – law enforcement agencies could benefit from such an evaluation, particularly as agencies' ability to link crimes (e.g., via DNA databases, ballistics identification systems, and sophisticated search capabilities of records management systems) improves over the years. Indeed, there is no existing source of information to which law enforcement agencies can refer to help them make decisions regarding the acquisition of geographic profiling software.

Even geographic profiling's staunchest supporters do not claim that geographic profiling is a "magic bullet." First, the number of cases of serial murder, rape, robbery, arson, or burglary is small for all but the largest jurisdictions, and many of these cases are not amenable to geographic profiling, in particular those cases involving offenders that Canter (2004) characterizes as "commuters." A key input to some geographic profiling software applications is the geographic area about which the software makes calculations[2]: if the offender travels a long distance to commit crimes, this "search area" will likely not include the offender's base of operations. Finally, and perhaps most importantly, the software's performance is limited by the quality of the geographic and crime information with which it has to work. For example, the utility of geographic profiling software depends on the investigator's ability to link cases to a single, serial offender, which can be extremely difficult. Obviously, the software will have difficulty estimating the base of operations of a serial offender if it is fed crimes committed by several offenders. That said, law enforcement agencies may view any investment in geographic profiling as worthwhile if it helps solve even a single high profile or serious case.

1.2. Approach to Methodology Development

NIJ contracted with Abt Associates to convene an expert roundtable to develop a methodology for evaluating geographic profiling software. NIJ selected the panelists, using two criteria. First, in an effort to make the process as fair and unbiased as possible, all panelists should have no commercial, advisory or any other direct tie to any of the four major software applications (CrimeStat, Dragnet, Predator, Rigel). Second, because criminological and geographic theory is operationalized into software, the group should have a broad range of experiences and areas of expertise. As such, panelists included both researchers and law enforcement practitioners whose expertise span criminology, crime analysis, geography, spatial analysis, and software development.

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[2] Rigel Analyst automatically computes the "search area", whereas it is user-specified in CrimeStat and Dragnet.

Abt Associates prepared a briefing paper and distributed it to the panelists one week before the panel met. The briefing paper contained background material on four geographic profiling software applications and a discussion of potential evaluation methodology issues.

The expert panel met at Abt Associates' Bethesda (MD) office on August 10-11, 2004. Discussions were recorded (see the summary of the discussions in Section 2 and a transcription in the Appendix). NIJ staff attended the meeting, but were careful not to participant in nor influence the discussions. At the beginning of the meeting NIJ briefly instructed the panel about the overall purpose of the roundtable (to develop a fair and rigorous methodology for evaluating geographic profiling software) and to remind panelists of the key audience of the evaluation (law enforcement officials). Thereafter, NIJ representatives observed the discussions and on a few occasions provided clarification about NIJ's intent when queried directly by panelists.

After the meeting, Abt Associates organized the roundtable discussions into a general evaluation methodology and circulated an outline of the draft methodology to the panel members for comment. The methodology outlined in Section 4 below incorporates feedback on the draft methodology from the roundtable experts.

2. Expert Panel Summary

This section contains a summary of the expert panel meeting held at Abt Associates' Bethesda office on August 10-11, 2004. A complete transcript of the meeting is in the appendix.

2.1. Day 1

The meeting convened at 8:30 AM on August 10, 2004.

Debra Stoe and Ron Wilson of the National Institute of Justice opened the meeting by welcoming everyone and indicating that the purpose of the meeting was to develop a rigorous methodology for evaluating geographic profiling software. They expressed a strong desire not to influence the deliberations, and pledged to be simply "observers" during the meeting and to be available to answer questions.

The panelists then introduced themselves. The panel was designed to be diverse, bringing a range of skills and experience to the group. The diversity of the panel was immediately evident – it included both practitioners and researchers with expertise in geography, criminology, crime analysis, spatial analysis, software design and development, and evaluation. None of the panelists had any direct ties to any of the four geographic profiling software applications under consideration (i.e., commercial interests or a role in development of the software).

Following introductions, Derek Paulson gave an overview of Rigel Analyst, CrimeStat, and Dragnet; he indicated that he had tried to obtain a copy of Predator, but had been unsuccessful. (Since none of the panelists has seen or used Predator, the panel focused on the other three software applications for the remainder of the roundtable.) Derek emphasized that the applications are very different; in particular, he noted that Rigel Analyst, because it is commercial software, has more extensive input, analysis, and output capabilities than the other two. Rigel is also the only one of the three applications that automatically creates the search area; in CrimeStat and Dragnet, the search area is user specified. Rigel is also the only application that does geocoding and the only one that has any mapping or GIS capabilities. The applications also use different distance decay functions: Rigel Analyst uses one (but does not allow the user to modify it); CrimeStat allows the user to select from among five functions or, alternatively, run the software with jurisdiction-specific calibrated data; and Dragnet has one distance decay function but will allow users to create their own functions. While all three applications produce a "hit score map," Derek also emphasized that the software applications produce different numerical statistics: Rigel Analyst produces a "hit score area" and "hit score percent," CrimeStat produces the peak likelihood for each point in the grid; and Dragnet does not produce any numerical statistics.

The panel then asked for clarification from NIJ on what the purpose of the panel is. Debra Stoe reiterated that the goal is to provide guidance to law enforcement agencies who are interested in learning about (and possibly purchasing) geographic profiling software. She also indicated that most of the evaluations of geographic profiling software have been performed by the developers of the software, which calls into question the objectivity of the evaluation (or, at least, creates the appearance that there may be bias in the results). Given the substantial commitment of public resources being committed to geographic profiling, an independent and unbiased evaluation of the

major profiling software applications was necessary. Ron Wilson added that law enforcement agencies need information regarding "value" – for example, is the $60,000 product delivering substantially more value than the free product. NIJ also emphasized that the evaluation should focus on the software, rather than on the viability of "the concept" of geographic profiling (e.g., do offenders have "activity spaces").

The panel discussed the issue of what the demand for this software is – particularly since 74% of law enforcement agencies serve populations under 10,000 people. There was concern that the panel was discussing something that only the very large police departments were going to consider using. Robin Wilfong commented that her agency (the Pinellas County Sheriff's Office) offers geographic profiling services to all law enforcement agencies (many of which are very small) in her county and neighboring counties.

The frequency with which geographic profiling software was used within a law enforcement agency was also discussed. Robin indicated her agency analyzes (using Rigel Analyst) about 20 crime series a year. Sean Bair noted that his former law enforcement agency (which serves a community of 140,000) used traditional methods of analysis, rather than using geographic profiling software. (These traditional methods became more effective once the department automated their crime reporting process.) It was also noted that even small towns are victimized by serial offenders, as predicted by criminological theory (a small cohort of individuals commit the vast majority of crimes). In the end, NIJ emphasized that, regardless of what the market for the software is, the goal of the panel is to provide guidance to any law enforcement agency.

The role of expertise in solving crimes was also discussed, in particular how expertise and local knowledge is used when examining the results of a geographic profile. Panelists wondered when analysts rely on expert judgment and when they feel the need for the assistance of software. Robin Wilfong indicated that she always "folds in" her knowledge about her jurisdiction and can usually tell whether the geographic profiling results are "reasonable."

It was also noted that the ability to properly link crimes into a series was a prerequisite to obtaining any value from geographic profiling software. Panelists noted that the extent to which an analyst can accurately link cases depends in part on their agency's automated data systems. In general, the more sophisticated the agency's records management system (e.g., the ability to search for a particular MO, crime type, location, and/or date range) the more successful the analyst will be at identifying crime series. It was also noted that the presence of sophisticated automated computer systems in law enforcement agencies offers the analyst a host of "data reduction" tools that may prove just as valuable (or more valuable) to crime analysts and investigators compared to geographic profiling software.

Panelists then discussed the relationship of two separate questions: (1) is the methodology valid and (2) does the software implement it correctly? Both were viewed as important, with some panelists emphasizing the need to address the first question before the second. Wil Gore made an analogy to the forecasting arena, where theory has led to the development of forecasting "principles" that have eventually found their way into forecasting software.

At this point, the discussion turned to the last agenda item before the morning break – an overview of evaluation issues. Shari Pfleeger gave an overview of the concept of quality, based on her expertise in software design and on the work of Garvin. Key questions related to quality include: is the theory

correct? does the software implement the theory correctly? does the software do the things the user needs done? and, is the software a good use of your money?

After the morning break, the discussion focused on examining the theoretical foundation of geographic profiling software. Derek Paulson's overview of the software noted that each application uses some type of distance decay function to model the offender's travel behavior. The panelists discussed the appropriateness of these functions. Panelists commented that there were several ways to improve these functions – for example, by incorporating land use maps (e.g., lakes and other barriers to travel), travel "opportunities", traffic patterns, and road networks. Panelists also noted that other more sophisticated models could be implemented in geographic profiling software, such as a multiple nodes approach. The panel concluded that distance decay functions were certainly not the ideal way to model offender travel behavior, but that they were relatively easy to implement and a good "baseline" that developers could use in attempts to build more effective models.

The next topic of discussion was the technical implementation of the theory underlying the software. To facilitate this discussion, Derek Paulson demonstrated the use of Rigel Analyst, CrimeStat, and Dragnet, which he had loaded on his laptop, along with sample datasets. His demonstration highlighted the major differences between the software applications, particularly in terms of the user interface. Rigel Analyst, being the only commercially available application, was clearly easier to use and had a broader array of input and output capabilities and features. Dragnet and CrimeStat, by contrast, were developed primarily for researchers; as such, their developers were less concerned about ease-of-use than implementation of the underlying algorithms.

With regard to technical implementation, the panel agreed that it was not practical to expect the evaluator to study the "inner workings" of each software application and draw conclusions as to whether the underlying algorithms had been properly implemented or whether simplifying assumptions had been made.

The discussion then moved to evaluating output accuracy. The panelists agreed that the key question was how one formulates a standard way to measure accuracy. For example, was it possible do develop a "search cost" measure for all three software applications? The issue of what crime series cases to include in the tests was also discussed. Rigel Analyst, it was noted, is only intended to be used for property crimes (and, in fact, law enforcement agencies using Rigel Analyst are required to sign a Memorandum of Understanding stating that they will *only* use the software on property crimes).

The panelists also discussed the possible different dimensions of output accuracy tests. One formulation discussed involved a three-dimensional graph that had axes for:
- Levels of crime pattern complexity;
- Geographic contexts (e.g., urban grid vs. suburban/rural area)
- Treatments to solve the problem (e.g., functions available and various levels of data enrichment).

The use of sensitivity analysis (varying one factor at a time) was viewed as very important in this analysis.

Panelists discussed the pros and cons of using "made up" crime data, as well as non-crime data (e.g., testing the ability of the software to predict people's home addresses based on gas purchases and

other routine activity locations). A consensus was reached, however, that the output accuracy methodology should only incorporate "real" crime series data provided by law enforcement agencies.

Following the afternoon break, the panel focused on usability issues. The panel agreed that it was important to include a "feature analysis" in the evaluation methodology. In this analysis, the evaluator would make a list of features that one would want to see in geographic profiling software, and then determine the extent to which each software application had those features. One possible "grading scale" discussed was an empty circle, a half-filled circle, and a completely filled circle, an approach often used in software reviews.

At the end of Day 1, the panel developed a list of the probable major components of the evaluation methodology. During this discussion, the major points agreed upon by the panelists is that the evaluation methodology should:

- include some type of testing related to output accuracy (either via "automated test drivers" or testing by trained analysts);
- incorporate the experiences of actual users of the software;
- include a feature analysis that examines what capabilities each software application has; and,
- include multiple definitions of performance.

The panelists agreed that geographic profiling had, to date, been tested only on very limited data sets (notably, Baltimore County crime series data), and that having substantial data sets from a number of law enforcement agencies opened up significant possibilities for analysis and evaluation. Sensitivity analysis was specifically mentioned, both involving varying input parameters and by randomly dropping specific cases from the series.

2.2. Day 2

The panel re-convened at 8:30 AM on August 11, 2004.

Prior to the first agenda item for the day (Evaluating Utility), the panel revisited the issue of trying to standardize the output accuracy tests in the methodology. Panelists recognized several potential challenges in developing unbiased tests, in particular the issue of how to standardize the search cost and the search area. With regard to search area, the panelists concluded that this issue could be handled by running any test first with Rigel Analyst (which computes the search area for the user), and then using that search area as input for Dragnet and CrimeStat. The panelists agreed that tests should involve only property crimes (since Rigel Analyst is only intended for use on these types of crimes) and that tests should involve a users with varying types and levels of experiences.

The panelists explored the pros and cons of developing "automated test drivers" to conduct the tests (i.e., developing software that controls the geographic profiling software applications and automatically runs software through a battery of tests). The alternative is to have actual users conduct the tests. While using test drivers was appealing (e.g., it eliminated the possibility of user error in conducting the tests), panelists with experience in this area later concluded that developing drivers would be expensive and would require significant collaboration with the developers and, therefore, was not a practical approach. Finally, the panelists also recommended that specific test scenarios be

developed, for both the geographic profiling applications and non-geographic profiling "control" methods.

The panel then discussed the role that actual users of these applications might play in the evaluation. Panelists felt that useful information could be gleaned from users, with the caveat that the evaluator needs to be cognizant of the potential problems of these data. For example, a user may have a negative view of a software application because it produced nonsensical results for a particular case, when in fact this occurred because the user incorrectly linked crimes thought to be part of a single series. Or, users may have an unfavorable view of an application because they were inadequately trained or used the software on a case that was not appropriate for geographic profiling.

The panelists recommended that any survey be used to learn what features users would like to see in geographic profiling software, thus using the survey as an opportunity to advance the field of geographic profiling. It was also suggested that a small group of users be recruited to keep a running log of the role that the software plays in individual cases.

Before the morning break, the panelists addressed the role of costs in the evaluation methodology. The panel agreed that documenting the costs of the software would be part of the evaluation methodology and that it was important to document the investment that law enforcement agencies make in geographic profiling software. Costs should include both direct financial costs (e.g., software licenses and the cost of training courses) and opportunity costs (e.g., time required to learn the software). The panel agreed that estimating the benefits of the software (in the sense of a doing a cost/benefit analysis) was not practical.

During the final two hours of the roundtable, the panelists attempted to resolve key outstanding issues and sketch out an overall evaluation methodology for the software applications. To begin the discussion, Abt Associates staff distributed to the panelists a ranking of the evaluation measures, based on the discussions on the previous day. The ordering was: output accuracy (most important), utility, usability, cost, implementation of theory, and theory (least important). The panelists indicated that they agreed with this ranking, although there was disagreement over whether a valid test of output accuracy could be conducted. Some panelists felt that the software applications were too different (e.g., they were based on different assumptions, allowed for different types of inputs, allowed for different options regarding distance decay functions, and computed different performance measures) to be subjected to a standard battery of tests. Other panelists felt that, while "it's not perfect," existing case data to perform output accuracy tests had been used in the past and was the best available and feasible methodology for output accuracy.

Proceeding on the assumption that output accuracy could be measured using extant crime data from law enforcement agencies, the panelists discussed the design components of these tests, including the minimum number of crimes in the series, the types of crimes to include, and the number and type of jurisdictions (e.g., type of road network) that should be asked to provide serial crime data. Individual panelists also presented what they felt was their "favorite" output accuracy measure. Favorite measures included the search ratio (the ratio of the optimal search area to the total search area), the profile accuracy (was the offender in the top profile area), and error distance (distance from the highest profile point to the offender's home base).

The meeting concluded at 12:30 PM on August 11, 2004. The panel moderator and NIJ thanked the panelists for their work.

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3. Background on the Geographic Profiling Software Applications

In developing the evaluation methodology, the expert panel focused on four geographic profiling software applications: CrimeStat, Dragnet, Predator, and Rigel Analyst. Each of these software applications is summarized in this section. It should be noted that they differ in many respects (see Exhibit 3.1), which should be expected because they were developed for different purposes and audiences. In particular, Rigel Analyst is the only one of the four that targets a commercial audience; the other three were developed either primarily for researchers or for the developer's own use. Thus, Rigel Analyst naturally has a much more fully developed user interface. Also, only CrimeStat and Rigel Analyst are readily accessible for law enforcement agencies (Rigel Analyst is commercially available and CrimeStat can be downloaded off the Internet); Dragnet is available only by contacting the developer and Predator is currently not available at all.

Exhibit 3.1: Feature Comparison (as of August 2004)

	CrimeStat	Dragnet	Predator	Rigel Analyst
Overall Features				
Software platform	Windows	Windows	Windows	Windows
Primary target users	Researchers	Developer and his research staff	Developer	Law enforcement crime analysts
Availability	Free download from Web site	Contact developer	Not currently available[3]	Purchase from ECRI
Input Features				
Ability to import crime data	Yes	No		Yes
Ability to manually add crime data	No	Yes		Yes
Ability to geocode crime data	No	No		Yes
Base maps included	No	No		Yes
Generation of search area	User specified	User specified		Automatically generated
Analysis Features				
Type of distance decay function (DDF)	User defined or 1 of 5 different DDFs	User defined or default DDF		Proprietary CGT algorithm
Output Features				
Performance measures computed	Peak likelihood location	None		Total hunting area; hit score

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[3] The only known user of Predatory is the developer, who has not made the software available for application or for external review. Because there is no detailed product description available and none of the expert panelists have seen Predator, no information is available on whether this software application has any of the features shown in this table.

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				area; hit score %
Ability to generate reports	No	No		Yes
Types of maps produced	Hit score surface map	Hit score surface map		Hit score surface map
Ability to export results to other mapping software	Yes	No		No

3.1. CrimeStat

CrimeStat is a spatial statistics "toolbox" that contains six general types of routines, one of which is a journey-to-crime estimate (the other five are spatial distribution, distance analysis, hot spot analysis, interpolation, and space-time analysis). Dr. Ned Levine, working with other researchers and law enforcement crime analysts, developed CrimeStat with funding from the National Institute of Justice. Originally released in 1999 (Version 1.0), CrimeStat has since been upgraded three times (Version 1.1 in 2000, Version 2.0 in 2002, and Version 3.0 in 2004). The latest release contains a new approach to modeling offender travel behavior. The approach utilizes a crime travel demand model that examines crime travel behavior of repeat offenders over an entire metropolitan area. The model, which is an application of travel demand theory that is widely used in transportation planning, includes modules for predicting crime origins and crime destinations, predicting trips from each origin to each destination, estimating the travel mode used in committing a crime trip, and guessing the likely travel route taken. This model is significantly more complex than the distance decay functions in the previous versions and will require more data collection and calibration efforts from the user.

The CrimeStat application and user manual are available for downloading (at no-cost) from the National Archive of Criminal Justice Data, where it has been downloaded more than 6,000 times through March 2004. Based on e-mails received for technical support, Dr. Levine estimates that 75 percent of users are researchers (in particular students pursuing their doctorate) and 25 percent are practitioners from a variety of governmental agencies. An unknown fraction are using the journey to crime functions, as opposed to the other spatial statistics routines.

A description of CrimeStat's approach to modeling offender travel behavior (in Version 3.0) is available at the CrimeStat Web site (see below). Briefly, users can describe the distance traveled to commit crimes in one of two ways. The first is by specifying one of five possible distance-decay functions: linear, negative exponential, normal, lognormal, and truncated negative exponential. Each function requires different user-specified parameters. The second method involves use of empirical data: CrimeStat computes a distance function based on a data set of origin (offender residence) and destination (crime location) pairs. For either of these two methods, CrimeStat outputs the probability at the offender's base of operations is in each cell of a user-specified grid. These probabilities can be exported to a GIS to produce maps similar to Exhibit 1.1.

For Additional Information:

- CrimeStat Web site: http://www.icpsr.umich.edu/NACJD/crimestat.html

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3.2.   Dragnet

Professor David Canter at the Centre for Investigative Psychology at the University of Liverpool (UK) developed Dragnet in the mid 1990s as a research tool to help him and his graduate students study spatial patterns in serial crimes. As wide distribution of Dragnet has not been a priority for Dr. Canter, the software is currently not available for downloading from a Web site. Persons interested in obtaining the software should contact Dr. Canter.   According to Dr. Canter, "I make it available to people who want to co-operate with us in a research partnership. If they will share data and are interested in being co-authors on any subsequent academic publications then I can e-mail the software."

Dragnet allows any type of function to be used to model the distance that offenders travel to commit crimes, although Canter et al (2000) report that a simple negative decay function without buffer zones was the most effective for the particular data sets they tested. The software application then computes the probability that the offender's base of operations is in each cell of a user-specified grid and displays these probabilities on a two-dimensional map surface. Dragnet is not currently linked to a GIS to allow layering of Dragnet's output and maps of the jurisdiction. This feature may be added shortly, as Dr. Canter reports that he recently received a large grant from a law enforcement agency to further develop Dragnet.

For Additional Information:

- Canter, David, Toby Coffey, Malcolm Huntley, and Christopher Missen (2000). "Predicting Serial Killers' Home Base Using a Decision Support System" in *Journal of Quantitative Criminology*, Volume 16, Issue 4, December 2000, Pages 457 – 478.

- Modeling the Home Location of Serial Offenders," a presentation by Dr. Canter at the Third Annual International Crime Mapping Research Center Conference (Orlando, December 1999). http://www.ojp.usdoj.gov/nij/maps/Conferences/99conf/abstracts.html

3.3.   Predator

Dr. Maurice Godwin developed Predator in the late 1990s as part of his doctoral research. He uses this software, written in Visual Basic, in his consulting business to help him solve crimes for his client agencies. Godwin (1999) describes how Predator was used in the case of five unsolved murders committed in Raleigh (NC) in 1996 and 1997. In this case, the offender lived "less than one block from the predicated home base area."

Dr. Godwin indicated that he has not attempted to commercialize or share Predator with other researchers, although he says that it could potentially be turned into a product. The Predator Web site (see below) contains a brief description of the software application, as well as a brief discussion of what Dr. Godwin sees as the strengths of Predator's approach to geographic profiling. No other information is available on Predator.

For Additional Information:

- Predator Web site: http://www.drmauricegodwin.com/geoprofile.htm

3.4. Rigel Analyst

Since 1997, Environmental Criminology Research Inc. (ECRI) has marketed their Rigel geographic
profiling software to law enforcement agencies. Rigel is based on the doctoral dissertation of Dr.
Kim Rossmo, who co-founded ECRI. Rossmo's criminal geographic targeting (CGT) model, which
produces a "probability surface" that shows the relative likelihood of the offender's base of
operations, is patented. Details of the CGT model can be found in Rossmo (1999).

Two versions of the software are currently available. The "Profiler" version sells for approximately
$60,000 and is designed primarily for full-time geographic profilers. According to ECRI, "about a
dozen large, national law enforcement agencies" have this version, including the Royal Canadian
Mounted Police and the Bureau of Alcohol, Tobacco, and Firearms. ECRI also sells the "Analyst"
version that is designed for crime analysts and costs approximately $6,000.[4] Staff from ECRI
emphasized the importance of training, both in the profession of geographic profiling (one full year of
training is necessary to become a full-time geographic profiler) and in the use of the Rigel software.
A two-week training course is available for the Analyst version. In the past, the National Law
Enforcement and Corrections Technology Center (NLECTC) has provided training on Rigel Analyst,
although they do not currently offer this training.

The Rigel web site includes several "success stories" that highlight how Rigel has helped solve
crimes.

For Additional Information:

- ECRI Web site: http://www.geographicprofiling.com/

- Rigel Analyst training course description
  http://www.tacia.org/documents/Other%20Agencies%20Docs/Profiling%20San%20Marcos.
  PDF

- Presentation by Dr. Kim Rossmo at the National Criminal Intelligence Service Conference,
  March 17- 19, 1998 at the University of Manchester (UK)
  http://les1.man.ac.uk/dass/hfc/NCIS/krossmo.pdf

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[4] Note that only the Rigel Analyst – and not the Rigel Profiler – is within the scope of the evaluation.

4. Evaluation Methodology

4.1. Summary

The primary goal of the evaluation is to provide assistance to law enforcement agencies who are considering using geographic profiling software by conducting a rigorous evaluation of currently available software applications. The evaluation project should focus, at a minimum, on three such software applications: CrimeStat, Dragnet, and Rigel Analyst. The evaluator may include other software in the project, such as Predator (if available from the developer) and any other newly released software. The evaluator should include the cost of acquiring these applications in their budget. Because of its substantial cost, Rigel Profiler should *not* be included in the project.

The expert panel convened to develop the evaluation methodology concluded that the evaluation should consist of the following three components:

1. *Output accuracy*. The evaluator should assess the extent to which each software application accurately predicts the offender's "base of operations" (e.g., home address, place of employment, an acquaintance's residence) by conducting a battery of tests on each software application, using actual serial crime data provided by law enforcement agencies. Test results should be compared to results from control methods, such as the spatial mean and "eye-ball" estimates.

2. *User feedback*. The evaluator should obtain information on each software application's utility and ease of use from crime analysts and other staff in law enforcement agencies who have actually used these software applications. Specifically, the evaluator should:
   a. Conduct a representative survey of users of each software application.
   b. Recruit a panel of users of each software application and have them keep a log or journal of the role the software plays in specific cases.

3. *Feature analysis*. The evaluator should conduct a "feature analysis" of each software application. Building on the list provided later in this document, the evaluator will develop a list of features (both "must haves" and "nice to haves") for geographic profiling software and compare the available features in each software application to the list. The features should cover a wide range of measures, including cost, user friendliness, and specific software capabilities.

Additional details on each of these three components are provided below.

Contractors proposing to conduct the evaluation are free to suggest *additional* or *alternative* approaches or modifications. However, proposals must demonstrate the rigor and objectivity of the alternative approach or modification, as well as show how it benefits the methodology. The expert panel, it should be noted, did not feel that it would be cost-effective to assess the appropriateness of each software application's underlying algorithms.

Contractors should also provide assurances that all staff working on this project have no commercial, advisory or any other direct tie to any of the software applications being evaluated. If it is found that

anyone involved in the evaluation has connections with the applications, NIJ will not accept the evaluation results.

4.2. Output Accuracy Testing

The expert panel felt that output accuracy – defined as the proximity of the offender's actual "base of operations" (e.g., residence, place of employment, or other frequented location) to the "top profile areas" (i.e., the predicted most likely region containing the base of operations) predicted by the software applications – is the most important evaluation criterion. To date, these software applications have only been tested against very limited data sets. CrimeStat, for example, has only been tested with crime series data from Baltimore County, Maryland (see Levine, 2002).

The evaluator should specify who will actually perform the output accuracy tests. Options include (1) evaluation staff who have been thoroughly trained in all the software applications and (2) law enforcement analysts who are familiar with all the applications. In either case, the testers should have no direct ties to any of the developers, as noted earlier. The evaluator must also guard against the possibility of tester bias due to different levels of knowledge about the software and familiarity with the jurisdiction where the crimes occurred.

Test Inputs

To conduct these tests, the evaluator should use actual crime series data from several law enforcement agencies. Evaluators are responsible for obtaining these data and should provide evidence (e.g., letters of support from law enforcement agencies) that they can successfully complete this task.

The expert panel recommended that data be obtained from law enforcement agencies that vary in size, urbanicity, type of road network (e.g., grid, non-grid, and sprawl), and presence of major travel obstacles (e.g., major rivers bisecting the jurisdiction).

The expert panel also recommended the following with respect to the crime series data:
- Crime series should be comprised of at least 3 crimes.
- To the extent possible, the data should closely resemble what was actually available to analysts during the investigation (i.e., include, if possible, the locations of other case-related items, just as places of employment or addresses of suspect acquaintances).
- Cases can include both "marauders" (i.e., offenders whose base of operations is within the minimum bounding rectangle of the locations where they commit crimes) and "commuters," but the evaluator should recognize that some software applications (e.g., Dragnet and CrimeStat) were not designed for commuter-type cases.
- Cases should only involve property crimes, since Rigel Analyst is intended only for use on property crimes.
- Cases should involve a variety of types of offenders, including youths.

The evaluator will be required, as part of an initial project deliverable, to specify in detail the testing protocol, including test scripts. This will help ensure that the tests are as unbiased as possible.

Performance Measures

The evaluator should specify which performance measure(s) will be used in the tests. The panel expert suggested a number of different measures for output accuracy, each of which has advantages and disadvantages (see the table below). In doing so, the panel recognized that, given the nature of the problem that the software is attempting to solve, there are no existing standards for measuring output accuracy, and that it will be up to the evaluator to define these standards. Again, the proposal must demonstrate the rigor and objectivity of any standard and discuss its advantages and disadvantages.

The different measures of output accuracy that the panel suggested are summarized below:

Performance Measure	Definition	Advantages	Disadvantages
Error Distance	• Distance from the actual to the predicted base of operations	• Can be applied to all software applications and control methods	• Focuses on a single point, rather than an area (which is more useful to investigators). • Not all of the software applications produce a point for which to compare one another.
Search Cost / Hit Score	• The percentage of cells, in an overlaid grid, that need to be searched to locate the cell that contains the offender's base of operations	• Indicates how much the profile reduced the search area, which is a key goal of the software applications.	• Highly dependent on how the search area is defined. • Subject to severe changes in output display based on method of thematically mapping the output
Profile error distance	• The distance from actual base of operations to the nearest point in the top profile region	• Takes into account the whole profile, rather than a single point	• Ignores the size of the profile area. • Not all of the software applications produce a point for comparison purposes
Top profile area	• The ratio of the total area of the top profile region to the total search area. Often used in combination with Profile error distance.	• Provides an area on which to focus the search	• Subject to severe changes in output display based on method of thematically mapping the output.
Profile accuracy	• Whether the offender's base of operations is within the top profile area (yes/no)	• Provides a simple measure of whether or not the profile was "correct"	• Provides no information on the size of the top profile region. • No 'cost' built into the models to reflect the accuracy of ease of travel.

The panel suggested that the evaluator use control measures in the analysis, such as simple spatial distribution measures (e.g., spatial mean) or "eye ball" estimation.

Data Analysis

The evaluator should propose a plan for analyzing the output accuracy test results. The expert panel recommended that the evaluator determine how output accuracy of the different software applications – including the control methods – varies by:

- Crime type (e.g., burglary, robbery, auto theft, and arson)
- Type of jurisdiction (e.g., size, population, road network type)
- Number of crimes in the series. The evaluator should vary the number of crimes in the series by randomly dropping crimes from the series.
- The spatial distribution of the crime series (e.g., highly dispersed or clustered)
- The temporal distribution of the crime series
- The level of experience / expertise of the tester

The evaluator should also conduct additional sensitivity analyses, including varying the values of different input parameters and changing the method by which the output are thematically mapped.

4.3. User Feedback

The expert panel felt that the experiences of existing users of geographic profiling software could contribute important information for the evaluation, and recommended that the evaluator undertake two related tasks:

1. *User Survey*. The evaluator will conduct a representative survey of geographic profiling software users that focuses on the software's utility and the user's overall experience with the software.
2. *User Log*. The evaluator will recruit law enforcement agency staff that are using the software on a regular basis, and have them keep a log that records (1) the details of each case for which the software is used and (2) the impact, if any, that the software had in the case.

In conducting these two tasks, the evaluator must develop a plan for addressing the potential problems with incorporating user bias. For example, a user may have a negative view of a particular software application because it produced nonsensical results for a particular case, when in fact this occurred because the user incorrectly linked crimes thought to be part of a series. Additionally, users may have an unfavorable view of a software application because they were inadequately trained or used the software on a case that was not appropriate for geographic profiling. The evaluator also needs to control for the extent to which the user has access to other "data reduction" techniques (e.g., sophisticated database querying based on offender characteristics), which can increase the utility of geographic profiling software.

User Survey

The evaluator will conduct a survey of users of each software application. In all likelihood, no comprehensive list of users exists for some of the software applications; thus, the evaluator should propose a method for obtaining a representative sample of users for each application.

The evaluator will design and pilot test a survey instrument. The instrument should build on the following items, which the expert panel recommended for the survey:

- Background questions on the respondent (e.g., position at the agency, # year of experience)
- Background questions on the agency (e.g., size)
- Which geographic profiling software applications have they used
- For each geographic profiling software application used:
    o When the software was acquired
    o Amount and type of training they received
    o Start up time required to fully learn the software
    o Frequency of use (e.g., number of cases by crime type per year)
    o Are they still using the software? If not, why not?
    o Overall satisfaction with the software
    o Degree to which investigators in the agency are receptive to geographic profiles
    o Features they would like to see in a new version of the software
    o Details on success and failure stories
    o Did they calibrate the software with local data
    o Details on the data that was used, including the appropriateness, completeness, and scope
    o What other investigative tools and methods do they use in conjunction with geographic profiling software

The evaluator should propose additional survey items, as appropriate.

User Log

In addition to the user survey, the evaluator will recruit a group of law enforcement personnel who are currently using one or more of the software applications and have them record on a on-going basis information about (1) the cases in which they used the software and (2) the impact that software application had on the investigation or outcome of the case.

The evaluator will design and pilot test a data collection instrument for the log. The instrument should build on the following items, which the expert panel recommended:
- What were the specifics of the case (e.g., crime type, number of crimes in the series)
- What was the hypothesized search area prior to doing the geographic profile?
- What inputs were used (e.g., the size of the search area).
- Did the profile results "look reasonable"?
- To what extent did local knowledge of the jurisdiction affect interpretation of the profile?
- How did the hypothesized search area prior to doing the geographic profile compare to the software application's output?
- Were the profile results shared with investigators? If yes,
    o How did investigators initially react to the profile?
    o Did they alter any investigative strategy as a result of the profile?
- In what way, if any, did the geographic profile help with the investigation?

The evaluator should propose additional data for the user log, as appropriate.

4.4. Feature Analysis

To assist law enforcement officials who are considering using geographic profiling software, the evaluator will develop a list of desirable features for geographic profiling software and judge each software application against those features. The list should include, at a minimum, those features that the expert panel recommended (see below). A secondary objective of the feature analysis is to determine what new features law enforcement personnel would like to see in these software applications. Discussing how each application would benefit from having new features would assist in efforts to advance the field of geographic profiling.

Since much of the feature analysis focuses on usability issues, the evaluator should recognize – and it should be emphasized in project deliverables – that the software applications were developed for different purposes and audiences. In particular, the degree to which each applications' user interface has been developed varies widely.

The following features should be included in the feature analysis:
- *Usability-related*:
  - *Installation procedure*. The evaluator shall report the ease with which the software can be installed and any errors that occurred during the installation procedure. The installation procedure should be tested on a variety of Windows platforms.
  - *Documentation*. The evaluator shall report whether the software has on-line help and written documentation. The evaluator shall also assess the overall quality of the documentation.
  - *Technical support*. The evaluator shall report on the availability and quality of technical support.
  - *Reliability*. As part of the output accuracy testing, the evaluator shall record the frequency and seriousness of error messages and crashes.
  - *Performance*. Also as part of the output accuracy testing, the evaluator shall record the approximate time required to compute the probability or risk surface values.
  - *Data management capabilities*. The evaluator shall judge the software's ability to streamline and simplify data management tasks, such as entering or importing crime series data.
  - *Output / performance measure display*. The evaluator shall report on the range of features available for viewing and analyzing outputs and performance measures.
  - *Overall ease of use*. The evaluator shall judge the software's overall ease of use. Inasmuch as this measure is subjective, the evaluator shall justify any proposed rating scale.
- *Cost-related*
  - *License cost*. The evaluator shall document the cost of the software license (if any).
  - *Hardware and software requirements*. The evaluator shall detail the hardware and software requirements for operating and fully utilizing (e.g., if a GIS is needed to visualize results) the software.
  - *Training requirements and costs*. The evaluator should determine the cost (and time commitment required) of the level of training that the developer recommends or requires to use the software effectively.
  - *Technical support / maintenance costs*. The evaluator shall document the cost of technical support and maintenance agreements.

- *Assumptions on offender travel behavior*
  - *Type of distance decay or other function.* The evaluator, via a review of the software's documentation and discussions with the developers, shall summarize the type(s) of functions used to model the distance that offender's travel to commit crimes.
  - *Assumptions on distances between points.* The evaluator shall describe each software applications' assumptions regarding travel distances. Two commonly used travel distance metric are the Manhattan (or right-angle) and crow-flies metrics.
  - *Assumptions and modeling of actual travel ease.* The evaluator shall describe other assumptions in each software application regarding offender travel characteristics.

As noted earlier, the evaluator can suggest other features by which to judge the software applications.

4.5. Summary of Deliverables

The evaluator will prepare three project deliverables:

- Revised evaluation design document, including:
  - The output accuracy testing plan, including details on test scripts and data to be used for the software applications.
  - The user survey instrument and the sampling plan for the survey
  - The user log data collection instrument and the identity of law enforcement personnel recruited for the user log task.
  - List of features included in the feature analysis

- Draft final report

- Final report

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Appendix: Expert Panel Transcript

The appendix contains a complete transcript of the expert panel meeting held at Abt Associates' Bethesda office on August 10-11, 2004.

Appendix: Transcript of Roundtable Discussion

The appendix contains a complete transcript of the expert panel meeting held at Abt
Associates' Bethesda office on August 10-11, 2004.

Day 1: August 10, 2004

Debra Stoe:	…Years ago we actually funded Ned Levine to create and develop CrimeStat. And there was an issue raised by Kim Rossmo regarding patent license, and as a result, it was all settled and it came out okay and everybody's okay with this. And as a result, Ron and I's participation will be minimal in this roundtable. We will be absolutely silent. We just want to make sure that if we can develop a methodology to evaluate these softwares, that is totally acceptable to NIJ. This will help create an eventual possible step to the implementation of that evaluation. So that's a possibility. Depends on the outcome of this meeting. But because of those circumstances, we're just going to be removed, so we're pretty much here as observers. And I just wanted, you know – it's going to be very difficult for us to not to say anything So to start things off, I'll leave it at that. I think Ron has a few words and then we'll turn it over to each of the panelists. Hopefully everyone feels free to join in. It's an open forum concerning. The bathrooms are right outside. You can get up and get coffee whenever you'd like. And just let go.
Ron Wilson:	The only thing I have to say is just give a little bit of background. The human nature of this project, in putting this together, just so you're aware of who around you. People from very diverse backgrounds. So you've got people from criminology. We've got field practitioners. We have software engineers. Criminologists and spatial data analysts, geographers. I thought that was important to have this together because what a lot of people don't realize about developing software is there's certain things about evaluating software that a lot of us who deal with criminological issues, spatial data analysis issues aren't quite aware of, and there's going to be some things that are coming up that is going to be a strength in the criminology area, about theories and so forth. can you analyze data and spatial data analysts and geographers, and then the software engineer being able, to able to say you can't do that

	because this is black box and so that's why you're seeing the group around here is because we've taken ideas and we've manifested them into a piece of software. So that's what I want to say about the group.
Keith Harries:	It says here that we do introductions. So let me introduce myself, and we'll go around the table. I'm Keith Harries. University of Maryland, Baltimore County. Not to be confused with many of the other universities in the Baltimore area. Baltimore County, of course, is as we think of serial crime, Baltimore County is that place that's famous for having produced Spiro Agnew *[Laughing]*… who was the County Executor and for Baltimore County and rose to prominence by that group. I've been working on geographic aspects of crime much too long, I think, probably some people would say. If only my depth of knowledge was proportional to the length of time that I've been working on the problem. But I'm just interested in all aspects – all geographic aspects of crime and strictly GIS-related applications… I'm also interested. And so a lot more criminological perspectives, I suppose you might say in the recent we've been looking at the relationship between demographic changes and violence in Baltimore City. With that let me pass it over to Derek. We'll have to go that way, because if I go that way they can't say anything. *[Laughing]*
Derek Paulson:	My name is Derek Paulson. I'm a senior detective and uh, like Keith, I've not been very long. I haven't had a Ph.D. that long. But I like to think I'm interested in anything, anything spatial that's a crime, I'm very interested. I've done some work on – in fact, I can tell you, I'm actually working with the state police on implementing crime mapping in their agency and helping them get the basic stuff done. I've done research on spatial _____ crime. I'm interested in profiling and predictions and in opportunity structures. I'm into _____ pretty much anything you can think of I'm fascinated by. A lot of people think I am a geographer. I don't know why, because if I'm around a geographer they can tell I'm not at all. But I just want to *[Laughing]* I love geography. I love everything about it. I love criminal justice. But that's it. And we just had a second child, so if I'm tired it's because last night was the closest thing to normal sleep I've had in like a month. I slept real good. I told my wife to call me

every time the dog woke up. She didn't, but I felt like she did. *[Laughing]*

Wil Gorr:
I'm Wil Gorr and Derek just gave my bio except for the second job. *[Laughing]* I hung out with geographers most of my academic life, but I'm not a geographer. I'm not a criminologist either. I'm just kind of a jack-of-all-trades. I'm at the high school public policy management at Carnegie Mellon University and I worked with Al Blumstein, Jackie Cohen, and Danny Nagan and that crowd for the last twenty years. Actually, Al was my dissertation advisor for the – much earlier. I've been working in crime mapping since the DMAP days. I think where I met you, Tom?

Tom Rich:
Yeah. How far back does that go?

Wil Gorr:
Uh, it goes back to early 1990. And continued to work in Lou Perry's place in that area. I think what I can bring to the table is I've grown up with the feel of forecasting as a discipline. The past 25 years have been with an association called the International Institute of Forecasters. It has an annual conference and a journal and I've been Editor of the Journal and so forth. I've organized conferences. What goes on there is comparative EMP analysis validation and forecasting methods. And there's twenty-five or thirty years of journals. There's two journals now in that field of experience. On how you validate that methodology predictive component. So I have that to bring to the table. Also, it turns out I teach in software development with GIS in particular. The first student project we did a small computer and dispatch system. It had a GIS component and we built automated crime mapping packages that take those steps out solutions so that you can press the button.

Jay Lee:
My name is Jay Lee. I taught at Kent State University for a number of years. I am known around as one of the applied geography conferences. For a living, I teach jazz almost twelve years at my university, but for personal interest I started out as an applied geographer, which means I would take the geographical theories and so on and find different areas to apply them in, and just to perceive that something that I can contribute in that process. In 1992 I remember the only paper I wrote was about crime and relate research in 1992 to create a resource service telling people where are the _____ and so on. But since then I haven't done much

directly with anything _____ or in the area. I went back to methodology because after a while of that kind of practice, I found out we need to go back to see the basic methodology to see if we can move that forward. So I wrote a book on statistical analysis and GIS with my colleague George Mason. We're working on the second version of that now. And that's probably why I was involved. Many other things I don't want to go over exactly. I'm hoping that I can devote more time to research than I can now. I think I must have been a naughty teacher. *[Laughing]* Because my colleagues made me Chair of the Department now, so it keeps me out of the classrooms. But the downside of that is that I have to talk to people almost all day long. Help _____ any time to complain about me. And then _____ it's complain about everybody else. So we have to work this out. So I'm hoping I can get back to the research agenda quicker. So that's about it.

Ron Wilson: You didn't mention your urban _____.

Jay Lee: Oh. Just did. We yeah – we also do some software development. Funded by U.S. EDA. We developed web based simulation for urban growth. And that, I'm very proud of because a lot of my students worked on that and eventually they all know more than I do, and that's where out discipline advances. You can – anyone, any public citizen without much training in urban planning and so forth can go to our web site and in consideration see how their neighborhood may look like ten, twenty, thirty years from now. Based on a number of assumptions that they can easily pick from, and those who are _____ when they plan, and this will set a boundary for growth. Will foster growth and contact or simply allowing urban sprawl to occur. Should they be avoiding lots of _____, or maybe avoiding _____ and so forth. Thanks. But I didn't know if I should mention it because of that. _____ even though some people think even planning is a crime by itself. *[Laughing]*

Robin Wilfong: My name is Robin Wilfong. I just started my twenty-seventh year at Pinellas County Sheriff's office, and seven of those years I've been in the crime analysis section of the Sheriff's office. Back in 2001 I went into GIS in the crime analysis section and actually got the privilege of going to N.L.E.C.T.C. and taking the class for geographic profiling for property crime and after the class, we did return again in March of 2001 to take an 8-hour exam for the

geographic profiling, and I do – when I came back to the Sheriff's office I actually – they established a grant so I am considered a geographic profiling analyst for the Sheriff's office to do property claims. And I do use the system Rigel. However, our agency is also looking into calibrating the county for CrimeStat. Basically the cost issues, so we are looking into that, too and working with NLECTC. A couple of years ago I also went to our local college and talked to them about establishing a program for GIS and crime analysis and starts this Fall. Which I get to do some teaching for – as a subject matter expert. That's all I can think of at this point.

Sean Bair: I guess it's the practitioner's corner here. My name is Sean Bair. I'm the program manager for the crime mapping and analysis program. It's a sub-program of the National Law Enforcement Technology center. Rocky Mountain Region. I went to the southeast region once. I've been doing that now for about four years. Prior to that I was a police office for the Tempe police department in Arizona. Prior to that, I was a crime analyst for that same department, the Tempe police department. I became a cop because I kept hearing as a crime analyst all the time, oh, you don't know. You haven't walked the streets or it's like that in the crime analysis world, but wait 'til you hit the streets. It'll be different. So I decided okay, I'll be a cop and I'll be able to talk that side of the talk, so that's why I did that. My other hat is as a software engineer or a President of a software company. I've had a little software company, Bair consulting for about ten years. And we've got an application, that actually identifies crime series and patterns. So kind of, taking law enforcement data and identifying the fact you've got a beltway sniper going on. I don't know if you could just through the media, but it identifies the fact that, you've got a series going on and allows them to predict how next where or say, when the _____ will strike, so that application attack is in use at more than seventy-five police agencies across the world, including the Department of _____ and some other big ones as well. So I kind of bring that side of the table to this – I mean, that's out of my, my background, so... That's me.

Debra Stoe: I have a question. Were they right, that you didn't understand there was a crime _____?

Sean Bair: They were absolutely right actually. *[Laughing]*

Joe Heaps: My name is Joe Heaps. I'm officer of science and technology at N.I.J. I work very closely physically and professionally with Debra. And I manage the information led policing portfolio there which currently encompasses information sharing, data analytics, location and tracking and that portion of critical incident management that is law enforcement of correction center. And I'm here to learn as much as I can. I'll do my best to listen.

Debra Stoe: You'll only do your best? *[Laughing]*

Joe Heaps: And I can promise no more.

Pat Brantingham: I'm Pat Brantingham from Simon Frazier University in Vancouver, Canada. And I teach criminology, but like some of you, I come from a different background. I started off in theoretical math. Did my Masters. Some of the, women in this room might understand that when you get married, you have a choice. You either _____ be here or you stay with your husband so I decided okay, I won't do that, so I design computer systems because it was long enough that computing science – companies didn't even really know that there – that math had nothing to do with computers. So I took the job. So then we moved around. We'd go like _____ urban planning but we're in Florida and then Tom's okay, we're going to move and once again I was doing health care. But I'd done some in crime and it was like oh, I get a job, on the west coast. He gets a job on the east coast, so we're going to have to come to a decision. So I say okay, law and health, and then comes crime. So then we move over to crime.

All that's kind of a lead-in to say like what is so good about this group is it's highly diverging, lots of background. Some people confuse me with a geographer, except geographers never do that. A lot of geographers, you know. At SFU we have an institute that works with police and works with other parts of the justice system. They have partnerships and we have available the data and we can point where we need the police.

For example we have, one of our databases is eighteen years worth of police data for Vancouver city. So it's a really good arrangement. A bit of this is a lead-in and I'm

sure I will mention it again, and I'll try to be as restrained as possible, but I found reading is fascinating in the sense that I was being attributed for having said things that I never did. For a theory that was never experienced. For those of you who have more of the computing science background would understand that back in the '70s my husband and I we wrote a paper and do it like you know mathematical way and we start with here's the easiest assumption. Assume everything's equal in all directions. Figure 1. Figure 2 is let's change one characteristic slightly. That's all they're using is Figure 1 and Figure 2. So that – those were just mathematical steps I took. Here's more of what a real model looks like. That was kind of a shock.

I would like to say one last thing that someone related to Kim Rossmo. I was not on his committee. I've never read his dissertation. My husband was his senior supervisor. But I do know him. But not in the sense – however, our lab has been given and, of course, downloaded CrimeStat and we have both versions of Rigel added into our lab for analysis.

Mike Shively: I'm Mike Shively. I'm a fairly generic sort of criminologist, research methodologist. I had training in criminology and evaluation research – not software evaluation, but program and policy evaluation. I was one of Peter Rossi's students. Rings a bell for some people, not others. And I've worked for the state prisons of Massachusetts for a few years, doing research for them. I was on the criminal justice faculty at Northeastern University for a few years. I've been at Abt Associates for three years and doing mostly law enforcement evaluation. And quite a bit of what I do is actually ___.

(Side conversation) (I worked with Eastern Kentucky, in Kentucky.)

Mike Shively: Anyway, I'm here mainly because I work for Tom Rich and Tom Rich is the brains behind our mapping capabilities at Abt Associates. I'm, here to provide general support and have some ideas about probably the biggest contribution I'll be able to make is to try and figure out ways to do some of the survey work that would maybe be useful in things like, user – usability and user feedback.

Tom Rich:	I'm Tom Rich from Abt Associates. I worked at that now for about ten years. I think coming up October it'll be ten years and I worked with NIJ's mapping center over the last ten years. I've been crime mapping since the end of the '80s. I build software occasionally. I built School COP, which is a package that schools use a lot to analyze incidents that occur in and around schools. It's used widely. Before I came to Abt, I worked for a small company, about ten people, and we did a lot work with police patrol resource allocation models. Which I think had some very interesting parallels, to what we're going to be talking about in that it sort of came out of academics. It was implemented. It's hard because they're – people didn't understand what they did. What was behind them. And they weren't all that successful. And anyway, we can talk about some of the commonalities.
Shari Pfleeger:	I'm Shari Lawrence Pfleeger from RAND. I deal with the _____ where I was teaching _____, and I'm sort of the odd duck here because I'm the software expert and I don't know a lot about criminal justice. But RAND does have work with NIJ's criminal justice I understand. And having read through the briefing book, I realized that a lot the problems that we work on have a lot of bearing on the problem that we're here to discuss. For example, last year I had some internal R&D money from RAND to look at what we called "collecting the dots." Everybody's talking about connecting them, and we looked at, well, how do you know something's a dot in the first place? How do you know _____ important enough to start tracking or call somebody else about. And how do you tell them in a way that doesn't flood your inbox if you don't pay attention? And then we'd just gotten some money from one of the intelligence agencies to look at some follow-on work that has do with emergent behavior. And how do you know that something's about to happen? So hope some of that is relevant. As a software person I've been involved for many years helping companies look at the software that they were building or buying to see how it was helping the bottom line. Is it any good; is it doing what they wanted. So _____ but give you the engineer's point of view of the software at this point if you – whether you evaluate software.
Debra Stoe:	I'm Debra Stoe. I'm with the National Institute of Justice and, I just want to reiterate that this is a very diverse group.

And I'm so excited. I'm trying to contain myself. *[Laughing]* it's difficult. Sitting here and I cannot imagine where the discussion is going to lead. And that's just— *[Laughing]*

Ron Wilson: I'm Ron Wilson. I _____ do contact _____ way, shape or form in the past, and Deb thinks it will be difficult to contain herself. As many of you know, we've gotten into many discussions and arguments here will be exponentially difficult _____. *[Laughing]* So on that note. Keith?

Keith Harries: I was wondering if Abt Corporation has a soundproof room? *[Laughing]* where Debra and Ron could go and scream.

Mike Shively: We have a cognitive testing lab. *[Laughing]*

Keith Harries: Well, thank you. Obviously it has been said, it's a very diverse, very interesting group. The agenda calls now for an overview of the software packages from Derek and I'm sure this will be ground that we'll revisit periodically according to the agenda.

Derek Paulson: What I'm going to try to do is just try to give you a quick overview of everything. I'll be honest. When I picked this up Tuesday and I looked through it, I was so proud that I looked through it and saw my name next to that one part. So it's a little _____ but I know. I've used all three of these software packages quite a few times. Has anyone used all three? I'll say – and there's a reason I'm saying all three. The fourth one I've never been able to get my hands on. The one built by Maurice Godwin and it's Predator and I've tried. I've contacted him. I've talked to him, but I've never been able to get a copy of it so when I say have you used all three, those are the only three I've ever been able to get a hand on. I don't know anyone besides Maurice who's ever used Predator. So, has anyone used Dragnet, CrimeStat, and Rigel Analyst, all three of them?

Now I can give you a quick overview and I actually have all three of them on my computer, so as the day goes on, if you want to come up, I've got a lot of sample data. We can look and see how all three of them – you can input data, output data, what you get. And the differences in what you see from the exact same crime scene.

What I was just going to do is talk about data entry. A quick bit about analysis and the output for all three. They are three different packages. Rigel, because it is commercial, they put a lot more into the experience. From an input standpoint, it's probably, with arguments about Dragnet, it's probably the easiest to input data. From a standpoint that it gives you a couple of different options. You can import data from a DBF file or other types of data, or other types of files. You can also simply – it's got a mapping data base. MapPoint is built right in. And you can just simply type in your address, type in the city that it's in, and it will map it right there for you.

They've got a dropdown of various different crimes. Rigel Analyst what I'm speaking now - Rigel Analyst is designed more for property crimes and the majority of crimes that analysts will see in terms of a serial nature. It was not designed in terms of purchase to be sold for serial murders, serial rape. I think arson's in there. But not more of the serious type crimes. Although, I have been assured by the ECRI people that it is the exact same _____. But when you input the data, you drop down, you actually select the type of crime and put in the date as well, and that comes back giving some of the analysis.

The key part of it – it has a wonderful map. It's got a beautiful face map of the entire United States. And so it is very difficult for it to not find a crime. You can go in and add X and Y coordinates. If you don't have – if it doesn't exactly match the address that you have, you can put in X and Y coordinates so that you can match it exactly how you want it.

A key thing within all of this discussion I think will be the search area. I'll include it in here instead of the analysis, but Rigel creates the search area for you based on Kim Rossmo's calculations. It is the only one that I really think does create it's own search area. CrimeStat does not. CrimeStat is a user-defined one. Dragnet is pretty much user defined as well. By how you just place the dots on the map. But it will – again, it's designed from the front end, from the very beginning to be very user friendly and it is in terms of data – from data input standpoints.

In terms of – I'm going to go right to this. CrimeStat, a little bit more difficult. CrimeStat is a stand-alone

program. There's no mapping software with it. It requires a stand-alone GIS to – or at least some form of GIS viewer to work completely, but in terms of inputting data, you need to have data already in a DBF file or Excel or shape file or some other form. Now it does accept quite a few formats. But you need to already have – you have to have X and Y coordinates. Whereas with Rigel, you don't. You can just have an address. But you have to have X and Y coordinates for – or some form of geographic coordinate system.

Again, you have to have a user-defined search area and when you do a profile, you actually have to create – you have to have the bottom left-hand coordinate, and the top right-hand coordinate of your search area. Which you have to put in. It's called a reference file. So you've got to have first your point file which you have to go in and set up. Then you have to have a reference file. Which is what the search area has been defined as. So there's two different files that you have to create. Now you can save that for later use, which if you do it more on a constant basis for some form of analysis, it's good to save it as reference files. But it is a little bit – consensually it's not as user friendly at all, as Rigel is _____ in that aspect in terms of _____. But again, it's not extremely difficult. There is – as I mentioned, there's no data map. There's no base maps of any sort. So when you're inputting data, you're just inputting data and it's really – it's a dropdown menu. It works fairly – again, it's fairly easy once you've done it first time. It's just that initial step of trying to figure out how you have to have the data set up to do it.

Dragnet – again a very different user interface. Dragnet – in a lot of senses it is the easiest to input data, because how you do it is simply you take a paper map with your points on it and you put it on top of the screen and you match the points to the screen. I've done some analysis with Dragnet and I'll—

Tom Rich: I don't quite understand what you mean.

Derek Paulson: You take – and you've got your crimes, you would trace them on a paper map. And you would take it and put it on the computer screen and you would take your mouse and _____ along those dote, so that you'd have it an equal – it's very easy if you have a tablet PC. And that's how I've

– when I done some work with it, I've had a tablet PC. It makes it much easier in terms of – so in some ways it is very easy to input data. In that you're just simply—

Pat Brantingham: Can you zoom in or is it—

Derek Paulson: You can do – there is some zooming in function on it. Not to the extent – it's a dropdown menu and you click zoom in and zoom out and it goes in – but there is no map.   No map. You cannot put in map data. It is simply, you are looking at a grid. And so there are no geographic features in – and there will never be, as far as I can determine. There are no map features. You will not ever see a base map on Dragnet. You cannot export data either. When I've done it, what I've done – since I'm inputting it with a piece of paper, what I've then done is when I've gotten the output, I retraced the output, taken it over to an ArcView and created a shapefile with it, so I can then do it on ArcView. So very different kind of a user interface in terms of putting in data, and how you work with it.

In terms of the analysis, I'll go back to Rigel. Only one Distance Decay function. And this is different from some of the others. Rigel has a standard Distance Decay function. What it does have, though, that is different – it has an expert system which, when I mentioned before, when you input data on Rigel you input the date as well. Now that's one of those things in terms of crime analysts, they'll often say – especially with some crimes, you won't know the exact date, but that's a given. You've got to burn bridges. You're working with a range of times, but you put in your best guess and do it and it has some function to put it in, in terms of how you do it. But it will stick out from the expert system based on if they're too close in time or too close in location. And I've talked with ECRI and it's – it works pretty well, but you can turn it off. So in terms of analysis you can what they call scenarios, which are various different – you can run it many different ways. You can do it with all the crime points, you can use the expert system which will – may weigh out certain crimes based on time that they occurred or how close they are to each other. And then you can do your own weighing out crimes, which you may feel for theoretical reasons that maybe these crimes, I don't want to have as many. You can run many different scenarios.

That allows you and gives you some ability to play with it a little bit more. When you do the analysis, it provides you with some – you get some basic statistics of each run. What they call hit score. Which is the percent of the search area that it has reduced down to, the fields it's in. And it'll give you the square mile area, which I think minus kilometers. But you get a basic area of how large that is, especially compared to the field notes that you did. You give a measurement of the search area as well. So if you're going from a 90-mile search area, you can reduce it down to the top 7.9% which will be around seven square miles or something.

And it'll give you those factors and it'll you a beautiful map. Color shaded, showing you the highest probability areas. And you can reduce that down to whatever percentage you want – down to 1% which is a nice thing with Rigel. If you want to say well what's just the top 1% of that search area where you think that maybe you can type in one, have it calculate it – it'll show just the colored area where it's that top 1%. It gives you some ability to edit the map and in that format. That's very nice.

In terms of CrimeStat, there are five built-in Distance Decay functions. Which I always confuse. But there's a negative exponential, a normal, a lognormal, a linear, and one other. Truncated negative exponential. In addition to that, you can calibrate CrimeStat with your own data to make it city specific. Robin, I think y'all are in the process of doing this. And I think Bill Candor is help doing this with Baltimore. If you use a lot of data, if you've got a lot of data on – I think it's crime data, you can create a Distance Decay function based on that city's data or that area's data, which can then be used to run a profile. So you can make it city specific, which can be very nice.

It gives you very basic statistics in that it gives you the X and Y coordinates of the top point locations, as well as the ranking on that top point. I guess it's called the Z. The Z _____ particular top point. So very – again, basic statistics. Different from Rigel. Does not give you the same statistics that Rigel gives you.

In terms of Dragnet, you can – it has a basic Distance Decay function and there are others that you can load in. You have to create those functions yourselves and put them

in the Dragnet format. I've not – I'm not capable of creating the Distance Decay function off the top of my head, so I've not done that. When you do it, there's basic analysis. There – it just basically gives you the map. Shaded on the side there is a color lamp, kind of a legend showing you the greens and the _____ highest profile – highest probability area, the lowest probability area. Again, there's no mapping. There no base map. There's no city – doesn't have no rivers, no streets, nothing on there. But – and there's really not a lot of statistics with it either. It gives you what's called the _____. Mean inner distance point, and you can put in like a central _____, but there is a report function on the dropdown menu, but it's been disabled on the version that I have so I'm not sure what else you might be able to do with it, but that's as far as I've been able to do anything with it.

The final part I'll talk about is the output. Going back to Rigel again. I've already mentioned that you do get a nice map output. Again, because Rigel is designed more analysts and again, it's a commercial product. They put a lot more into the back end on this as well. You can create reports with it. It's got a report-creating function. You can take picture snapshots of screen shots you've got, integrate that into a report, and then edit that report.

You can prioritize suspects. You can put in suspects' addresses and it will, based on the profile, it will prioritize the suspects and say which one is most likely to be an offender, based on where he's _____ suspects. It will give you, it'll give you a percentage score for each one.

Again, very user friendly in terms of being able to create a report and give it output that can be used in an analyst's aspect. CrimeStat, as I mentioned before, sometimes you need to have another – you need to have map info, art view, surfer. Some other GIS to view the maps. But what you do, again there's editing. Once you get it in the shape file, I've always used Arc View, it's very _____. You get a shape file, the first thing it just shows you the grid. It's a mono-color. You have to do – you have to go in and edit it, but it gives you color ramps. You can go in and change it however you want. And you can – again, you can see the exact highest location point and you can do a fair amount with it, once – again, assuming you're knowledgeable in GIS. Do it. There's no report function. There's no suspect

prioritization that you have with Rigel. Again, the statistics are a little more basic. But again, if you have knowledge of how to use a GIS, it's not at all very difficult.

Last one. Dragnet. Again, no geographic features. No base map. No ability to export results. You can't save it and put it in another format. So if someone else has Dragnet, you can ship them the Dragnet file. No real statistics. Again, the way that I've put it onto a map, I've just retraced it onto a piece of paper and created a shapefile with it so that I can put it on a map to see how it works in terms of street location and all. It's a lot more basic of a system. But it does give you – gives you a profile which you can use. It's just – you have to have more knowledge in your head of what you're looking at when you see it.

That's kind of a rundown of the three software systems. Again, I have all three on a computer and I can go through them. We can look at them all with some simple data so that you can see how they operate in terms of _____.

Mike Shively: I just want to say that if you think that it would be helpful in determining how to go about evaluating these packages, that we have the capability to hook it up where we can, watch them.

Derek Paulson: It might be a good little thing that we both look at the same crime scene series across all systems.

Wil Gorr: How does Dragnet get the scale of those points that you put on the maps so it can--

Derek Paulson: You actually have to – and I missed that. You are suppose to enter in the scale. It gives you _____ using, when I've always input, I've taken crime points off of ArcView. And so I'll have the running – it asks you for the distance in kilometers along the bottom axis and what I've done is just taken art view and measured along that bottom and converted it to kilometers and just given that. So that's how it works. I forgot to mention that. That's a good point. So that's how that works in terms of the scale.

Tom Rich: I should also mention in my conversations with David Canter he indicated that he's going to be upgrading the user interface. I guess he got a contract with a law enforcement agency to do that.

Derek Paulson:	I talked with David about it. Cause when he first sent it to me and I didn't know how to get data in it at all. And his first comment was just go to the web page, and I looked at it, and I sent him an email and said, know how to get _____ in there. Once he did, it made things a lot more clear in terms of how to do it. And again – in many ways it's very simple. You just simply put them all in that way. It just is, in terms of accuracy there may be – there may be some issues in terms of how accurate you actually are. And it does – you're inputting on a grid, so. One other thing I forgot to mention, if you have crimes – and this will happen –you've got a series where you've got two locations at the same exact address. I've not figured out how you can do that in Dragnet. You can't overlay it one on top of one. It will not record the same point twice. So you – you're out a crime in a sense. If you've got two done in the same location. Which you will have in certain crime series where you'll have burglaries, or commercial robberies. They happen in the same place twice _____. But you won't be able to input that in the same location twice.
Jay Lee:	I'm curious about cost. Do you happen to know about that?
Derek Paulson:	CrimeStat free. Dragnet, obviously free for just asking David Canter for it, and he just sent it to me, and Rigel is now up to 6,000. I think I paid 5,700.
Tom Rich:	Yeah, I think Rigel is – they have two different versions. One is the – one is 6,000.
Derek Paulson:	One is Rigel.
Tom Rich:	Right. Rigel Analyst. I think when I talked to him he said it was 7,500.
Pat Brantingham:	He's speaking Canadian?
Derek Paulson:	Well, maybe that's it. 7,500 Canadian. *[Laughing]* I paid 5,700. Yeah. I paid 5,700 for it about a year and a half--
Jay Lee:	That's for general or community or government users, right?
Derek Paulson:	They're not – I don't think there's any rates.

Tom Rich:	I think that's just for commercial users.
Robin Wilfong:	_____ each year and pays $1,200 in eight years.
Shari Pfleeger:	And then training's on top of that?
Pat Brantingham:	That's for the full blown one. If you get the $60,000 you get the big one, then there is training that goes along with it.
Derek Paulson:	I think it's a year.
Pat Brantingham:	However, most of the people that I have known who have done the full training I think are analysts.
Derek Paulson:	And that's what became _____ a lot of the people who have Rigel are using Rigel Analyst, because people who have Rigel are just – a lot of the people who have Rigel are Rigel Analysts, because it's just – the one thing Kim has told me about Rigel is it's – you've got to have – you've got to get the base map. Whereas Rigel, he uses Rigel Analyst I think almost consistently because it's got a built-in base map as opposed to Rigel you had to go through and get a base map. Rigel has a lot more statistics and other things with it that Rigel Analyst may not, but I think what they did when they created Rigel Analyst was to take the top things that they felt people needed and put those in there. And fixed some of the issues that have Rigel _____. Because Kim would say when I would show up to do a profile, I'd have to tell him find the base map for this place first and foremost, and trying to find a good base map for it got to be a very – for some of these locations it was a very difficult thing. And Kim said, this solved that problem put them on top of map one.
Pat Brantingham:	And Rigel was set up – designed around – on a _____.
Derek Paulson:	Right. Yeah.
Pat Brantingham:	So it's just a _____.
Derek Paulson:	But he's told me it's the same algorithm so in terms of doing an analysis you get the same. So.
Keith Harries:	Any other comments? Questions regarding things at this point?

Tom Rich: Well, I think I highlighted that these were built for very different reasons. One was built to sell. And so obviously they're going to put a lot of work into the user interface. Another – the Dragnet was built to serve its own purposes I guess. For doing Canter's own work. Predator, that's what I was told – it was for Godwin's own work. CrimeStat is primarily for researchers, rather than practitioners.

Jay Lee: May I ask them questions. *[Laughing]*

Keith Harries: At your own risk. *[Laughing]*

Jay Lee: Well you guys absolutely quiet, because in my mind, I kept comparing to this one table with the technical panel that I attended at the HUD _____ a few years back. At that time HUD was trying to evaluate software so that the agency could buy several hundreds of them. And distribute them to different housing authorities as opposed to _____. Where I am still not clear about what is the intention and what is the format, or and if there is any plant at all. For example, if you were thinking of doing what HUD was doing, then of course, it's _____ how much it costs is one thing. Renewal is another. Licensing and so forth. On top of functionality. If you wish to provide advice to say law enforcement _____, then workers will be very different. You cannot assume all the police will be as good and _____ *[Laughing]*. Because my experience is that sometimes we have more senior member on staff that no one can get to use it _____. So the consideration would be very different. I, these are the kinds of questions I have on my mind and until this is addressed to some degree, I don't really know what I can contribute.

Debra Stoe: That's an excellent question. _____ Basically as the National Institute of Justice which is a leader in the research, and what we want to do is establish some sort of documentation as a _____ the long-term plan. That will provide law enforcement with some sort of guidance. They have limited budgets. They have – they are pretty much typically at the mercy of those vendors. The vendor approaches them and says this is what I have to sell. You know. They don't have the resources to go and investigate that and evaluate it on their own. So they look to us for that type of advice. This is an area, if you're going to profile a software that's been around for a while, and we

have _____ all necessary which one we use, we can't say that. Especially when it's a proprietary software. We can't say ArcView is better than MapInfo, and that MapInfo easier to use than whatever. We have to be very unbiased. So what we're trying to do is combine that type of documentation that can go among others and say, this one does this. This one does that, and – they still make the choices themselves. But they do have some unbiased information that they can base their choices on it. So that's our intent.

In addition to that, the software that's out there, to my knowledge, pretty much – most of the evaluations have been done by the creators. And for that reason alone, it implies bias in the results. Which is another reason we want to make sure that we're totally, removed from this evaluation or development in technology. In addition to the fact that geographic profiling has become a buzzword and the general public believes that these softwares do what they say they do. Because they're available. You can buy them. People can use them. So that's the general belief. But there's actually no evaluation to substantiate that they do. So that's the intent and purpose of this.

Ron Wilson: We're trying to define quality, but that term _____. In the sense that any software that ranges from free to $60,000. Now without this kind of guidance, we're sending out some sort of methodology to somebody that's actually checking these out. I mean $60,000 may very well be what they need instead of free. Because it does something more, has more capabilities, it's output is more accurate and what-have-you. Or the size of their data and so forth might dictate them that they need this material. There's all kinds of things I can say about different packages, you know. It's just like – there's a whole barrage of things to consider there, that I think that law enforcement – they don't have the resources, time which contributes to their ability to actually evaluate the software for these kinds of things. It's just overwhelming. It's just as well they read what's on the web site, talk with a few people. Things like that. You're having the same objections on subjectivity that might not give them what they really need, until they buy it and they say ah, you know what? With a little more investigation and a little more effort we could have used this package instead of spending all this money on this.

So like I've said. The geographic profiling software is a buzzword. And as that starts to happen, I mean with the sniper cases, it really became a nationwide and I think well, starting in Canada with some of the cases up there, and then the next big case you heard was in New Orleans. There was a serial murder going on down there and then the Beltway sniper really became, so everybody knows you have the profiling – it's just tried and true testing method and the software they're putting out there is something that's guaranteed to solve.

I mean, _____ we need to put this so law enforcement can say okay, what does quality mean to me? Does the theoretical underpinnings match this, to give us what we want? But they all seem to, they might have a different theoretical underpinning. The value-base. Is it worth this cost to give us what we need?

And from the user perspective. Is this thing easy to use? How much do I have to do? Do I really want to be tracing on a map and putting dots on paper? Or do I not need the graphics or the interface for the maps and so forth? So that's the kinds of things that need to be addressed.

Keith Harries: One aspect of this that I find myself thinking about in preparing for this was the briefing book, the perspective seems to me is primarily the supply side perspective. The emphasis is on the software. What are the characteristics of the software? What is the quality of the software, how are they defined? Those kinds of issues. It seems to me that there is a demand side, dimension, that we should at least consider somewhere along the line.

For example, the U.S. has about 18,000 police agencies. And less than 1% of those serve populations over 250,000. So 74% serve populations of less than 10,000. There seems to me then that this software is really only going to be accessed by that upper echelon. Last week I thought, the way to get a handle on this is to call my local police department and just ask the question, do you think guys do anything with this? I live in Howard County which is actually next door to Montgomery County, where we are now, and Howard County has a population that's right at that threshold of 250,000. And I called up the main crime analyst, and I said George, do you guys do any geographic profiling? And he said what? What's that? Simply

because that nomenclature wasn't really familiar to him. I mean, they do geographic profiling. They just don't call it that. But then I asked, do you use any of this – any software packages to do that? Any dedicated, specialized software. He said no, we just look at clusters of points and when we think we have a series, then we look for a parolees, or probationers or repeat offenders and then we try to, dot the Is and cross the Ts. So I guess my point is that it seems really very unlikely that the smaller agencies are going to be able to use this software. Or are they? I'm going to make that a rhetorical question. What do you think about that? And if that is a valid point, then are we really only talking to the largest, that very small group, of very large police departments? And if we are, then does that change the nature of this discussion? So I'll just throw that open for your consideration.

Robin Wilfong: Let me tell you, I've been _____, but kind of share a thought, too. There's a million population in our county, but we have 13 different jurisdictions. And the area – some of those don't have any analyst at all. Some of them may have one analyst. So under my grant I actually cover the whole county as a, for the profiling I'll have the analyst send me the crime series. And not only just our county, but I handle Polk County, Orange County. not just the Pinellas county area, but I can see the smaller jurisdictions would not participate--

Keith Harries: But you've been known as kind of an ad-hoc regional solution.

Tom Rich: Do you think there's a sense of, I mean, if I'm from a city of 100,000 people, how many crime series of serial burglaries, serial whatever, are we talking one a week? One a month? One every six months?

Robin Wilfong: Well, I can tell you probably over the last year, just for our county alone, I've probably done about twenty series _____.

Tom Rich: That's from a million population.

Robin Wilfong: Yes.

Tom Rich: Twenty. So a little over one month.

Sean Bair: The department I work for had a population of 165,000 people and it's a pretty affluent community. Just kind of traditional methods of analysis. You know. Hand tabulated notes about crimes that have occurred. We're about one per quarter. When we started automating that process about one or two per week. So everybody has crimes. That's the big key right there that I think we don't really know. No one knows – the key to all of this – one of the keys is, is that everything is data. And does the agency even have it linked? And how do you know you've got a linked series? How will you know? And these small towns, I mean, I taught in Boom, North Carolina, and I talked with the agencies up there, and the one thing they always said was well, our crime is, in the town named Boom, we're talking beach, mountains, and we're talking meat camp. But you're talking very, very small towns _____ North Carolina, and they all – they say our crime is their crime. You know. The same people committing our crimes is the same people committing their crimes. I mean, they're very closely – geographic close town. They don't have a lot of crime. But much of it may be linked. Now, how do they know they're linked? That's a different question. And that's a thing, if we could find – if they could know they were linked, they might _____ as Sean said. Once they start automating, they were doing a lot more because they were having linked series – they just didn't know. And that may be an issue that you run into in small towns. Especially in rural areas we're dealing with this in eastern Kentucky. how do you know? There's probably a lot more of it than they know about.

Derek Paulson: We actually had conversations before I even started doing this. It's called tactical crime analysis. That's what this whole process is. This method of identifying crime series is called tactical crime analysis. I actually remember having a conversation with my supervisor that should we even undertake to look for crime series. Does our affluent town have, the series that would necessitate somebody going out and actually looking for them. As a result, they're one of the few departments that have actually hired on a fulltime tactical crime analyst, because of how many crime series they've identified. It just goes back to, criminological theory. This small cohort of individuals create a, vast majority of the crimes.

Shari Pfleeger:	I think this is a related question. A few years ago I was looking at the notion of expertise. How do you become an expert related to software, and _____ process. What I found was that although there are a lot of software modeling tools similar to what you're talking about, in fact, most of the time expert judgment worked better than software did. So my question to you is, especially for the smaller communities, there are people who have this, expertise, this sixth sense where if you ask the software and you ask them, by the time it takes you to set up the software you have some guy in your office who says, that sounds like John Doe who lives over here. Maybe we should go question him. And maybe this expert doesn't even articulate why he thinks John Doe is the right person, but in fact, the expert is right. And so my question is, when do you rely on the expert judgment of people in the crime field and when do you need to look to the software to do things that the experts can't?
Mike Shively:	If I can try to – I'm just going to try to restate my understanding of what NIJ is trying to accomplish with this roundtable, and I guess relevant to the things that are in status. I think regardless of the size of the market, regardless of the size, or how many people are actually using this – whether it's a thousand or a hundred, isn't what you're trying to accomplish is to provide guidance for whoever's interested. The thing is that we don't know what the market size is right now, but these products are out there, and law enforcement agencies are, in some number, are using them. And a lot of others have considered them. So we just – since the products are out there, we're trying to get guidance. I think we're starting in our discussion right now to evaluate the software. We're starting to say, does it really work? And I think we need to – again, correct me if I'm wrong, but I think what we're trying to do is get to the point: since they're out there, and they're being used, are they doing any good? I mean, are they useful? That's one of the things the evaluation's going to answer. The evaluation itself. So then the question is, how do we tell? And I think that's what we're trying to put on the table. Is that right?
Ron Wilson:	That's correct.
Tom Rich:	Also, just a go-around of what Sheri said. That I think we have to say, is the scope of this evaluation only on these

	four packages, or is it on putting these in a context with other methods? Like expertise. Because eyeballing… I think the guy probably lives over there, just because this is, you know. So are we comparing these packages to these other available techniques?
Mike Shively:	I think the long-term research agenda, I think it'd be fascinating to get inside the heads of crime analysts and investigate. Now they're using some metrics, they're calibrating without even knowing it. They're prioritizing factors. What number of factors? And I think if somebody wanted to build crime analytic tools that are really going to work, then you try to find analysts that know what they're doing and seem to have a good capacity for prediction and find out what's going into those decisions. We build a software upon that. In terms of these software packages that are out there and Keith's point about what percentage of all law enforcement is likely to use it or can use it, I think one of the important issues there is Who's our audience? What are we going to write, who are going to be the users of the evaluation that we are trying to design. Are we talking to crime analysts? Police chiefs? Operations chiefs? Command staff of law enforcement? Are we talking about the researchers?
Ron Wilson:	Well, we're trying to get – to develop a methodology here for a research group to undertake, which will then speak back to the law enforcement agencies from the local, state, and Federal level.
Mike Shively:	So, we're just trying to get method –
Ron Wilson:	That's a very good question.
Mike Shively:	And one of the issues that keeps coming up over and over, is to what extent are we really talking about doing three or four? Are we going to, just for the sake of moving the discussion and being practical, are we going to be able to evaluate Predator?
Tom Rich:	Well, in my conversations with Dr. Godwin, he was not interested in providing it to anyone.
Mike Shively:	And it seems like, we can have access to Rigel and CrimeStat, and that's – not access, but we can, propose methodology that will evaluate the, just disseminate them

widely enough. Dragnet, Cantor just wants to have, he wants to have research partners basically. So do we need his permission? I mean, we're going to produce some sort of evaluation method, and hopefully it's going to be generic enough that it doesn't only fit these three or four software packages.

Ron Wilson:　　No, it's not suppose to specific. It's just these are the ones that are available. And they're all commercially for sale so we don't need anyone's permission.

Mike Shively:　　You asked us to focus on these, right? So –

Ron Wilson:　　Right. Because we're the only ones up there, but there are ways the way the software industry works is that somebody's, somebody just doesn't step up to the plate to address user's needs or think that they have a better idea. And new ones will be manifest.

Shari Pfleeger:　　So will one for the outputs then be, in a sense, a requirement or specification to what law enforcement agencies and researchers would like to see _____. And then you take whatever's available and you see how well it's been accepted _____ specifications. May suggest to other developers that there's an opportunity to improve the software that's there, or build new software that's better.

Ron Wilson:　　I think that's an outcome that I hadn't considered personally. But that certainly – that's certainly something that's of tangible benefit to what we're trying to do that'll open up the market to people saying, let's take a look at this. If somebody actually does carry out the evaluation the results are going to ___. There're a lot of holes here.

Wil Gorr:　　Can I build on Sheri's point? I see a supply side comment here. They're separable in two components. There's an analytical methodology and some emergent theory, some design components, and it has an empirical validation. Those are all researcher questions. Does the methodology work? And then there's a separate issue which is do the software folks implement that methodology problem? And then there's another aspect of that which Rigel has user requirements in terms of nice things to have that make it a whole lot easier as the user of it. But it seems to me with only a couple of software packages at this point, you have relatively basic or simple methodologies are at this point,

they're enormous methodology questions and very large and empirical validation needs before you get to the software implementation. _____ you seem to have a question _____ with that same topic.

Pat Brantingham: Very much so. That is one of the things on the agenda is are any of these theory-based or are they just tools which go to the eyeball. I think that's an important thing to look at. But is what they're interested in? And given that, from NIJ's perspective, there's law enforcement agencies, but for these things to improve there has to be a research on them – a research component. So can we look at them in both of those connections and to add more to what you said, because it is – Rigel is starting to be supportive evidence in court cases. So is that one of the things that we look at? If it's being used by experts and prosecutions. That's another dimension. I'm not sure I'd like to give up on the experts in court cases. And CSI is changing a little.

Wil Gorr: Just really one experience. Working with this forecasting group over the last twenty-five years, we've had – we have annual conferences. We have journals. We have web sites and so forth. Now there's been – forecasting is much, much larger area. This is one phase that'll fit into that under the umbrella, this is one smaller area. But the empirical knowledge has built up as it needs to many researchers, many contexts, many methods, all looking at the basic same questions, over time, to the point where they are now principles. Where we say in this context do this. Over here, do that. If you're looking longer term, you do that. And so forth. So it's sort of distilled. So at our conference every year, the developers - software developers, they come to the sessions, they read the papers, and then you see what's going on the research world is showing up in the software at some point. So the neat thing about this organization is that it's like one community and there's the researchers' side and then the implementation of that in commercial software. So my point is I guess my earlier point was that research base just seems to be starting and emerging. And there are a lot of questions there, and then , if you didn't know what do to and then how you implement it in software is another question. A separate question.

Pat Brantingham: I think I actually agree with you and Keith is in one of the unique situations because when you use CrimeStat you're

working with the police and you have a very unique relationship. I mean, in Baltimore County.

Keith Harries: Oh, well, yeah with Phil Canter.

Pat Brantingham: With Phil who is extremely knowledgeable person. Makes it possible to do research and applications tied together, but that's real unique.

Keith Harries: Well, thank you for those comments. At this point the agenda calls for an overview of evaluation issues and we only have about ten or twelve minutes before we need to break. As you see, we have dimensions of assessment, applicable methods of evaluation and defining target audiences of evaluation results. Now as you might recall from the briefing from that, the dimensions of assessment were presented in the context of a manufacturing perspective and user perspective. Value perspective and I was if Sheri, would you care to comment on those? Because I know that you were cited there in that section.

Shari Pfleeger: Yeah. It actually comes from the work of a guy named Dave Garbin who wrote a paper about five aspects of quality and Ron took three of them, but the idea is that there are different ways of looking at quality. One is that – the one that Ron discarded was theoretical. Supreme Court view of pornography, for instance. I know it when I see it. So you don't explicitly define quality, you just can divide things into quality and non-quality. So the three here are a way of separating out issues. So – and then your factoring view is – if you look inside the black box, was it built properly and especially two things. We have jargon in software engineering for it. Verification and validation. Is it the right thing and was it built properly? So is the theory correct? If it is correct. And does the software implement that theory correctly?

So the manufacturing view is that if the workings of the software to see whether it's going to work properly. The user point of view, has more to do with the functionality. So is it doing the things that the user needs? So software may work correctly. You put the right inputs in, you get the right outputs out. But if it's not doing what you need, then from a user's point of view, it's not high quality.

	And then the third aspect is value and that has to do with more of tradeoffs. So if you spend $60,000 on Rigel, is that a good use of your money? So even if the software is correct from the manufacturer's point of view, and from the user's point of view, is it somehow displacing other things that you could be doing that would accomplish the same goal?
Keith Harries:	Under the question what methods are applicable to evaluations, I notice that there is a statement to the effect that there would be a formal experiment to test hypothesis. And I was wondering could you elaborate on that? You can pass me a note. *[Laughing]* Is that a fair statement or is there any background you could give us on that?
Tom Rich:	I think you wrote that. *[Laughing]*
Mike Shively:	No, actually I did. I mean it's justified. What methods can be brought to bear? That's a broad question. What can we do? The term I'm familiar with is, bench testing. If you're in the science business and assessing detection devices or something, you bench test it to see if that's a – does it function? Does it blow up? Does it do the things that it's trying to do? And one can also use true experimentation. Where you can set up a ___. It's really, setting up little tests. You ran the assigned cases and give one software package an opportunity to solve it and one group set up with different software, give it a chance to solve the same, set of cases. Things like that, in an unbiased manner. Trying to get it to test out, and it could have different meanings. Depends on if you're talking about user issues or just the manufacturing issues.
	In what instances would survey be useful, and I think in terms of user issues, there are cases where you just want to see it, if we're talking dream scenarios we're really being able to test this out, you take a set of people… experienced users possibly, and then people categorized as likely or potential users who are not familiar with it yet and say okay, open the box and let her rip. Try to do something with the software.
	So there could be, some sort of lab where you can bench test types of experiments where you – or not experiments. Exercises where you just say use it. And you look at things like error rates, time, proficiency complaints. Things like

that. Find out if it's useable or not. I would also want to see a – these are either alternatives or complimentary _____ which would be to gather user feedback and that would be some type of a survey. And I would imagine going through professional organizations through us because random assignment doesn't make a whole lot of sense. Possibly in random selection. Possibly with something as widespread as CrimeStat where you're talking a certain number of thousands of users. That may require that, but regardless of the sample selection, gathering feedback in real world conditions and there are benefits and advantages and disadvantages to having things occur under controlled conditions. And ideally you have both. You have the controlled so you can kind of do comparisons of different things, but also there's more artificiality there, so another thing that I'd like to see is feedback from the real world and real conditions with real data with you know the captain whose screaming at you, you know. Can you perform under those, so. Anyway, just talk about experimentation, but that was really what we were trying to convey was, to what extent can different types of research methods be brought to address all these issues.

Tom Rich: And I think adding one sort of cut that can be made is it fair or two different approaches are to have analysts use these as they are working on actual cases as opposed to doing an after-the-fact analysis? Here are some serial cases. Let's see how these packages would have worked. That's one approach. The other approach is actually have them use it while they're trying to solve these crimes.

Keith Harries: Do you foresee any difficulties in terms of cooperation from law enforcement as to testing and experimentation process used for it. I think perhaps Robin and Sean might comment?

Robin Wilfong: I would imagine some agencies probably would. But I think probably the best approach would be to utilize the agencies that maybe some of their analysts who have gone thru the N.L.A.C.T.C. training along with, if we could find some agencies that I know somebody had said that mostly researchers use that. If you apply that small percentage of agencies that do use it, and we are getting ready to utilize that one once we get our county to calibrate it. That might

be – I don't know what you think as far as some of the bigger agencies.

Sean Bair: I think we're starting to get ahead of ourselves in terms of what we're evaluating. Are we evaluating the software? Just assuming that it performs a function that it's claimed to perform, or are we actually evaluating the methodology or the discipline of geographic profiling? I used to think geographic profiling was just perfect. I didn't need a specialized software application to do that. I knew what – somewhat methods were that you used to apply geographic profiling techniques and I could just – I used to think there was an art to it, so I think we really need to study whether or not geographic profiling, whether or not the fact that we have a crime series, whether we can derive the home location of a defender based on a distribution of points, or some of the reactions of putting analysts in front of the software and sort of test it, whether or not it's _____ having house issues or something like that. _____ evaluate, does the software work? Does this methodology work?

Now how do we do that is another matter that I think is very difficult because David Canner did a study where, I don't know if you're familiar with the study, but he evaluated geographic profiling and got a whole bunch of folks together and said alright, you're a seasoned investigator. Here's a map of a crime series, and you're an intern, and here's a map of a crime series, and you're a cop with two years on. Here's a map of a crime series. Where does he live? And by and large, the interns did the best. It was the seasoned investigators that over-thought the process – oh, he lives over here because of this and that and the other, and this happening over here. And they didn't do all that well. So I think we need, just have a methodology or how we should evaluate this.

I have one of those late-night things so it might sound a little odd as it comes out, but if – whether we're studying crime or something else, I think if – I was trying to think, okay, well, how could I study my wife's, patterns and how could I derive where she may live or her house is based on her, her spatial target selections. And could we just use real-world data? The fact that my wife goes to the market, goes to Costco and then goes and delivers stuff to the pre-school, and does all these different things. We have all

these actual, locations of events, could I apply this
technique using the software? And uncover where she may
live based on this. I think that – that kind of real world, but
saying the data we have, actual knowledge about versus
crime series. Crime series sometimes have, under-
reporting. Crimes could have been committed; other issues
that I think are going to, skew our results here if we don't,
be careful about that.

So I think we study just, somebody's distribution, some,
like your daily activities, I think that, shows us where you
live and then maybe this whole geographic profiling thing
could work. So maybe coming up with some different
types of methodology that way.

Derek Paulson: I've done that on my own, but also I teach a class in crime
and what I did with my students I have them like that. The
ten places they go to see how well it works. Just to show
that it really worked. I've actually got – if we show the
software I can show you Rigel and CrimeStat, how well
they worked in the profiling.

I don't have my student's results right now, but I had them
all do it just to see – just to show them. They're fascinated
by the whole theory and we do a big section on behavioral
geography.

Pat Brantingham: I've actually had students do that, too.

Sean Bair: Yeah. They love--

Pat Brantingham: Patterns and--

Sean Bair: I also have _____ maps. Does this whole commuter and
marauder thing come into play there, because again, with
my wife, I bring her up because we live at the end of a road
and all her activities are south of her, so she's a commuter
and I would think that your geographic profiling software
couldn't work on somebody _____, yeah, she's a
commuter, but it wouldn't work on her versus, it would
have work on only marauder. Is there a methodology you
can come up with that'll actually establish based on a
distribution of points, whether you're dealing with a
marauder or, if so, now you can use the software.

Pat Brantingham:	This is actually a community thing. This is part of how – this has to be matched with regular GIS or urban studies, because whether you're a commuter or a marauder might really depend on what the city looks like, though. And those things are really important
Derek Paulson:	Well, and _____ there are crime types that are more prone to being – I mean you have to look at the opportunity structure.
Pat Brantingham:	Where is the opportunity.
Derek Paulson:	Yeah, I mean, you're going to have to – if you want to rob banks. It's a lot different if you want to rob people on the street. If you want to rob someone – a street robber you'd think would be much easier to just go out and find a victim within two, three blocks. A bank robber, you're going to have to go to where the banks are. There's a difference in all of this and one thing, I've thought long and hard about you can tell a commuter from a marauder and I don't think there's any way that you can tell they caught the individual. I mean, I've really been trying to figure out. One measure I'm trying to use is dispersion. Just the distance between the two farthest points. Will that tell you anything about – _____. So that's one thing I'm really trying to figure out. Is looking at the distribution points and anything that can give analysts any kind of heads-up on will this profile the crime. And the thing that I've found so far that professes just the type of crime. You've got to look at city type as well as crime type.
Robin Wilfong:	I think going back to what Sheri said, though is did he know your area pretty well? And does he _____? You're going to know for a fact investigators and analysts, and that's what we look at. We use geographic profiling as a tool, but we use a lot of other tools and methods.
Derek Paulson:	Well, that's interesting _____ in terms of the evaluation.
Tom Rich:	I thought it was interesting. I was reading in this section on CrimeStat; it sort of admits that eyeballing works just as well.
Jay Lee:	Actually I have a slightly different view from – maybe it's the same, but to me it's not surprising. For example, the GIS, recently became such a buzzword that many people in

many fields are jumping_____. Now what GIS is doing is nothing new from what so-called geographers or other people have been doing. The difference was as we're doing the same thing with computers entering a larger body of _____ data in shorter time. Maybe with higher levels of precision _____, so listening to the points that people make, I don't know much about criminology, so that part about how accurate and what kind of functionality is needed and so forth, I don't have much to input, but I wish to provide an observation between for example Arch Info and Map Info is that in their early marketing strategies were very different. When you buy Arch Info, you buy a package of things – very expensive, but it literally can do everything you need to on your own, including preparing your database, including _____ analysis, and allows you to package a few steps _____ applications. But when you buy MapInfo, you buy those kinds of procedures where even preparing your own _____ money. Data and for _____ that's why I'm asking _____ earlier, when you give advice to these law enforcement agencies, do you expect them to be able to prepare data _____, listening to what they have to say _____ hire _____ are the people going to be able to _____ that way or do we expect they all have budget to hire someone to _____. So to me, evaluating software _____ that we have a list of functionality that people use the most, then it becomes straightforward to see which one does better and so forth, but let's not forget about where long-range structure of their marketing tactics. Whether there can be a national database established and shared by everyone, or we expect everyone to come up with their own _____ and so forth. So these are the kinds of things that a roundtable like this _____ now on the real testing is where I – to me, I can just _____ somewhere expensive you get, providing _____ data. _____ do it. You don't mind _____. So I say if _____ takes NIJ a lot more thinking to think about a long range direction. Are you going to try to have some funding effort to research this, say standardize the database or standardizing the _____, or are you going to – let's say, I don't know any of it. So I can say _____ are you going to have concepts to add more function or have concepts to make it easier for this _____. More user friendly. Are you going to help _____? Software to improve more functionality.

Wil Gorr:	Incomplete. But if we put it to a vote, I'm going to vote with Sean. I think we need to evaluate the methodology. Then we're evaluating the software, too, in a sense.
Shari Pfleeger:	And I agree with you and I think we need to be careful not to get trapped into thinking only in geographic terms. There are a whole host of under other techniques that works _____ a problem in completely different ways and might come with a better solutions or solutions that supplement what we can already do in order to improve the solutions we have now. So we might even want to think of something like having a contest regarding a description of what you want the methodology to be able to do and throw it open to a host of universities and you ask them try to adjust it with whatever _____. And I bet you'd get ____ that's the problem with. And then we might be able to put together _____.
Keith Harries:	Thank you. And also think about ten minutes. _____

(Day 1 – File 2)

Keith Harries:	It occurs to me that when we talk about theory in this context, we're really not talking about criminological theory. We're not talking about theory in the traditional sense. That theories refer to in the context of crime. Which typically means a set of conditions or situations that help to explain why crime is where it is. The theory in this context is very heavily vested in the concept of Distance Decay or the gravity model. And when we talk theory, that is substantially in this context of what we're talking about. With that, let me throw the discussion open and invite you to contribute your perspective on what you see theory being in the context of geographic profiling and perhaps some preliminary thoughts on whether the software seems to meet expectations from a theoretical side.
Jay Lee:	If I may. I wanted to admit from the beginning that I have not personally used any of the tools. When I – from Derek's description was that I don't remember which one that was – one package has several distance decay functions. Another allows users to define their own. Am I correct?
Derek Paulson:	It's the same. You can - CrimeStat gives you five functions and then you can also calibrate to your location, your

	jurisdiction as well, so you can create your own with CrimeStat as well. Dragnet allows you to bring in as many different Distance Decay functions as you want. It's just how you create those.
Jay Lee:	How about the--
Derek Paulson:	Rigel has the – just has the one Distance Decay function.
Jay Lee:	In GIS for example, when you produce a map that you want to use different colors to view the material, that represent a series of _____, you use different color _____. There are several classifications methods people who have might have heard of a major break, standard deviation, equal interval, equal distance and so forth. This is the same suggestion as that where they are different Distance Decay that you can use or you trust the software altogether? Now the issue really is not whether all software package is calculated is correct or not. Is allowing you to have more control. What if – I want to see how much difference the outcome may be if I choose to try different Distance Decay functions. I'm sure robbery is a crime. It might have different Distance Decay from say rape or a domestic violence or _____ I don't know. I'm just making that up. If they do have different Distance Decay, then from that point I would say it allows more choice, to try different things and it seems to me that this would be _____. So in terms of software, I don't necessarily need to know if a black box can be opened up. _____ from the choices. Perhaps _____ one of the--
Pat Brantingham:	The geographers can go to this site, too, and that's really – should you use Distance Decay?
Jay Lee:	That's one thing I cannot comment on is because depending on how criminology people think, the important of distance in that sense.
Derek Paulson:	And there's another instance of Distance Decay that I was talking to Kim about this a long time ago. About using Distance Decay using miles versus using times. And a lot of it's based on – a lot of Distance Decay are based on theory of crime. Based on distance to the crime in terms of miles. But he said what about time? want to _____ use _____ functions and so on. Where you can analyze it based on time. How long it takes you. Because the same

	exact journey at 5:00 in the afternoon versus 3:00 in the morning takes you an hour less around the Beltway. Maybe that's an issue that you _____ between doing profiling and _____.
Pat Brantingham:	Right, but there's a lot more to it.
Derek Paulson:	Oh, yeah. No, that's the point. There's a whole lot to it.
Pat Brantingham:	It's kind of like that. That's a well developed theme, transportation planning.
Derek Paulson:	Yes.
Pat Brantingham:	But that's an optimization issue. One of the things in classes I ask people to think about: say you're going over to someone's house for the first time. And you've never been there before. How long does it take you to get there? And how long does it take you to get home? There's a familiarity which shrinks these distances. And in a way, Distance Decay and gravity model came from a belief in physics being brought over to social sciences. But have we reached a point where right now it's a crude measure given that, maybe you don't have better information, but we've gone a long way. I mean Distance Decay in some ways I think is; you use it if you don't have anything better. if I wouldn't – I wouldn't use it as a method of measuring distance.
Shari Pfleeger:	Has anybody ever done a classification tree analysis? With a whole _____ you know what I'm talking about?
Pat Brantingham:	Yeah, but not in criminology.
Shari Pfleeger:	You have a whole host of variables and you essentially throw them in the pot, and you see which ones in combination are the best predictors of the outcome.
Mike Shively:	That's just about all we do.
Shari Pfleeger:	Pardon?
Mike Shively:	That's just about all we do.

Shari Pfleeger: So I'm surprised that people haven't done that, because very often you find variables that you never otherwise expect to be predictors.

Pat Brantingham: But one of the things with distance decay, given this origin, I think if I understand correctly, I must admit that CrimeStat, like you say, it's got potential, but it is difficult so if you're going to get the students to work it, I've never had them make it work. So I haven't spent the time either, but it seems to be one that's Distance Decay but I think it's really focused on home location. Where even things that look at marketing find, well, what do you mean? There are all these other things that influence it, but you've got multiple nodal points or regions. And it can be distance along any of them and then you have distances – it's a long road network. So it's not uniform in all directions. You've got pedestrians, you've got bus travelers, you've got cars. You've got all these other things that matter in which case Distance Decay – maybe for the purposes of these is fine, but put that forward. Put that forward – are you sure that's the theory you want to look at or is that the technique that's used when there's no better no better technique exists

Keith Harries: No, all I'm suggesting is that when we – when we look this, the literature, the briefing book basically all we see is Distance Decay. I'm not advocating it, I'm not taking a position. I'm just pointing out that that's it. Basically. And further to that, it seems as if the classic variables that come out of criminology are essentially impractical or don't seem to work very well. For example, you look at Baltimore City. Where is the high concentration of violent crime in Baltimore City? It's in the poverty areas. But do poverty areas predict serial events of the kind that this software addresses? I throw that open. Do poverty areas do that? I don't think they do. And there's this anomaly that – at least I perceive it as an anomaly and this may not be accurate, and I would appreciate your comment, again, you have a Baltimore situation. Those very high crime – violent crime areas, are predominantly African-American. They're predominantly poor. And yet they don't seem to generate the kind of serial events, again, that we are talking about. It almost seems that there is – there is pretty much an exclusion of the African-American community from these crimes of serial events. And I refer to the practitioners on that. Is that a valid point or is that just a misperception on my part?

Sean Bair:	I think that every crime type, every jurisdiction has serial activity in it. Now to identify it. That's the trickiest part. It's there.
Mike Shively:	Maybe investigation resources are not really deployed as aggressively in very poor, minority districts so that they don't go to the trouble, hey, it's a bunch of burglaries in this poor, high crime area. Who cares? Right? I mean, that's cavalier. They, of course, they care--
Keith Harries:	The investigators are overwhelmed.
Mike Shively:	Yeah, they're overwhelmed right. So they for any number of reasons they – maybe that's it. Maybe it's really just inability of law enforcement to link…
Derek Paulson:	Yeah, you going link all the crimes in a series? I mean, you say they may not care. They may not know.
Mike Shively:	Well, sure. Yeah. But, yes.
Derek Paulson:	I mean, I say in terms of some serial crimes, there's an under-representation at least that we know of in terms of which are serial murders. Some of these others possibly, but in terms of the garden variety of serial crimes, robbery and burglary and so on, I'd say it's there.
Keith Harries:	Are some series going to be hidden because the density of events is so high, the series doesn't stand out in the way that it would in a suburban community.
Sean Bair:	Just the ambiguity of the event doesn't, make it stand out. The fact that we've got somebody who goes over alleys, fences to take jewelry, that's a pretty distinct MO. But you've all seen that in all of your jurisdictions, so removing that from the mix and saying this set of ten cases are related because of this distinct MO, we have no suspect descriptors, it's difficult to do. But they're there. It's just a matter of typically, in crime analysis we get those that they're so – there's one specific part of the series that makes it so unique that it's like these are definitely the same guy, he's wearing underwear and going into a bank and robbing people. Yeah, I'm pretty sure these are all related. You know. But yeah, all of the crimes have

	_____ having the amount of data that is necessary that gives the analyst the indication that they're dealing with a group of cases that are related by the same suspect.
Shari Pfleeger:	What if they're related by a group like a gang rather than a single suspect?
Sean Bair:	It happens all the time and it's very difficult to uncover those as well, because you're dealing with multiple patterns on top of each other now.
Robin Wilfong:	And you're looking at an agency that might be very automated with their systems compared to some agencies where they still have people doing data entry that that information might – it might be two or three weeks before they even are able to put something together.
Pat Brantingham:	Vancouver is a wonderful city, but it is also a cocaine, crack capital. So – and it's binge drugs, so it's – if you park your car in a certain area, it's going to be broken into. Pretty sure. But what it is, is they figure it takes about forty-five minutes for the cycle of breaking into the car, go to the pawn shop, get the money, buy the drug, get over the high, break into a car. Okay, so that's a serial event, but that's not what people are talking about here. I mean, that's a serial offender. So like you say, are you were saying, are we caught in looking at this anomalous behavior in the sense of a lot of people don't do? Or it's a rare event? Not a common serial. We had another guy, Arson by Cody, he used to tag all the things he'd burned. It could be ten a week. Is that a serial thing?
Tom Rich:	I want to ask you about a comment you made a couple of minutes ago, which is you felt that Distance Decay was a little old fashioned. because all of these packages that's what they're all about. I've been there. Because they have to do it some way. And that's now they chose to do it. Maybe it's convenient. Maybe it's easy. Maybe that's all there is. But it is, is that not as good as it could be for example?
Pat Brantingham:	I think it's done as good as it could be. The question is, is it sufficient for the purpose? Because it is the easiest thing to do. But it does – some of it I mentioned a little bit – how do you measure your – I didn't notice any of them that were really getting into any vector orientation escape

_____. But you've got your distance from home. Say, you live at a home point and you're doing it all on a main road going away from your home and it's got cluster close and further away, where you get a Distance Decay function. But then Ned talks about it a little bit, but then it gets applied uniformly in all directions. So but that's a vector. So how do you handle vectors?

Keith Harries: Well, there's been some more work _____ Warren and Regussen did on rape cases. This region I guess basically. They _____

Pat Brantingham: Absolutely and with that or even you can go back to Capone and Nichols. A lot of geographers have looked at the vector orientation. So I guess the question is, it goes back to what you're evaluating. Like are we evaluating – is this sufficient for the goals of these programs or is it sufficient to where you get serial crime in a research sense?

Keith Harries: So can the theoretical base be enriched?

Pat Brantingham: The theoretical base, certainly from Distance Decay or from the criminological side, on both it can be greatly enriched, but _____ functional _____ of whether it's used by crime analysts and investigators to help kind of narrow the focus. That's a different stand. And I guess that's going back to the first question, like what are we looking at? Are we looking at minimum standard that helps shape investigation or are we looking at a really good – I mean Distance Decay is – there are lots of other ways to do it better now. Even if you're using – well, certainly there are multiple nodal points at different levels of authority. Then you could have a decrease going around it, and then you have clusters of opportunity which they'll talk about. And that greatly changes the type of functions. It's not just one function. It's kind of an event for an agent or an object. It's what happens today. And why they're in that direction. So you've got someone who, it's a bank today. So that's a long distance. Well, it's a corner store tomorrow and that's half a block. Is that a Distance Decay?

Wil Gorr: Is the objective to locate the point where the criminal lives or define an area of likely, continual likely points narrow investigation? Which is what Cantor and Rossmo uses the criteria function. Whereas Snook and Cantor all seem to – they think it's to find a point. Which I don't think is--

Derek Paulson: I think that's a measurement issue.

Wil Gorr: It's a measurement issue, but--

Derek Paulson: Rather, I mean in terms of why they did it, though, because they – Cantor and Snook admits – Snook has another article from the Journal of Quantitative criminology that he sent me and he again, has used that what they called air distance. Like Ned used. Now I think it's more – the way you look at – you measure to one point. It's a crow flight distance to one point. I think it's more methodologically easier, but they mention in there – now this is not the way the profiles work, and that's – but that's their one measurement.

Wil Gorr: I think that's dead wrong. Because you have to ask yourself, what's the utility of this methodology for police? Knowing that predicted point is not, to me, worth a lot. As in you might be able to use your judgment and say well, really there's a community over here, residential places where maybe the criminal lives, and over there is a lake and so we won't look in the lake, we'll look over here. So you might be able to use it, but to have an area that might contain multiple nodes in this network, seems to be a much more useful piece of information the police could prioritize their investigation. I mean, that gets – to me, the criterion you use to evaluate these must be driven by the need or the purpose police have for it. Combined with what the methodology is capable of doing. And predicting a point with something this crude seems to me to be mystifying _____ in a sense.

Keith Harries: I think if you come back to the intrusive approach and the eye-balling approach, it's easy to really underestimate that in the sense that the power is the – when we eyeball a map or a piece of a city, or actually incorporating all the context. If we know that area, we see the physical environment, and we see the social environment, we see the lakes and parks and so forth, that's all in our mental map. And so what seems like a crude eye-balling is actually very sophisticated in the sense that it includes all those physical and social environmental components. Which may help explain why eye-balling seems to have worked pretty well.

Sean Bair:	The tricky part to the eye-balling thing though is that there are a lot of people that kind of stake their reputations on the fact they're able to just use their experience, investigative background and what-not. An eye-baller, the next event's going to occur where the person may live, but how do we impart that knowledge now to my, my rookie? How can I teach them to be an eye-baller? How can I sit in court and say well I just eye-balled it, judge. You've got to trust me on this one. *[Laughing]* You can't do that.
Derek Paulson:	That's where – that's the behavioral profiling. _____ they say it's more an art than a science and how do you train to do that? You're creating the same issues there. And that there is no set, we do it this way every time. A lot of it's a gut feeling. And how you go – and you're right. I mean, you've got to go down the same road again. You pass that knowledge down to the next guy.
Sean Bair:	I think it's more of a mental map thing. People are going through a methodology in their head of how they're doing something. It's just a matter of they can articulate what they're doing. But it probably could be, the method could be imparted to somebody else.
Keith Harries:	It's probably a function of experience. Local knowledge. Knowledge of the environment. But also, the power of observation and the ability to relate – to spatially relate to these components in the landscape. Which I think some people are better at than others, regardless of experience. some people kind of intuitively grasp the notion of direction and distance and spatial relationships really, and some are really not very good at that. So experience is a piece, but maybe not the whole _____.
Tom Rich:	Have there been any extensive validations say of this Distance Decay? I mean, it seems to me that if I were an analyst and I use one of these, and I give him my high point of probability, there's a good chance that's not right, and we're going to go work over here when in fact we ought to be working over here, and on any individual case there's a good chance this isn't going to be accurate. And is that of any value to the investigator? I mean, I'd be interested to know how often a Distance Decay model is just completely inaccurate for a given offender.

Pat Brantingham:	If you're talking about one for the home location, then there's been research been done in different types of crime, home location but if you're looking at I think it's that the expert _____ there with Cantor's model and with Kim's model, they'll tell you an activity or will infer one back from a clustering and how you want to measure that cluster. But one of the activity modes might be a shopping center, or another one might be intellectually you know or, that's a bar area, or that's an area where that person goes to. And that couldn't tell you _____ home is, and where those bars are, that's a big land use decision. That's not a Distance Decay. You might be able to say you go the closest one or you might say go to the one that's closest to your friends. Those are distance measures. What's closest? But that doesn't mean Distance Decay when you're doing the first cut isn't okay.
Tom Rich:	Right, I mean that's easy to do. And that's probably why they all have it in there because it's relatively easy to implement, and it's better than not doing anything.
Pat Brantingham:	I don't know why we got into social sciences, was it in the '40s? But _____. Sometimes _____
Jay Lee:	But to me, I think these are the kinds of functions that analysts use to provide, something that's first guess, but I'm sure that no one will think that's the only thing they should do. So in a way, if I took what NIJ's required earlier, that their end was to advise when they were being asked. But different agencies _____ so forth. Then very intuitively I would think allowing users more choice or more alternative, more options at the very same time. Not necessarily same distance as the _____ distance. To us, distance – it's not just distance that can be traveling time. Cost, distance and so forth. Cost may be defined in so many ways. So that's _____. I think there's a whole big literature body of spatial interaction. That based on _____ out of that and so prior to this, but I'm sure there are other things that can be implemented into somewhere _____ like this. You know, risk assessment. _____ so are we talking about an ideal package or are we talking about what we have so that they can provide advice whenever they were asked? I think that would help us define how _____ somewhere because there, of course, not be a perfect _____ everything 100%. If we're thinking about what we have, sounds to me there are two, or somewhere three,

available and one allows you to try more ways of seeing every potential outcome. Another is less of that, but I don't know how accurate either one is. But just for that suite of options.

Keith Harries: Is it fair to say that one obstacle to enriching the data that goes into these models is the unevenness of the availability of such data? For example, a natural inclusion might be land use. If you have land use, then you exclude land use and put a road such as _____ parks and so forth. But perhaps a digital land use map that'll work with the given program just isn't available in that particular jurisdiction. So then if the model will only work with that inclusion, then you're stuck. So it would have to be an option if it's going to be included. Is it fair to say that that's an obstacle to enrichment? The fact that the background data is so unevenly available?

Wil Gorr: I don't know. But I guess I would question the fact there are others – the opportunity space in terms of theory. where the targets are. How about residential space and where criminals live?

Pat Brantingham: Absolutely. I think part of it is the theory from my perspective, there's opportunities but there has to be an awareness of, so you have to have – so what people end up going after are opportunities that they know about or know of. So there's kind of an awareness. There's a movement pattern, so it may – there's a distance _____ more complex measures of distance, but there's an awareness of it. And that could tell you something. If it's – yeah, there's an opportunity structure but it's kind of like you go to places where in a way, and that influences the opportunity – or restricts it. It's kind of take your space and chalk this out, chalk this out. It gets narrower and narrower.

Wil Gorr: The intersection of where the criminals live and work and so forth and the opportunities but do we have a good theory of where criminals live? In other words, do they live in upper crust neighborhoods? Probably not. All in low poverty areas are 95% of them. In which case you could limit residential areas where criminals live based on a theory. Then the data. If we knew that was a high priority and that worked really well, we could get that data into a package. I can't imagine that, at least for major cities, that there's a true data limitation. It's simply the matter of the

	effort and time it costs to – justifying that cost and getting it into the package.
Keith Harries:	Do traffic flows have _____? We were talking about movement and arterial highways which could have a significant influence on just the easiest path for people could move in a given direction so--
Derek Paulson:	I think it'd be important for certain crimes more than others, and then again, you're going back to we know how offenders travel? We know they travel, but the question is do we know if – when they commit the crime, do they go by car? Do they go by bus? Do they walk? Take a bike? Do we know that? And then that would have – we know for some crimes they may be driving, and that would have a lot more _____. There's a lot of variables, again, that we don't know.
Pat Brantingham:	That's one of the nice things – I mean, when you start talking about anything that has to do with profiling where you start with six cases and you move up to ten for a while. I mean, this is a different world. But if you found that all of them – this is the intellectual type, all of them were including _____ near entrances to mass transit where you wouldn't think that that, the geographic Distance Decay can tell you where they live because you just know they're near a route that can take you all sorts of places. If you go to a larger number of crimes in a geographic _____ volume crimes, we just had an under-graduate student in honors and she just picked the five major roads in Vancouver City, and we're getting a million people. So just five roads out. That caught 85% of all property crimes, just doing _____ which is a simple _____ distance. I mean it's so concentrated. So concentrated.
Derek Paulson:	Does that help investigation? Knowing that we've got 85% _____ on those five roads, but would that practically – how much would that help us? Can we say okay, it's just one of those five roads and now we've got how many umpteen million people on there.
Pat Brantingham:	Well, that's part of why you get into offender movements and mobility. I does matter. They break into gas stations. Do they go across the city to gas stations there or close to them?

Keith Harries:	Are there any other elements that could enrich the theoretical or – I guess I'm feeling less and less comfortable with the use of the term theoretical. It's really the operational base. It's not really theoretical, but are there any other components that could enrich that? From – do you have anything in the field that you think might help with that?
Robin Wilfong:	One thing I was thinking that I could mention is that residential, but you can't really _____ those. I would say that in our county, and I don't think it's unique to our county, probably 80% of the property crimes, especially _____ burglary, are committed by young adults, juveniles or very young adults. Probably it's not very far from where they live. Another thing I was thinking as far as travel and things like that, is just by knowing our area, a lot the offenders like to know their escape routes. They want to be – _____ escape routes. They like to be somewhat familiar with how they're going to get out of there if an alarm was set, sounded in the area or something like that. So as far as the profiles that I've done for property crimes I've done over forty, 50% of them have been pretty accurate. But that's not only using geographic profiling in itself. Not just saying here it is, here's the be all end all, and other tools have been used with it to--
Keith Harries:	So you're seeing it more as a support system rather than the magic bullet?
Robin Wilfong:	Right.
Pat Brantingham:	And there's a lot of value for something for the support system if you're making an intellectual decision _____. Like with juveniles like with we're talking about. Some studies where if you look at where they lived, it's within a neighborhood and surrounded by commercial and very main roads. The commission of the crime may bounce off of those. It's getting out of their neighborhood. How far out is another thing to think about. Where are their friends? So it's the network _____ what their friends know. Do they go to a common school?
Tom Rich:	I should point out in CrimeStat I believe one of the options is to not use a pre-defined function, but to base it entirely on past data.

Derek Paulson:	That's the calibration.
Tom Rich:	Right. The calibration. So that's an alternative.
Derek Paulson:	And I've seen that; test that with Baltimore County using the – having it calibrated with Baltimore County versus the five mathematical functions. Using those five and the calibrated function works much better. But he's also tested it – when he's calibrated it, he's then used the case that he's done kind of quickly just to show that you can calibrate it, but then he used a case within it once he calibrated it to do it, but it does give – it gives a very different function than ones that are in the package, but it does a lot of customization – again, based on empirical data within that area. It is, it is a function I guess Dragnet does have that ability.
Tom Rich:	Because I consider it an acceptable alternative to using distance decay functions?
Robin Wilfong:	It's not as easy as it sounds.
Tom Rich:	Yeah, it's not. It's not very easy to – it's only been done once.
Pat Brantingham:	But it also means that you're given the option of you pick the comparable crime. So say you were looking at teenagers committing burglaries. Your comparable crimes ought to be other teenagers committing burglaries or other people who use the bus. Or other people who drive. So you're given this, like factor analysis. You're given an endless list, things that you can calibrate on so if you've got the knowledge base it might help. _____ pieces. We had access – we had something called VICLASS which is a national thing. She was able to look at all serial arsonists and one-time arsonists and that's one-time _____ so, but looking at their distances. I think _____ measures the distance and once we were one-time _____ and more than once, but their distances were quite different than the serial ones. So I don't know that there's been enough comparative research have any idea whether serial offenders use distances in the same way.
Derek Paulson:	it's a very – it's a really good point. Ned has mentioned that.

Pat Brantingham: He mentions it. Ned is excellent at putting in all the limitations. This is forthright.

Derek Paulson: Yeah, he's definitely that. He's talked about that, serial offender is very different than like you said, a one-time offense. I mean, he fully states that it's very _____ how well that's going to play out. I mean, just what his basic comment of that comes down to it's still an option. You know. It gives you the option to do it. It may be different, but it's just another – it's a sixth tool in addition to the five that it's got in there.

Pat Brantingham: What has he told you about why did he use all five of them? Why didn't he use a gamma distribution? I didn't understand why he used five instead of just one.

Tom Rich: Well in terms of how we would go about evaluating this, I mean, is there enough extant work that we can get together an extra panel, and sort of go through this and say yes, this is reasonable. Or does new research have to be done? To answer that, to answer this question.

Wil Gorr: If you want to accept Distance Decay and you can agree on a criterion function, yeah, like the area, this optimal search area _____ whether it's used. I think you can validate it, and as a matter of fact, I took the, sort of the forecasting experimental design and wrote it up in terms of this problem as an experimental design. The one thing that researchers have not done to date is to do auto-sample testing. So really it's a cross-section of validation problem, because you have to solve serial crimes. As your data is set. You know the residents are other anchor points of being a criminal that are known. You've got your serial crime. That's the input. You have known output so what you really need, though, some kind of experimental design where you have a calibration data set and then a hold-out sample data set. Because the criterion function on any of the points that were used in the calibration set, we have estimated the Distance Decay parameters, you're going to do better there. You're going to do worse whenever you step outside look at a hold-out sample. So that's what the practitioner's going to do is you're going to take a calibrated method. You're going to have a new crime to come in that doesn't – you haven't seen before. The Distance Decay hasn't seen that particular case to be estimated. So as you average across those hold-out samples

or new cases, you'll tend to do worse. So we don't know what those numbers are yet, because all the past studies have been strictly fitted using the estimation data set to record the performance of the methodology. So I mean there is a whole list of issues likely to come out when you want to validate from the practitioner's point of view the methodology. If it makes agreements, you have to optimize over function types. Parameters of functions. Agreeing on the different ways to pre-process the data. Agree on whether or not you're going to toss out points that are too close as Rossmo does. Is that a valid thing to do? Well, toss them out, and then don't toss them out. See what comes out best. I mean, there are empirical answers to all of these question with the careful design; you can call it experimental, although some people will disagree there's no control group. But we can compute the performance. Performance measures. But if you're violently opposed to Distance Decay, you think it's worthless, I mean, you think the whole thing is--

Pat Brantingham: I didn't mean it's worthless. It's the best we'*ve got.*
[Laughing]

Tom Rich: I mean, when you say that you mean that it's the best, that is easily implemented in real world situations. You don't have to get a lot of investigative – it's not a real pain to get input data.

Pat Brantingham: Using these types of models.

Tom Rich: Yeah.

Pat Brantingham: Not using other areas--

Derek Paulson: I guess the question is it theoretically valid? Distance Decay?

Wil Gorr: From the fitting results so, I forget what the numbers are, in the Canter paper 10- 20% of the search area, the rectangle as you want to define it, the original search area that contains the serial crimes extended judgmentally by some factor, you can reduce the area, prioritizes investigations down to 10 to 20% of that area.

Tom Rich: Which is the probability that the offender will actually live in that area?

Wil Gorr:	Well, that's the validation. So they figured that out by looking at where the sole serial crimes--
Pat Brantingham:	Not necessarily live. Live or act.
Wil Gorr:	Yeah. And act, okay. Yeah. And act as an chorpoint. Anyway, if you're investigating it might have to do with where, the work depending on the geography. That location. Those clusters. And maybe there's another cluster in your home, another cluster in your girlfriend's house, or what-have-you. But that's where the crime analyst comes in, but in terms of coming up with – for a set of empirical studies with the proper design and so forth, you can see how much you can narrow down that search area, and I guess a good percentage of them don't have an anchor point in that search area. Because they live outside it.
Derek Paulson:	That's the one thing about – and Cantor mentions it in that presentation. If the home base is outside that search area, you can use his search costs. You can calculate that search cost. And the way, and one thing that I've found is that that's a critical part in the whole creating a profile, is how you determine the search area. If you determine – and it's determined by the way that Rossmo works. The crime patterns – if you've got a series of crimes that occur on one road, and they may be – you hit a bunch of commercial establishments on one major road, which is a very possible thing to have occur, you're going to have a very narrow search area. So it's going to be tall and skinny. That offender may live a half mile off the road, but would not be considered within the search area. Thus the software would never them within the search area, so thus your hit score or your search cost would not be able to be calculated, although the profile would still only be off by maybe half a block. The search area is such a huge part in how these software systems work. How you come up with a valid search area is vital to it, because how you do it; and there's no really good way to come up with how you do it. That's one of the ways--
Tom Rich:	Then why don't you make it huge?
Derek Paulson:	Depending on what utility you – well, I've had this discussion and you're right. I mean, how big do you make it? Do you make it a city? And then you say oh, we've

	reduced it down to 2%? If you've got a 400-square-mile city and you've reduced it down to 2%, what have you got?
Wil Gorr:	That's another empirical question, though. You take all the points of the serial crimes that have been identified, you can have a bounded rectangle to contain them, but a point in every boundary of that rectangle, then you extend out some amount, and that extension – if you have enough solved serial crimes, you can estimate the probability at zero? Of something that's inside? The probability that it's outside and then how big that distance should be from an empirical point of view. You can do that. But I haven't seen any mark on that. How to estimate the extension. That seems judgmental.
Derek Paulson:	Yeah, I mean, it's – that's a huge issue. And Kim – there is – Kim has a method for determining. CrimeStat leaves it completely up to you. You just determine it on your own. You pick your two points and you do it, and it's basically the same way with Dragnet. It's totally easily defined, which that – which is common nature how you standardize it across all three, if you're going to do evaluations.
Pat Brantingham:	When you were describing Dragnet, I was trying to picture like what happens you have someone who's a serial offender, but they've got a truck and it's in a rural county. So then you've got your map that's the size of the screen, which is a road network in the county, and say there a two or three together, but on that map it's just a moot point. I mean, you don't have any ability to zoom in; there's no granularity at all. At least, if I understood you correctly just, visually what you can see.
Derek Paulson:	It's just a grid.
Pat Brantingham:	It's just a grid. .
Derek Paulson:	With whatever you put some points on it and that's all you have. You have a bunch of dots.
Pat Brantingham:	So the scale could be a hundred kilometers or one kilometer.
Derek Paulson:	You determine the scale.

Keith Harries:	This is a question of whether we would like to see a demonstration of these programs. Would you be willing to?
Derek Paulson:	Yeah, I think – Ron didn't say it because he can't talk.
Robin Wilfong:	Derek have you done studies on these packages?
Derek Paulson:	Am I allowed to say?
Ron Wilson:	No – it's, we prefer that we leave that out of this and Derek has done some work in this area, but for the purpose of this, we don't want to let those results have any influence on what you all think about the programs and so forth, so even though I know some of the preliminary results are – it just doesn't. Or why we still need to stay out of the picture. But we don't want any of those influences, leading you down directions.
Ron Wilson:	Derek has information on how the products have worked historically, but--
Tom Rich:	Based on after-the-fact analysis. And one can argue whether or not that's, okay.
Pat Brantingham:	Which is interesting from our number – things I've heard Kim say he tries to train people to root out the ones that won't work in his model before he ever even tries his models, so if you do a historical analysis he would have said well, you shouldn't have had that in model to start with. At least that's the stuff he's said in public; if it's really not following a geographic pattern then he just _____.
Tom Rich:	And is it easy to tell it's not following a pattern? *[Laughing]*
Derek Paulson:	See, that's the big issue. Can you – it goes back to that community marauder. Can you determine – because you shouldn't be _____ with commuters. But can you tell a commuter before you've caught them?
Pat Brantingham:	No, and the one fascinating thing we've found in studies is you've got to look at prior residences. Commuter marauders tends to disappear and people get really used to the--

Derek Paulson:	You can get – I mean, that's the key. You can get – just like we know, theoretically the individual's activity points are going to determine where they're going to be offending but can we know those activity points until after – but once we look at it, even now the police data is so missing, lacking that kind of information unless you've just got a really good solve, a serious, very important case like on a serial murderer, serial rapist. You may have that information. But it's just very difficult to come by.
Pat Brantingham:	Which is also from the point like we're working the point data. I mean, why not work with polygon data or line data? Instead of point data. To build your search area based on that? Points are put there by algorithms mostly from the GIS program to begin with. Until we get to using the map out the sites. They're not accurate.
Wil Gorr:	Can you explain that?
Pat Brantingham:	You've got a street segment and that sometimes can be long, long and narrow, so the error depends on the street network within the city. But correct me if I'm wrong, okay? But I understand that you might have a low point and then you – low address, high address, right side of the street, left side of the street. And they just use a linear algorithm to the point. But if and that may or may not--
Sean Bair:	And it'd be an interpolation of that address along the lines of segment but yeah, you can use partials and get – if you're dealing with a really heinous crime or a series, you typically pull in partial information or have building footprints and say okay, well here's exactly where it happened. So you don't get into those issues with, linear interpolation.
Pat Brantingham:	But the Distance Decay function that they all use, they'll find points along a line.
Sean Bair:	Crime points you mean?
Pat Brantingham:	Yeah. The incident. The next Y coordinate.
Sean Bair:	Sure, but--

Pat Brantingham:	You could already say well that X Y coordinate is more or less right and make it bigger and bigger just to _____ on some rougher shape? And you don't do that.
Sean Bair:	I don't quite follow. The other big issue I think kind of goes with what you're saying is the fact that there are multiple points per crime. For instance, like the Beltway sniper. is the dot where the person died or is the dot where he shot 500 yards away or where they found – I mean, all the different types of things that do impact these distance functions that are being, incorporated into the software, but--
Keith Harries:	Another source of ambiguity is the itinerary of offenders. The fact that they may not have an address that is fixed for any extended length of time. So in looking for a home base, you're looking for something that can't really be defined. What is home base?
Derek Paulson:	Well, and how accurate when they tell you that this is where I live. Is that really where they live? I know, Brian Healey. And I talked with him about that and he's given me some data and said well, do what you will with it, but these addresses – I can't guarantee this is actually where the offender lives. I think he gave me a figure that maybe 20% of them were correct. Which is not so good.
Shari Pfleeger:	And in general, when you're doing your evaluation, you just separate the correctness of the data and the correctness of the net quality of the data are bad, then you have the greatest methodology in the world, but it's not going to work right. And in my experience what the police charge somebody with and what they eventually convict him or her of can be very different, so if you don't yet know the resolution of the crime, you may be working with bad data that way. You think somebody's a burglar. It turns out he's also a murderer. And from what I read in the briefing book, those two crimes have very different patterns.
Sean Bair:	There's some work being done at San Diego Server Computer on the bad data being delivered on a home address based on if the suspect needs to be able to string his or her story back together, there's some patterns on changing a number or a letter in an address so there's some work being done to kind of tie what's said stop what's actually.

Shari Pfleeger:	How much do you use data mining because data miners do that—they take multiple data bases and they try to make sure that everything's consistent. Is that evolving?
Sean Bair:	In law enforcement?
Shari Pfleeger:	Well, that's what I'm asking. Do you use it in law enforcement? They certainly use it when they're trying to do data mining for other things like terrorism.
Sean Bair:	They can get the dots on the map. That's a massive leap forward so no, there's nothing going on with other neural networks or data mining or.
Derek Paulson:	I did a survey in North Carolina Chiefs of Police years ago and asking them do you do crime mapping. And I had to alter the question. Do you do computerized crime mapping. And they got someone who said yeah, we do mapping. We've got a map right in front you. *[Laughing]* What's the big deal? And so in terms of – I mean, we talked about, the user being 1% of all agencies booked in 2000, that probably jives with GIS. GIS may be has filtered down a little bit more than that, but a lot of them do mapping but they do it here or whatever, you know. I've come across one agency with seven officers that actually had gotten a Federal grant to get GIS. And they patrolled one road that went in to a ski resort. And all they did was write speeding tickets, but they had GIS.
Tom Rich:	Can I ask a question? How important is the theory? I tend to think that a bottom line measure of geographic profiling software is did it help the analyst? And it happens to have good a theory behind it, and that's great, but I don't – that isn't the most attribute. It's "did it help me out?" And so I guess, one could ask the question in order to help the analyst, does it have to have good theory? Well maybe not. Maybe it does, maybe it doesn't. I don't know. But how important is this? In an evaluation.
Shari Pfleeger:	Well, it may be a two-part criterion because it sounds as if you need something that's credible in court and there was that example in one of the papers about some woman who put her hair – somebody's hair in a little container, right? And walked around with it and then found the right

location. That stuff won't be credible in court, but it may work fairly often.

Tom Rich: So it's not – if you have to go to court on this and if you don't have a good theoretical underpinning… so from that perspective it's important.

Shari Pfleeger: Or some credible expertise. If Sean is really good at always finding the right location and he doesn't reveal how he does it, but he has a great track record, then that may help hold up in court, but somebody saying that she rubbed her magic wand and you know found the right location, that's not going to be credible.

Wil Gorr: Have you ever had to go to court on--

Robin Wilfong: No I haven't but I was just thinking about if I were to be going into court, again I would go back to I can use this tool, this tool, this tool and this tool and _____ investigator and, I'm not pinpointing the location. I'm narrowing down an area that you might want to search for victims.

Derek Paulson: One thing that Kim Rossmo notes very clearly on is this is not going to solve the crimes. It is a tool to help – it's just one part – he always says, I think, what's his, he's got a good little line he always goes, the only way you can ever solve a crime is physical evidence? He's got a couple of things, but never once does he mention profiling. He always states it is just a tool to help in the investigation, and there's multiple other things that you're suppose to do. And once you have the profile, all the things you're suppose to do and once you have the profile all the things you're suppose to do with the results, then in terms of overlaying probations or other types of things that land these things, he's very clear on that. And I think everyone else is, too. When you do this, it's not just to say X marks the spot.

Shari Pfleeger: But that's the conviction. What about for getting a warrant to go search somebody's house? Is the tool more credible than _____

Sean Bair: If you walked up to a judge and said here's my geographic profile, I want a warrant. He'd laugh at you.

Robin Wilfong:	One of the things I'm going back to as far as calibrating the county … the thought I had on that was a lot of times law enforcement officers will put in the county jail as being the offender's address. *[Laughing]*
Pat Brantingham:	That's really interesting from the CrimeStat point of view. If you're a crime analyst, which of the options do you use? Whichever one you want, right? So if you're going to be comparing them, are you going to be comparing them against if you took this distance decay function versus that distance decay function.
Derek Paulson:	There's not a lot of guidance in there at all, but the benefits of one – I mean there is but it's – I don't think it's very easy to pick out as to why you use one over the other.
Wil Gorr:	That's what a validation study should supply.
Pat Brantingham:	Should say which is better.
Wil Gorr:	For a given circumstance.
Pat Brantingham:	For one after the fact? Which one would have been better? Had you used this one?
Wil Gorr:	Well you need before-the-fact information to apply it, right? So before the fact you would say because it's a burglary and because it's residential, then – this is a type of function you should use and you should use your own data to calibrate that function. To calibrate it and then, having done that, apply it to the particular case. I think that would be the objective – one of the objectives of a validation study.
Robin Wilfong:	I know with Rossmo's software and we signed an MOU saying we would only use it for property crimes. I don't know about CrimeStat and everything else, but they usually want to use it for property crimes, not serial. From the signs.
Sean Bair:	What's the reason behind that?
Robin Wilfong:	My theory? *[Laughing]*
Sean Bair:	You didn't even get a call said well why? why would a serial--

Robin Wilfong:	Because you have profilers and you have profiling analysts and I think that they know – maybe they have more or feel like they have more studies – level of training.
Pat Brantingham:	And that's to get beyond Rigel Analyst and into the full Rigel?
Derek Paulson:	He does not want serial rapes, serial murder cases being profiled by, using Rigel Analyst.
Tom Rich	I thought it was the same underlying algorithm?
Derek Paulson:	It is. But he wants you to call in one of the profilers. And have them come in and do the profile.
Pat Brantingham:	So that long training is telling you when you should--
Derek Paulson:	It's purely a training issue because we've talked to him about that. And he said it's a training issue. That these guys go through a lot more training and it's the psychological aspects, he feels _____ partially rape and murder that are different than – that there's other things that go on in the minds of the criminal in serial murder cases and serial rape cases than in some who are arsonists than they would in commercial robberies or commercial burglars.
Robin Wilfong:	Is there a stipulation on CrimeStat use?
Derek Paulson:	Personally I think Ned doesn't care what you use it for. You can profile Starbucks. It's for you, however you want to.
Keith Harries:	Should we continue the discussion theory or move on because the agenda has us covering technical implementation?
Tom Rich:	Right, I guess I would like to hear some of the consensus on whether or not this is an issue that needs to be explored by a separate panel of experts or have people agreed that these approaches are perfectly reasonable? Or does more investigation need to be made into whether or not Distance Decay is a good way to go? Or is that an open question?

Keith Harries:	I feel that the data environment – again, I feel uncomfortable going with theory; operational environment could be enriched. Perhaps the question might be how could it best be enriched?
Tom Rich:	So Distance Decay is a reasonable first step?
Wil Gorr:	It's a good straw man to try to beat. And that's clearly – in the forecasting field, again to draw an analogy it started with the Box Jenkins method, which is very complex. And it just was mathematically, not in terms of its empirical needs, but it was debunked. It doesn't really perform well at all and so the principle came out of in terms of doing these comparative analysis different methods of approach to include a really good simple method as the basis. And sort of an engineering approach. Don't advance to another more complicated method unless you can _____. So I would say one of these methods we're looking at is probably a good straw man and you need to put that baseline in. A benchmark, and establish what it can do in terms of performance and then make available the data sets – the calibration data sets, and experimental designs to others that want it so they can prove it. To enrich the baseline. So I think there's a good basis to move forward on this. It's not bad. It starts with something simple. And then put it out there and say, all you creative folks have all this expertise, and what-have-you and do better.
Tom Rich:	And it has to be something and with all these things there are inherent trade-offs between complexity of implementation.
Wil Gorr:	The cost benefit component to this at some point, too. Is the additional sophistication – was it _____ or was it _____? Our resources lead to a pay-off, or not?
Shari Pfleeger:	But to answer your question, it might be worthwhile to get a panel of people in from a variety of other disciplines to kind of look at this question and do a little introduction to them and ask them how they – what they have to tackle these problems. And see what they say. And somebody mentioned actuarial data.
Wil Gorr:	Another option might be to have a white paper or a thought piece of some kind to lay out a framework and search it like that. And something very – we need something pretty

specific. I think this kind of discussion raises more issues. There are a lot of details that have to be worked out. And something fairly specific that people can react to might be another mode. I think we're – this group is pretty good at raising these issues. And I don't know how you work out nitty-gritty details.

Debra Stoe: I just have a real simple question. I think this is pretty simple, so I just wondered why – Robin and Sean – you had used the software packages. I want to know which software package you used for the record, and why you chose to use those. I mean, are you aware of other applications out there?

Robin Wilfong: Myself I've actually a few years ago went to National Law Enforcement Corrections Technology Center and the training was strictly the Rigel training. When we went back to our agency, we presented it to them. Got a grant, were able to buy the Rigel product through the grant. If our agency had – if they were going to purchase a product, maybe for one individual but we had eight analysts, so eight analysts time $6,000, that's a big bundle there. So now we are looking into CrimeStat and calibrating the county to bring that in so that everybody has that availability. I haven't used CrimeStat yet. So it would be very interesting because we'll have Rigel and CrimeStat at the same time to see if we take a crime and enter it into both what are we going to see? What's going to come back. And again, with Rigel I don't use it as the be-all/end-all, I use it as a tool. Right now I'm under a grant and therefore, that's all I use and take serial crimes from different agencies and along with going around and talking to the different conferences about geographic profiling analysts and it's one of those things that I see that a lot of analysts are very interested in. Whether their departments are interested in it is another thing. And whether they'll spend the money or whether they'll want to calibrate their county, if they have the IT people available to do that. That kind of thing. That's why I started out with the Rigel _____ through a grant and _____. And Rigel Analyst.

Sean Bair: I ended my crime analysis career in '97 I think so the whole geographic profiling phenomena took off after I left, although I was doing it like I say – doing different types of things with MapInfo and Arc View as an analyst, I just didn't know what to call it back then. I got the opportunity

to get trained by Dick Cantor. He came over, as and presented me – actually gave a full day on Dragnet and Life _____ which is another one of his applications. So I saw that and I did the whole paper up on the screen, too. I go wow, this is pretty technologically advanced. But it works, hey what the heck. It's probably good for _____. And I've gone through police foundation and hosted CrimeStat training so I've actually had that _____ CrimeStat. I couldn't use CrimeStat if I tried. It's a very difficult to use. I didn't think, from a software perspective, it was all that well written to be honest with you. A Dragnet – and if you really want to get down to the nitty-gritty here, the only one that's really commercially available right now is Rigel. I mean, Dave funded and provides for free. CrimeStat. Dragnet is offered pretty much as a research kind of application. Say hey look, we'll give it to you if you'll say yeah, I'll provide you some research data. If you called Dragnet tech support, you get him, between classes. It's not like it's a company. You know. ECRI, they're a company and they're in the business to make money so that is really an application. But they're the ones that I've used. Like I said, I've also done some geographic profiling through ArcView and MapInfo and I did walk you through my methodology for doing that as well. So those – they seemed to work some of the time. The big trick is whether or not they are commuters or marauders. You don't know that before you apply the technique, so you're already at 50/50 to see whether or not you're going to hit it.

Keith Harries: Are there any other points relating to what we loosely call theoretical aspects?

Ron Wilson: It'd be interesting I think to get an informal poll of those who sign _____ if they're getting any value out of that. That'd be interesting to learn. I think.

Tom Rich: Oh yeah. Absolutely. I mean you mean in terms of whether or not it's helping them?

Ron Wilson: Well, if they're blown off _____ or whether they're creating value outside of where they're totally--

Derek Paulson: I'm thinking in terms of some of them. I mean, let's face it serial murder is an extremely rare incident, and I'm not sure if there's a lot serial arson, serial rape in those areas that's being used.

Ron Wilson:	We have an arsonist, don't we?
Derek Paulson:	There are – it's just whether or not in the areas where they let me use the sign. Tommy Sexton might be able to tell you more.
Robin Wilfong:	And I know Tommy _____ arson because somebody goes usually outside – they're usually targeting something. A Church or whatever. So they go outside their realm.
Pat Brantingham:	In talking with the police for the most serious serial arsonist, that seems to be _____.
Derek Paulson:	Trying to get serial arson data, from multiple states. It's not an easy thing to get data on at all. I've tried with multiple Kentucky state police. Because of one simple thing – who owns the crime? Fire marshals. But so do the state police and so do the local jurisdictions, and nobody keeps a very good base, and nobody wants to give up. I've had a time and a half trying to do it. And now I've got a student who's got a fire safety degree who's going to try to get it. Because he's worked with some, so I'm hopeful to get some so that I can analyze it a little bit more from various aspects – I actually had data from the State of Massachusetts is the state he's involved – that's his job. He does arson analysis for the state police department.
Shari Pfleeger:	_____ investigations _____.
Derek Paulson:	The people we've got has got fire safety degrees, and they do a big arson investigation, they do an arson investigation every _____. And they've had a time. I've talked with the chair of their department, and he and I have both tried to – we've called the state police _____ and they just act like stone walls, like crazy. So you can get a case here and there, and that's – we're trying to gather as much data as we can.
Pat Brantingham:	_____ used to be profiling.
Keith Harries:	Any other points relating to so-called theory?
Pat Brantingham:	We can get into _____. *[Incidental Conversation, Off-point Remarks]*

Keith Harries:	We have about fifteen minutes before lunch, and perhaps we can at least begin to get into the technical implementation part. Which might help lead us into the demonstration that will come after lunch, perhaps. Would you care to say more about this, Derek? As sort of a preface to what you might be doing later. I hate to put you on the spot but--
Derek Paulson:	This one, I've looked at this _____ exactly for me how I can take like the second one – _____ assumptions for me. So how are they put – how they have been put into the computer code? That's a difficult one for me from the standpoint of – that's a leap that's hard for me to make that theoretical into mathematical into the actual software and how it's – how well it's been done. I don't even know, having played with the software _____ if I could even test that exactly. When I – I went through the same training that Robin did for Rigel Analyst. And they give you – in fact, I have it here. A nice big thing on the mathematics involved with how the Rigel Analyst works. And from that standpoint, I think that's something we can actually look at and say okay, here's how the mathematics would apply and the theory then goes into the – the mathematics then goes into the software. For CrimeStat and Dragnet it's a little more sketchy for me because in terms of how well – Dragnet there's almost no literature on it. And I can't _____ software. Ned Levine will talk to me as long as I want about how well it works. The problem is I don't always understand Ned, when he's talking to me about those things.
Tom Rich:	Which is a huge issue with all these packages is do the people using them understand the theory and limitations and appropriate use? That's a huge issue. But when I think of technical implementation, I also include you know sort of, in all models you have to provide input parameters. The X, the X _____, things like that. And gee, should this be a one? Should this be a point one? Should this be a ten. I don't know. I'll try one.
Pat Brantingham:	Default.
Tom Rich:	Yeah, right. When in doubt, use default and that's a weakness out of all these things is that people don't have any idea what these parameters ought to be or what they

	even mean, that's one of the things I think of in terms of technical implementation.
Derek Paulson:	Rigel gives you a little bit more in terms of giving you some parameters that, again, I think with the commercial implementation, they – well, also in the training, that was obviously given to me but the ability to weigh out cases and there being some theoretical behind weighing out cases, or _____ for. Now the thing is Kim and I have talked about that quite a bit and I'm not – I'm not always a believer that you kick out, I mean – if I've got a full data set, I want to analyze the whole data set. if the guy hits the same place twice, but it was a week later, or two days later, I want to – to me that means that there's something very important. Whereas it might be weighted out and another – the thing about Rigel Analyst is it allows you to do it as many different ways as you want to. The expert system will check it out. You can weigh it out yourself. You can leave them all in there and that's where the training comes in. To sit there and give you some more of that; here's when you should or should not lay them out or what-have-you. Again, CrimeStat. Here's the software. Here's the manual. And yeah, I printed that out at work. Massive, massive piece of work.
Tom Rich:	Yeah, we just put in one, you know. *[Incidental Conversation, Off-point Remarks]*
Derek Paulson:	Yeah, because they've added more this year, so there's more. More coming into it. But you're right, there's not a lot going in – with Dragnet there's – you don't put in commuters. In terms of, if what you're getting in terms of technical implementation is do they give you some good parameters about how to use it, when to use it, and things like that. There's not – and I think that's just geographic profiling in general. I think the rules are the same throughout the software system. I mean, you should, if you're going to weigh them out Rigel with a project, you should weigh it out with CrimeStat, you should weigh it out with Dragnet. If you're going to kick out a crime, you kick out of all three. That's a theoretical issue.
Wil Gorr:	Yeah, it should be empirical. It should be empirical. Try it both ways on sufficiently large sample cases and see if it makes a difference. And then recommend, based on that _____ So that's where evaluation comes into place. This

	section – technical implementation – it seems a little bit the horse before the cart. Since it's really only one package out there and it's a patented algorithm.
Mike Shively:	Whether it's one or ten software packages still, I mean, the exercise in putting it to an evaluation would be the same. So how do we evaluate whether it's being, whatever theoretical assumptions, whatever you want to call them. How well are they being implemented?
Shari Pfleeger:	And It's my understanding that they won't let you go look inside with the software, right?
Tom Rich:	Well, CrimeStat is – you could probably get the code. I mean, whether or not you want to, that's another thing, but I assume that that's – I mean, NIJ owns the code. [Banter, laughter.]
Ron Wilson:	No. We don't have it.
Wil Gorr:	We've heard Sean say that it's pretty hard package for practitioners to use. Is that really a viable alternative for geographic profiling?
Tom Rich:	Well, again I haven't – that makes the question is our audience only practitioners? Or are we also offering guidance to Ph.D. students who want to study the--
Derek Paulson:	I do know people – I do know a person who uses--
Sean Bair:	And I can tell you who that person is. *[Laughing]* I can tell you that person doesn't know how to use the program.
Shari Pfleeger:	I guess what I'm getting at is there's two issues. One is a, is the algorithm correct? And the other is, has it been implemented properly? And the second question, if you can't look inside the software, then you can't _____, not to any degree of satisfaction. You can run some test data, but you have no idea what _____. And if they know what the tests are, the can write code to just spit out the right answers.
Jay Lee:	You know there really is no solution to this issue, because we don't expect these things to be 100% accurate to begin with. So as Robin said earlier, it's one of the many tools that we use.

Shari Pfleeger:	Yeah, but there are different levels. I mean, you can take some data that clearly are related to your _____ and put it in the software and see if it comes out with the right answer. You cook the data – the input data so that you know what you want the output data to look like. And if that doesn't even work, then you know the software isn't working. It that works, then you go to the next level. But to absolutely verify that the software has implemented the correct algorithm correctly is impossible without looking inside it.
Jay Lee:	We give up on that sometime ago, you know, in GIS. I think, over the break I talked to Ron. Send special statistics _____ and by methodology, by a code that I wrote myself. Get three different answers. So what do I _____. There's really a comment that I heard from Derek and then Sean that CrimeStat is difficult to use, but I wonder if it is possible to put in some effort, make that easier to use?
Tom Rich:	Well, yeah, right. We should keep that in mind with all of these. That given resources, they could turn it into a nice, slick interface, easy to import, export, thing. So we should keep that in mind. Just because it's hard to use right now doesn't mean it couldn't be made easier.
Sean Bair	He's actually contacted us about interface design and whatnot, so I mean, he IS aware of these issues, and he's taking steps to correct it.
Jay Lee:	Maybe he got, not his priority, because he's _____ plan to commercialize that.
Derek Paulson:	It's not his priority. He's – he thinks – it IS, it's a spatial analysis toolbox. I mean, it's just a lot of different, and they've – Version 3 is coming out, soon, and he's doing beta testing _____. But they've added Poisson regressions. They've added _____. They've added a--
Ron Wilson:	Crime travel demand models
Derek Paulson:	Yeah, crime travel command models which, once at the crime mapping conference in Boston, they explained it and everybody. I had presented at the same time so I didn't get to hear him, but people like that just way – even more intense in terms of some of the things that – that's Ned's

purpose in this. Is putting a lot of tools to give, and it is. It's for researchers, it's for practitioners. But it's a lot of different tools out there to do a lot of different things. So I don't think – making it a nice, easy usability in terms of – I mean, that's obviously a consideration, but it is not--

[Incidental Conversation, Off-point Remarks]

Sean Bair: That's not to say that we shouldn't encourage crime analysts or _____ to use it. It'd be no different than, this six-shooter going into the office and an automatic. I mean, just because it looks like of scary and you don't quite understand it, doesn't mean you should fall asleep _____ six-shooter. It's just a matter of educating the community. Look, this is why we did this and this is why it's important and this is how it's going to help you do your job better. They'll begin to catch on.

Keith Harris: Are there any other pre-pranial points? *[Incidental Conversation, Off-point Remarks]*

Jay Lee: Well, actually I have one if you people will allow me to use a few minutes. My experience with the _____ growth that Ron mentioned is that my colleague and your _____ which is twelve miles from where _____ is, he spend money buying _____ a program, a software, something I think is the same thing as I'm doing. But his system allows people to put in physical _____ and all those very detailed things. And to incorporate a lot of assumptions to come up with an estimation of how many housing groups a community might expect to grow in next 10 years. Where my software simply asks how many units do you think _____? How many housing units do you think we need to put in? So that actually comes to the point I'm making here. That for software that's useable, you can leave a lot of assumptions to the main writer by experience or expertise and come up with some intermediate results. And poof, the software can work for you on _____. Not all software is going to make judgment. Software is only built-in part of the calculation, and so forth. We as human beings and users, _____. And then _____ after. So I thought that's a point that I should suggest people can see better when we talk about implementation and technical implementation between totally automated and entirely manual, this _____ we can have a point anywhere in the _____. So for, I'm not assuming the law enforcement

people are not computerized, as much as the university researcher. But I'm suggesting that there are so many other things to do that they might not hold _____ so much manual style they might want to go to more automatic style. And the question is how far to that end is acceptable? Because the more you go to here, the more you go towards the automatic end, the more assumptions you allow your software to make _____ and that's where results will deviate from _____.

Pat Brantingham: Why don't you follow-up on that? I really like that _____ if what you did was, like you could go through a series of questions like is there some – is there a series of things down there, and you're getting your coefficents you could say okay, how long does it take me to drive from here to here? And just put in a time estimate. Just your best guess. Instead of having try to do it by calibrating it on all of the data.

Keith Harries: It sounds almost like the old Delphi technique that was so fashionable many years ago.

Pat Brantingham: Yeah. It was fashionable about the same time that _____. And since we're talking about one level of the _____ educated _____.

Wil Gorr: I think you should take the empirical reality as far as we can and after that, let the expertise work.

Pat Brantingham: I think their problem is that, if you say we've got all this type of crime and how many places have it all geocoded. And it's kind of like this baseline data is what empirical reality is. Probably not used to thinking _____ most police departments _____ exist, so it's more like then we're pushed into which one of those functions do you want to guess on. And there's that kind of past experience. I mean that may be not New York city where they geo-coded it.

Derek Paulson: Yeah. Sure.

Shari Pfleeger: And you could do--

Wil Gorr: But then you would still be taking the empirical results from another region and applying to your region. You don't have the data or the inclination to do that. It's still

being empirically driven. And the thing about software of course, is that you can have algorithm, you put data in and stuff can come out. None of them is going to be pure nonsense. Something will come out. Right? And so I think you have to have a basis of some empirical validation for most parts, and then there's plenty for practitioners with expert knowledge to think that. With music, it's the right kind of tool. It narrows down things reasonably. And – but I still think, the empirical part is what has to be built up. So we've been dancing around this issue all morning. Whether we evaluate the methodology or the software package at this point.

Pat Brantingham: The software package.

Wil Gorr: Pardon?

Pat Brantingham: I think the software.

Wil Gorr: The software.

Tom Rich: But that has to be viewed in the context of other available methods. I think.

Wil Gorr: Yeah.

Shari Pfleeger: And the methodology that works today may not work tomorrow. In a sense that there could be a dramatic shift either in our understanding of the crime or in the nature of the crime itself. For instance, here in DC, the gang-related crimes are changing. So methods that might have worked six months ago to predict where gang-related crime might be next won't work anymore. It's become much more common and much more violent.

Mike Shively: Ideally a software package should have user input that would allow you to make changes in the baseline. Whatever it is, I mean you can think of a million examples, but a shift from, crack to cocaine to heroin, and then the differences that are involved there, you could be able to input things, but that gets back to something that Tom was saying earlier… it really requires an understanding of what the computer's going to do with what you're putting in there and trying to take your street knowledge. I mean, it doesn't need to be from a grand theory, but you take some sort of street knowledge about the dynamics and plug it in.

	Once you do plug in, hopefully it's going to do something useful and sensible with that.

Shari Pfleeger: Right, and what that suggests is that part of evaluating the methodology should be looking at how flexible you can change that.

Mike Shively: I'm sensing an energy level issue here. *[Incidental Conversation, Off-point Remarks]*

(Lunch Break)

[Incidental Conversation, Off-point Remarks]

Derek Paulson: This is Rigel Analyst right here, and I've actually got a case I've loaded into it, and I think it's – there's something – how do you get everything? There are some mapping functions you can do with this. The red dots are the crimes. This is just a sample case, so it's just all the dates are the same so, the analyst – when the expert system pops up, it'll say something about the _____. I think the screen's a little cut off.

Tom Rich: So these are crimes which the analyst has already identified as a pattern?

Derek Paulson: You have – yeah, it does not help you – none of these softwares is going to help you determine if you have a series. They are assuming – in fact, one of the assumptions within Rigel Analyst training. You have a complete – you remember them all? Was there four?

Robin Wilfong: I had it memorized and _____ --

Derek Paulson: I know. We had you _____ a little test. But you have a complete series. If they're not a commuter. Here's another one I've got somewhere. But yours – assuming you have a complete series, okay? So here's a space of whether or not you have it, and you're assuming this is all the crime points that you have. And then determine that this is a linked series. Okay? And you can also put in your suspects, and I've got just one here. And that's the blue dot right there. Now you can see up here, you've got new, you can open, you can import cases down here. You can export it. It'll only open up in Rigel Analyst to another Rigel Analyst. You can – no, you can't on Rigel Analyst. You can't get

_____ shaped files onto Rigel Analyst. But you can import shaped files to Map Point. So it doesn't really help you a great deal there, but you can do a few things there. The preference says you can change up things. How your map looks, which we're not going to get to. It's in miles, although it's not really – crazy Canadians _____. It confuses the devil out of me. All I know is that 8 kilometers is 6.2 miles, because I run the 8K race on that.

In terms of crimes, you've got this adding/modifying technique, and that's now you weight crimes out. Again, same for suspects. You can add or modify. And here we'll actually – we'll actually do the geo profile. You can just click on the calculator. And here's where the extra system kicked in. It kicks out – he wants to kick out crime 4 because of the near distance stat. Now this is where you get into should you kick it out, should you not kick it out? You can ignore it, and I will – and it'll give you 100% analysis _____. It's trying.

Pat Brantingham: Can you add a waiving so that you can say a high waive of things that you would – are pretty sure are related and--

Derek Paulson: You can only waive the case in or out.

Pat Brantingham: Oh.

Derek Paulson: Or in. And that's all you can do with it. Here's the – here's the actual broken out – when you see the 100% in here? This part right here, you can change that down to as low as 1%. You cannot go ½%. You can't go below 1%.

Tom Rich: What does that mean? What's--

Derek Paulson: And that's what I'll show you. Here we have just the full profile. So you can see all the different colors. Come up here now, you see a profile and statistics. It'll give you the basic statistics. The number of crimes, number of sites you actually used. The hunting area here is 96.47 square miles. The expected hit rate for hit score is 7.9%. That means 70% of the time we would expect to find the offender in just 7.9% of that 96.47 square miles. Which that hit score area, that 70% area, totals 7.67 square miles. So it shrinks it down. Now--

Shari Pfleeger: Is that based on theory or on the database that you have? A empirical data that you have. _____ based on here?

Derek Paulson: Yes. This is _____.

Pat Brantingham: It's based on the environmental perimeter?

Derek Paulson: Yes.

Shari Pfleeger: Okay. Environmental criminology.

Tom Rich: Aren't they using – doesn't Kim Distance Decay functions?

Pat Brantingham: With a lowered expectation close to the origin.

Tom Rich: Oh. Right. The buffer.

Pat Brantingham: A buffer. Not a zero, but a lower – but it's based on _____. Near where you live? And each one has a different decay and you add them up so the high points are _____ different range for multiple hits.

Derek Paulson: If you're very interested in the mathematics of it, I do have a handout. You can copy it as to how the mathematics of how the whole thing works. It's not – it's not truly how the whole thing works. It's just like how – what they teach you in class. Basic calculus. It is not – it is NOT in any way, shape, or form the code or how the whole thing works. It's just a – it's a breakdown. A simple breakdown for analysts to figure out what is actually kind of going on.

Now what they have you do. What they teach you to do is this 7.9% we then will put back into the profile – get our _____ profile here. So we take – we go back to the calculator, and then where it says peak percentile we round up to 8%. So calculate – and now where these areas – you see how it shrinks it down. Now it's just 7.97 square miles. That's these color areas here. And then you can zoom in and you see where it's darkest red, even right here, there's this _____.

Pat Brantingham: And that's where you can sort of buffer around--

Derek Paulson: Right. Right. And you can shrink it down to just 1%. That's as low as you can go. So if you want to see just the top 1% where it predicts it'll be, you can just hit one on that

	pink profile and it'll just give you the top 1% probability area for this profile.
Tom Rich:	I would have expected it to sort of pick as an area right in the middle of all those. Near the, say over here. Doesn't that, I mean just based on where these things are. I mean, isn't that – and why doesn't it _____.
Derek Paulson:	There's more crimes right down around here, but for some reason, this computer screen is cutting it.
Tom Rich:	Oh, okay. Oh, I got it.
Derek Paulson:	Because you're only seeing one, two, three, four, five – there are two more crimes down here.
Shari Pfleeger:	But still, the point is that you were expected to have something to do with the centroid of the whole area, and there's nothing around the centroid at all.
Pat Brantingham:	Do you want me to – I'll get you – I might not be – admittedly, this comes out of Paul's and my theories. Okay?
Derek Paulson:	I started to say. If you want to *[Incidental Conversation, Off-point Remarks]* –
Pat Brantingham:	Basically what it is, and it's really extremely simple, is that _____ kind of geographic knowledge. If you've got say a clustering here, and a clustering there, and a clustering there, the idea is that there's some nodal activity, nodal activity here, and nodal point here, and nodal point there. The theory actually says then there's some sort of route that people learn that connects them. And if you were to look at real activity. That nodal point here, a nodal point here, a nodal point here. _____ that connects them. You have an awareness space you build around them, overlay targets. Those are more likely to be victimized. Ones that intercept known areas. And what Kim did with an earlier version, which said if you've got a nodal point here, crime activities and a nodal point here, and a nodal point here, you don't consider the connecting roads. And moves it back to the nodal points. But what you were saying, if you consider the connecting roads, you get a different answer. You find some sort of scattering of chances that they will _____

	along those routes as well. Does that explain it? So he was using basically – you just find where the activity is.
Derek Paulson:	In your assumption that it would be in the center, different of these – different Distance Decay functions may put it more in the center. That's where you'll see the difference in calculating differences. You can see up here there's also the report. This little button is the capture. That you can capture that screen image and you can place it in the report. And the report – you can review the math, and it gives you – there's some _____ language you can get in there and have it, and in the class they give you some tips on how to come up with a good report. And it's – like I say, it's a neat reporting function. You can come up with a very quick – well, very quick. Some of it's very quick. You can add more function to it, and more analysis to reports. But again, it provides you very quickly, very easily, some of those functions.
	Now if you do not – I imported this case. If you just want to simply do a new one – when I talked about just adding crimes. Okay, here we go. New case. Here's where you just add the crime in. You put – this is the basic information. And then you put in the city. And here's your crime type, and here's where you have your choice of different crime types.
	Now when I first saw this, I thought – I asked Kim, I said does that mean it calculates among the different crime types, and he said no. I asked him why he had it. He said for the reporting function. But those are the crimes that – those are basically _____ the crimes that Rigel Analyst is designed to do profiles on.
Tom Rich:	So in other words, there's one Distance Decay function or for all crime types?
Derek Paulson:	Yes.
Tom Rich:	Or one algorithm – I got it.
Derek Paulson:	One calculation. It doesn't calculate – it does not distinguish between the crime types. It _____ calculator. So then you just – _____ makes any sense.

Ron Wilson:	So the hunting area wouldn't necessarily be bounded by the commercial real estate or the residential real estate--
Derek Paulson:	It pays no attention to the underlying base map. The base map is just there for you to see what's going on. It does not take any of that into consideration when it's calculating.
Pat Brantingham:	I gather you're trying to do that in another version.
Derek Paulson:	Yeah, I'm not sure _____. And you just simply take here, when you add crimes, just go up _____ and it'll give you somehow, below it, you just type in the street address and it'll geo-code it to that. And you can put in information, comments, and some other things in here as well. Then again, then you can go in different scenarios and weight out crimes if you so desire. It's – I've never really had a problem with accuracy in terms of geo-coding. Have you ever had a problem with geocoding, Robin?
Robin Wilfong:	Yes. Along U.S. 19 in our area there's been problems that we _____.
Derek Paulson:	Yeah, and if there are problems, it's not – I would say it's _____ MapPoint. I believe they've got – when you get it now, you get it. This is MapPoint 2002. I think they've got _____. Alright, is that – anybody want to see anything else on Rigel?
Shari Pfleeger:	Up there, _____ like add, delete, and modify. What's—
Derek Paulson:	Modify is the weighting out of crimes. So we'll go back. I'll _____.
Ron Wilson:	How many people are using this product?
Derek Paulson:	You'd have to ask ECRI.
Tom Rich:	I actually asked them that, but they said that it would take them a while to get the answer. They said that twelve agencies are using their full $60,000 product. Worldwide.
Derek Paulson:	And they've got – and there are several agencies _____ that are using it. Well, like I think ATF has it. And uh, the crime lab. And yeah. *[Incidental Conversation, Off-point Remarks]* But there are, yeah, there are quite a few that are using it. So _____ crime, go back here to crimes and—

Tom Rich:	So what does the weighing in do?
Derek Paulson:	That's whether or not you want it in or not. If it's a one, it's considered in the analysis. If you weight it to zero, it's going to be kicked out of the analysis.
Ron Wilson:	In other words, if you're not sure – in other words if you're not sure if this is a part of the crime series?
Derek Paulson:	No.
Wil Gorr:	Can you put in a .5?
Derek Paulson:	No. It's – if you think that, when Kim and I talked – we talked about this a little bit. Some of this – it goes on in the expert system; the system will kick them out because of time and location. Well, when I ran this, it'll say number four failed location. It'd say do you want to kick out because you feel there's – and it's a theoretic thing. If you think there's something about these crimes – the way Kim explained it to me, if there were two incidents, and one that might have been one series – like you hit one here and then went further on and another one a couple of blocks away. Just keeping that one, and you might get rid of the one _____. Or if you hit one residential burglary _____ hit one house and you come back and hit that location again or hit right next door to it, maybe a week later, it might kick one of those out. Because if we put too much emphasis on that one area, where theoretically that individual, he's already come to that area, he's _____ targets.
Ron Wilson:	_____ apartment complex, a unit, going back.
Derek Paulson:	Well, then that – well, there might be something – well, before you get into should you throw it out, should you not throw it out, it's instant – this is where he says it's an art. Should you keep it in? Should you keep it out? This is why you have up in this upper corner a serial. And you can run as many as you want. So you can do it with kicking some crimes out, kicking others out. When I went to the class, I made a – I made a little chart because I _____. And it was which ones I might kick out and why. I would always have myself say why would I kick it out? And then I would look at the statistics again and see what fit, and what did not fit. What I thought might happen. So it

allows you to throw out as many cases as you feel you should or should not throw out.

Pat Brantingham: Actually, I feel funny _____ because _____. But he does say that _____ based on theory _____ research to show whether you should throw _____ cases _____. Whether, I do find _____ points and kind of target that factor _____ pattern. His ideas, one time _____ area _____ more importance on the _____ find the _____ search areas. Because you may not _____.

Derek Paulson: But it does change the way, the calculations. And that's why he weighed it out. And that's why the extra system – the last time I talked to him, he _____ system they were – they said it had some bugs in it, and they're working on it, and I know they're working on it now. I don't have _____. They were still working – it was still, this is _____ system is not to their expectations. So when I, so just _____. Any other questions on Analyst before I show CrimeStat?

Alright. CrimeStat. Again, this is a totally different kind of interface. And you'll see that it's got a bunch of different things in here. Okay. You've got the data set up where you've got a primary file, a secondary file, and a reference file, and _____. The primary file and secondary file are for – not used in every case. You always have a primary file. You don't always have a secondary file. It depends on the analysis you're conducting. With the geographic profiles you do not have a secondary file. But you will use a reference file. Again, you'll see that there's a ton of different analysis techniques in here. None of which are going to _____ different set of analysis, but not something you really need to take into account at this point. In terms of importing, you go up, select file. I always leave it on _____, but you can _____ search for several different _____. This should be the exact case I just did. And then you go into the column and you have to tell it where the X and Y coordinates are. Okay.

And missing values, not as big an issue anymore. The first version of CrimeStat, missing values would cause it to freak out a little bit more.

I've already loaded in the records file. But this is your search area. Again, it's user-defined. In this case I think

	I've got it as close to the way Rigel did it as possible. And it's just simply the lower left corner X and Y, the upper right corner X and Y. You can save these. Like if you're doing a live analysis in your jurisdiction for – it works really well if you're doing okay, _____ jurisdiction. You just load _____ you always have the same X and Y coordinates.
	_____ modeling. And the screen says there's _____ crime. Calibrate the _____ function. _____ we're not going to do that here. To use the standard, use this. Use calibrated distance functions. No. Use mathematical functions is which what we'll do here. In the instant filing you would select primary, secondary, you don't have to always make the incident file the primary. And then you've got your mathematical functions. Which one you choose. *[Incidental Conversation, Off-point Remarks]*
	You have to save your output. Again, you can save it to various different forms here. _____. Excuse me?
Tom Rich:	This is perfect – this is a great example. What does that mean? You know. I mean, you know. Does it have any inherent meaning?
Wil Gorr:	It should depend on the units, miles. And I think that's—
Tom Rich:	I mean, what is X or X _____ for? Do either of these have any – what does it mean?
Mike Shively:	It's described here in the documentation as – or user's guide where they say here's where you would want to use one function versus another.
Derek Paulson:	Oh, the different mathematical functions?
Mike Shively:	Yeah.
Derek Paulson:	That's where the – I don't remember that it really – it talks about the differences in them, but it doesn't say – I don't think it comes out and says for crime patterns that are this way, or if you've got—
Mike Shively:	Yeah. You've got—

Derek Paulson:	It doesn't go into the _____ and all that. But he'll talk about – right. He just wanted to give people options. Yeah, he'll talk about how the calculations are different, and give you some basic tips. But he does not go through and say for robberies, this one is better, for this type, this one's better. _____ that's far beyond his ability to do all that in the manual. That's just – it takes a long time just to _____ to do that kind of analysis for that I think is beyond his realm. And again, he's giving you options with some guidance, but not, step by step and say, you know—
Mike Shively:	So Robin, how far along are you in implementing it – 'til you run into, analysts come to you and say well, what is – what do I do here or?
Robin Wilfong:	This I haven't even seen before.
Mike Shively:	Okay.
Robin Wilfong:	We're trying to calibrate county _____ doing that system to utilize that _____. That would be my question. Which one am I suppose to use? I know. What –
Ron Wilson:	It's in here. And I don't think it's just directly straight-forward. For example, it says – it's also been argued in here that the negative exponential function generally gives a better _____ urban travel pattern. So rather than unlike what I've seen in the other parts of his manual, strengths, weaknesses, it's sort of got a _____.
Derek Paulson:	Yeah, it's a little guidance, but it's not – it's not huge.
Tom Rich:	But he also suggests that you *[Incidental Conversation, Off-point Remarks]* use the other option.
Derek Paulson:	And I tell you again, if you were really going to use it a lot, the calibrations would just judge, as you can get it specific to your jurisdiction. Again, it's just – _____ is more into building a set of tools and getting them _____ as possible, and that's – and different purposes you can use. Rigel and CrimeStat are very different. And this is I think where you'll really see that. This is not at all built the same way that Rigel Analyst was.
Robin Wilfong:	I have a question. I know with the calibration what they're looking for in our county, the offender's home address.

	Well, if the offender – take it that you're calibrating it on their home address, if the offender is at their work or girlfriend's house or whatever, this is going to _____ where to look.
Derek Paulson:	All they're looking at in calibration – well, again, you can calibrate it on whatever you want to calibrate it off of. If you want to calibrate it on, what you can find. If you have this data, where did you come from, where did you leave before you commit the crimes, or where did you leave from? What was your anchor point? If you can explain it, get that information. That's probably what they would tell you to do. It's a proxy and that's all it is. It's just a proxy or an anchor point. And it's the – the thing about it, it's the proxy most often used. Is it the best one? _____ so that's pretty much why he's using that. Now again, you're right. His home address. Is that really their home address? Do they, do you arrest them multiple times, do they keep using the same address? Or do they live someplace different? Or did they give you a fake one. You really don't know. But it's going to give you – it's still going to let you calibrate. It's going to give you something different than those five mathematical functions. We save the output and now you just – down here. You can _____ here it goes quick. And it tells you just some basic things. It tells you the function to use. The reference points, which is just the search area grid. Location points. Measuring type. The peak likely _____ and it gives you the X and Y coordinates for that. Tells you how long _____. And then it gives you some basic just graph _____.

Now it will go and show you – again, that's just the basic – I'll just give you that. Now you have to go to ArcView or whatever other GIS. So you pull it up. And I'm not going to pull up a base map with it. And this is your profile. *[Laughing]* Right, _____ go in here and _____ color. You go down to classification field, go down to the base core. |
| *Mike Shively:* | It's plaid. Can you do different types of plaid? |
| *Derek Paulson:* | You can do – and that – well, then you come into _____ classified function and how you classify it. Yeah, and here you come into how you classify – if you want to leave it at five. If you want to make it thirty-five. If you – how you want to do it. there's a million ways to do it in here. |

Keith Harries:	_____ if they don't have more than say five categories. If you want that _____.
Derek Paulson:	It just gives you a range to values. The _____ the higher the probability. And then again, you can, you can pull it up here and how you want to classify it. _____ it's up to you. And as far as I know, there's nothing in our – I mean in the manual about how to do this part at all. It's just a crapshoot.
	_____ set of crimes. You can get a different picture and I'll see if I can pull up _____. Type that in _____ location. But – you can't see it very well. Again, it's cut off. But _____ there are still a couple down here. And you can, make it pretty. Get rid of the grid by _____, et cetera. It gives you – and the darker the color – one thing you can't – and I forgot. There's one other thing. If you want to know the exact highest point, you go into _____. You can see that little _____. The highest point _____ narrow to one point. _____ *[Incidental Conversation, Off-point Remarks]*
	And if you do all five, you'll get different – all five analyses will give you something different. And they're very different in terms of what they'll give you. Look at the ones here, and look at all five mathematical functions, they give you something different. Some will give you a larger area, some will give you the exact opposite of that, and the lightest colors will be the darkest colors.
Tom Rich:	Depending on which function you pick?
Derek Paulson:	Yes. _____. It will give you different Distance Decay functions and again, so it should give you a different – different calculations. It'll give you a different map.
Jay Lee:	The output – that is to be displayed by our viewer or some other program. I believe there is a free thing called ArcExplorer.
Derek Paulson:	You cannot – as far as I know, I've tried it. And I don't think you can go in and do this part on ArcExplorer. *[Incidental Conversation, Off-point Remarks]*

Wil Gorr:	_____ equal intervals. There's only one option, you know.
Tom Rich	So again, if we did – if you went back and showed a different Distance Decay function, it's a totally different matter.
Derek Paulson:	Yeah, and if you want, I'll do it _____. *[Incidental Conversation, Off-point Remarks]*
Tom Rich:	If you chose a different coefficients you would get a different match. Right.
Derek Paulson:	This _____ section is much larger than – if you go through all of them, I mean some of them really are completely – I'm mean, almost the opposite of – and some of them give you a very large _____ a large search area. And that should be an even smaller one. And again, you're right. You change coefficients you _____. There's a lot more user ability to adapt changes. Any more questions?
	Alright, now we go to Dragnet. You go up to Dragnet, you start off and you'll see already on the left side, that is your range right there. So obviously it's already built in there. Go up to new, and it asks you – and you put horizontal scale. I'm just going to make up a crime series on this one. I know _____. And now all you simply do is you overlay your map and you – there's your points. Make a little difference _____ *[Laughing]*. There we go.
Tom Rich:	That's pretty good. *[Laughing]* *[Incidental Conversation, Off-point Remarks]*
Derek Paulson:	And now you just plot the probability map that'll give you a little number of sites, _____ distance in. _____
Tom Rich:	that is taking more of the central—
Derek Paulson:	And if you'd like to center it. It may not do it.
Sean Bair:	if I remember correctly, you have to have that set prior to doing it.
Derek Paulson:	Yeah, there's one that I want to throw around _____ center, it'll throw it on there. It throws a little _____.

Sean Bair:	I need to redo it on _____. Redo the whole _____
Derek Paulson:	And that's it. That's your results. That's what you've got.
Tom Rich:	So now if we went to CrimeStat and it shows a negative expediential and maybe we did. If we do a negative – did we do a negative expediential in CrimeStat?
Derek Paulson:	Yes. That was the first one.
Tom Rich:	Which was very different, then.
Derek Paulson:	Yes.

[Incidental Conversation, off-point Remarks]

Pat Brantingham:	What I'm saying is with that _____ technology, and _____ looking for _____ a linear path so you can take an X and Y coordinate _____ and plots a straight line _____ orientation. And that's what he's doing. I mean, is that going be broke down? *[Incidental Conversation, Off-point Remarks]*
Derek Paulson:	Again, that's pretty much right, and you can load other functions. I don't know how to create the functions. You can. You take your same piece of paper _____. *[Laughing]* And trace it back on there.
Tom Rich:	The old fashioned way.
Derek Paulson:	I just trace it back on there. This is what I've done. When I've done it before, and I want to put it on map, I've drawn it back on there. Gone back into Art View and you can create a shape file. It works a whole lot better with this little bad boy, this type of PC, because you can use a pen to create your shape file. So it's a lot more accurate than if you want to try to use a mouse. If you've got to be in a very dark courtroom. *[Laughing]* You've got to be right up on it. _____.
Jay Lee:	What's the menu. I mean, I ask, what's the menu item under the _____?
Derek Paulson:	What was your question? You can put your own box? Again I, and it will ask where it is.

Jay Lee:	And how's that specified?
Derek Paulson:	It's in a FUN file.
Tom Rich:	A FUN file. I like that. *[Laughing] [Incidental Conversation, Off-point Remarks]*
Off-Point:	Did you get the sample data _____?
Derek Paulson:	I did not. Yeah, I think I did, but I didn't use it. Did you – he actually – no, he did. He gave me. I did use it. Yeah, I didn't use it very much. Did he ever talk about using _____?
Sean Bair:	He did, and that was I think on day two and the first day was that whole life factor analysis and everything, so at that point – those little boxes were starting to get to me and I _____ *[Laughing]* So yeah, I don't remember the FUN stuff. *[Laughing] [Incidental Conversation, Off-point Remarks]*
Derek Paulson:	There are ways to put it in.
Jay Lee:	It seems to me that the _____ is just for convenience. But it is to be commercialized.
Derek Paulson:	Well, again – very different. Yeah. It's very different purposes how it's built. if you built it in-house, then it doesn't – he doesn't try to sell it. If you ask him for it, he'll probably let me have it.
Jay Lee:	Yeah, he probably doesn't care if other people know how to put the function in.
Derek Paulson:	As you said, when you call tech support, you get him. And if he's got time, he'll help you out. He's been, I always just send him an e-mail. But he's always been very helpful. But there are – and again it does allow the ability to put in other functions. You can talk to him if you're going to _____. But it is more basic in many ways. It's more basic in terms of its input – in terms of data input – it is really pretty easy.
Jay Lee:	So far I haven't seen anything that the vendors _____.
Sean Bair:	Assume you know the math behind it to do it. _____.

Derek Paulson:	Yeah, oh, yeah. You're right. If you can _____ *[Incidental Conversation, Off-point Remarks]*
Derek Paulson:	So these packages, though, definitely create different outputs. I mean, for the same – even if you specify the same Distance Decay function, you're going to get a wildly different map.
Keith Harris:	Some of that could have to do with the number of _____. It could have some impact. You can go back and change _____? Just to see what effect that might have?
Derek Paulson:	Yeah, what would you like? How many?
Keith Harris:	Oh, say eight. Just arbitrarily _____.
Derek Paulson:	You want that one? This – that is what you had before. And so when you added another layer, you got _____. Stop right there. _____ right there, and got a little separation in there.

[Incidental Conversation, Off-point Remarks]

Sean Blair:	Derek, can you use any of this stuff in Iraq?
Derek Paulson:	I know that there's been a lot of questions on the list—well, not a lot. There have been *some* questions that have run across the ListServ that are about if it's being used, but I think it'd be different theoretical assumptions of it. And I know people have asked about can you use it, and there was a thread that went along _____. I think it _____ off-line, but I would not be surprised if it's being used.
Sean Bair:	Because if there are dollars chasing that, then they could be valuable for this group as well.
Derek Paulson:	I would think. They were _____.
Keith Harries:	Well, Kevin probably knows. *[Incidental Conversation, Off-point Remarks]* *[Laughing]*
Derek Paulson:	I said it was going to be an *easy* one; I got like *85 responses*. It was killing me. I just thought no one would respond so soon _____.

Keith Harries:	Well, where would you like to pick up? We have – on the agenda to evaluate the output _____ or continuing discussion from this morning.
Tom Rich:	We should probably move along.
Shari Pfleeger:	Since we're getting into the user perspective, can I ask a question of the two of you, with all these different formats, what's the most useful to use? What would be the most helpful in solving a problem that we need to solve?
Robin Wilfong:	I think myself, as a user, if I had to through a very difficult formula based thing to come up with, as opposed to eye-balling it. I think I'd go with the eye-balling results, but you know, I think it would be easier for the product from a user perspective the better, you know. The more user friendly the better. As far as I – I mean, as far as quality of the product? That would also come into consideration, you know. Is it – if it says it is 70% accurate, then *is* it 70% accurate, and I think the only way, as a user I'm going to be able to determine that is by using it and seeing. And how much of an accuracy I'm getting _____.
Shari Pfleeger:	Some of that might come from calibration that you take over time. It's calibrated to your situation. It would be different from _____ say a national database.
Tom Rich:	I have a question about calibration, though. Is it how much – I mean, I can see advantages to calibrating for your county as opposed to Baltimore County. But is that – but each offender is different. And is that going to help you solve a particular case if – I mean, is an individual offender more likely to follow, however you calibrate it, in your county as opposed to some other county? I mean, maybe I don't – maybe that's not calibration. I don't know what that buys you. You know.
Robin Wilfong:	That's a good question. I'm not sure, and if we're calibrating and we're calibrating it by the offender's home address, what are we missing? Are we missing something there or is that making the product better or, you know. I'm not sure.
Tom Rich:	Wouldn't you need to calibrate it by the type of criminal or – yeah, type of, as opposed to an area. Maybe I don't understand the calibration procedures. Or what it's intent is.

Robin Wilfong:	My understanding is very limited on it and if you're calibrating by an offender's residence, or their home address, theory supposedly is they only go out so far from that location to commit that crime, and then if you take all those subjects in your area and they've only gone out – say the most they've gone out is eight miles from there, then you build a – I guess it builds a probability from that? For your particular county. And that, like I say is – I don't know if I'm explaining that right or—
Tom Rich:	Sounds _____.
Robin Wilfong:	I have a limited knowledge on that. On the calibration process.
Tom Rich:	So into the theory that the Pinellas County offenders' travel patterns are significantly different than the Baltimore County, which I guess – is that what's going to be hypothesized I guess.
Robin Wilfong:	Right.
Derek Paulson:	I think it kind of allows for city specifications. Just based on incidents, it's a simple way of saying, allowing differences between cities _____ possibly. If your offenders travel differently on average, because of whatever factor. We talked about this at lunch. Is Boston different than Atlanta? _____ use it in terms of the average during the crime. The different size of the city. So it would be able to allow you to take those things into consideration in a general way. Specify it down to that with the calibration.
Keith Harries:	Isn't there often a fallacy in calibration to one jurisdiction – again, I can't help thinking about Baltimore City, Baltimore County. You've got Baltimore City is basically a rectangle. It's like D.C. It's sort of ten miles on a side. And then Baltimore County is wrapped around it like a horseshoe. Well, of course, there's a lot of travel between Baltimore City and Baltimore County. And this is one of the big problems with Baltimore County, P.D. is all this commuting from Baltimore City. And if you calibrate it to Baltimore County, aren't you sort of missing that whole – that whole dimension really?

Derek Paulson:	Unless your offenders – if you're getting the offenders that offend in Baltimore County, and you're calibrating to Baltimore County, then wherever they live, if they're coming from Baltimore City, you'll get that.
Keith Harries:	Oh, you will capture that?
Derek Paulson:	You will capture that. Because you're just calibrating based on where the offender offended. It's just a simple one-crime. Where they offended, where they went. So, if they're doing – if they live in Baltimore City and drive out to Towson to offend on a daily basis, for whatever reason, you'll get that calibration in, so the majority of offenders are from within Baltimore City who offend out in Baltimore County or vice versa, it should take that into consideration. You should be okay with it.
Shari Pfleeger:	It seems to me there's something missing or a misunderstanding, and that is calibration to the terrain. So for instance I could be half a mile from a place, but if there's a river between me and that place, and there are only certain places to cross the river, then in fact, my proximity to that place is very different. And so that's one way that Canales County is different from Arizona and it's different from all these other cities that you mention. There doesn't seem to be an underlying database of terrain. The algorithm.
Keith Harries:	This would come under the heading of the enrichment we were talking about this morning. That's the kind of thing _____.
Wil Gorr:	And just as Derek mentioned earlier, the option of using time when you use a road network as the basis for – you take an optimal route to that point it'll take, an hour to get there I guess.
Derek Paulson:	You won't know that that's the route they took. But then again, when we _____ we have no idea either, so it's not – it's here one way or the other.
Wil Gorr:	But you would find it's not accessible. Because it's _____ the way.

Jay Lee:	Also from users' perspective, Sean, you saw the _____. This metrics. How helpful is that? This here. There's no road. There's no _____.
Sean Bair:	It's kind of like Derek would say, it seems stupid that you have to do it that way, but honestly, it is very easy just to print out a map in Art View, put it up to the screen, put my, limited number of dots that are in my criteria, and then once I have my area, trace it, bring it back, and it's not that – it wasn't that big of a deal. Actually I had more difficulty with CrimeStat in going now what's this exponent thing? And how's this – why do I have incorporate that? It just seems so much easier to just, three clicks of the mouse, you get results. That and Rigel. I seen Rigel again. It's like, oh yeah. That's pretty simplistic, too. Very user friendly I think.
Tom Rich:	There's always a trade-off between having – giving the user lots of options and then really confusing them, by having all of these options.
Jay Lee:	It is _____, too, yes. You let people have more option, they _____. The more option that you give the user, the more confused they are.
Shari Pfleeger:	But good software can have levels that you can choose, so you go into the simplest one first, and as you master that, you add other options.
Jay Lee:	That's when the people comes in.
Sean Bair:	Well, then the software is also written to the end user, and the end user being the crime analyst, does not know what a exponent is. So he'll describe it as oh, that might be whether or not they took a road network or a such-n-such – well, you know. Put that in a box. Give me a drop down box that says they primarily use the road network or this, that, and the other. Don't make me come up with this expedient thing like oh, okay, one equals this, 4.5 equals.
Tom Rich:	Well, again – that's his audience is more researchers.
Sean Bair:	He says it's used by researchers, but what was the original intention of that application?

Jay Lee:	But I'm still hopeful, you know. The base, or the foundation is made ah, maybe with further resources available that – that kind of different label of users, or even _____. So that the user can just take a simple menu and go on with it.
Derek Paulson:	It was designed to be enabled to use as it is. MapInfo. ArcView. As many people as possible for free. If you want to build those things in, you're probably going to run into a call. If you're going to put it on Map Point with a built-in database, it's probably going to cost you. Which it was designed to do for free. but there's many different systems as possible, which it does, and that means you're going to – you're going to lose some of those things. Again, it's the trade-off _____ you're doing this. The ease of use when you try to make it as general a system _____ things. Again, it's just one small – even under the spatial module, it's just one-half. You've got – and now you've got even more tabs in the newer version. It's just one small aspect of that. I'd say it's more heavily used to create hot spots than anything else. I think going beyond that, it's _____. That's just one function of that software. So it's trying to accommodate, so again, it's a totally different purpose than what the others were designed for.
Keith Harries:	This is not a facetious question. It may be a pedantic question, but it's not facetious. What do we mean by accuracy? How do you test that? If you're going to detect a finite form, then you can evaluate accuracy. But you're really using this as an assisted tool, then what is accuracy?
Wil Gorr:	I would say it's the hit score; part of the optimal assistance and its concept as I understand it, that you have the search region broken up into a rectangle. And there are grid cells. And you compare _____ solve crime series, the location of the anchor point. And then you have the peak. You have the peak grid cell from your jeopardy surface. Then you go through a process to see if your research from the peak of that surface down, I'm not sure you'd have the cover until you got to the anchor point. And that turns out to be 20% or 25%, 15% or 7%.
Tom Rich:	In certain cases. I mean, again, in this test case or in these series of test cases, that's what Canter came up with, 20%.

Derek Paulson:	And the problem that he points out, and as I mentioned before, it's totally dependent on your search area. And if the offender lives outside that search area you cannot create a search _____ for his _____. Plus, depending on the – and again, since – with Dragnet and with CrimeStat you can create your own search area. With Rigel you can't. Okay, now the points are you can still be only half a mile away, but you'd be outside the search area. And so is that, the thing you've got to remember, how can you measure it across all three? Can you standard the search cost or hit score for all three measures? That's the hardest part of measuring accuracy. How do you come up with a way to measure accuracy across all three, or four counting Predator, systems equally? How do you – can you make sure you can create the same exact search area for all four? Can you make sure you can calculate search costs the same way for all four?
Tom Rich:	You talk in light of application, is that what you're talking about?
Derek Paulson:	Yeah. I mean, like if you're using – if you're going to do what we just did, we ran through whatever sample data, are you sure you could measure the search costs for Rigel, CrimeStat, and Dragnet? Equally. So that you know and that you've got the exact same measurements, the same frames, and you've got the – so you can say oh, it was 12% in Dragnet, 15% in CrimeStat, and 7% in Rigel. Whatever. Because Rigel, we can't crack into that software. It doesn't give you – it gives you a hit score. But it's different than – is it the same way, can you do that exact same calculation for CrimeStat and for Dragnet? So whatever it is you come up with as an accuracy, you have to make sure you can do it for all three. And that's where you come into the different systems and different outputs. Different ways to do it.
Tom Rich:	Yeah, but with all of them you can see where the home anchor point was relative to the high point, so I don't understand why you couldn't – that might be cumbersome. But couldn't you do it?
Derek Paulson:	That's what I'm after. You've got to make sure you can. I mean, you could, in theory do it.

Pat Brantingham:	But you said the MOU with Rigel Analyst is that, you can only look at property crimes?
Derek Paulson:	That's if – but if you buy Rigel Analyst you can do whatever you want with it.
Pat Brantingham:	But I meant in a – in an evaluation, in a legal sense, wouldn't you have to be – if you're going to compare for other series, more series violent types of crimes, you'd have to use full blown Rigel, and then you have the front end of the training – I mean, like—
Derek Paulson:	I think that's only under the agreements through NLECTC The Southeast Center. That MOU states that you can only do that. Those who purchase or those who – to do this evaluation, NI. pointed out and bought seven different systems, and gave them out _____ there would be no limit on _____ —
Pat Brantingham:	And that's a legal thing with ECRI?
Derek Paulson:	I'm mean, E.C.R.I. does not tell me I can't do whatever – I can do whatever I want with the copy. I mean, I own copy of Rigel Analyst. I have no agreement that says I can't profile anyone. I can profile any case. So it comes down to the way, the MOU that y'all have is different. I don't have an MOU with ECRI I just own a copy.
Shari Pfleeger:	But the dropdown menu for choosing which kind it is, is very limited.
Derek Paulson:	But it has no impact on the – it has no impact on the calculations.
Pat Brantingham:	But as long as you don't sign anything restricting its usage?
Derek Paulson:	Right. And like I said, if you're ever going to do an evaluation and you want to give it to seven agencies to use it, then what you'd probably have to do, unless you could work something out with ECRI, is you've got to buy seven copies or something else. But it – when I got a copy, the copy I received, there's no limit on what I can do with it. I can profile – if I want to I can go profile serial murders if I want
Pat Brantingham:	It's not in dark print on the back of any pages on the—

Derek Paulson:	I didn't sign anything. *[Laughing]* I just paid. But theirs is a different – there's, the NLECTC *[Laughing]* They have a different – the way the whole thing's set up. You didn't actually purchase – some of the agencies who have it did not pay for it. They are receiving it through NLECTC.
Pat Brantingham:	So that means the training that used to be with the big Rigel aren't required anymore?
Tom Rich:	They told me that it was required, but I just don't know who offers. I don't know where it's—
Derek Paulson:	Yes. Yes. I don't think Southeast Center – Southeast Center didn't offer the big Rigel training. They always went through Kim.
Pat Brantingham:	I'm just thinking hypothetically – if one were to take the program and use it without the training, could you consider that kind of a reliable estimate of its accuracy? If they say training's necessary to use it well. I mean, I'm just—
Derek Paulson:	No, no. That's a good question.
Tom Rich:	And are you talking after-the-fact analysis? Like Baltimore County. Data set, after-the-fact. Or are we talking about using that to come up with accuracy measures? Or if the people from ECRI say no, you can't do that. That's not fair. You have to – you have to ask the analyst in each case, was this software helpful on that case.
Pat Brantingham:	Or would you have to ask someone who's trained would Rigel apply on this type of case first? Before you--
Tom Rich:	Yeah, that's right. That's a good point, too.
Derek Paulson:	I have a question. Why would that be any valid way to analyze it? Using historical data. Because every article is going to use historical data. You can't use historical data--
Tom Rich:	I don't remember their exact reasoning, but I'm sure it has something to do with the fact the – whatever crime data you're going to get is not going to have all of the geographic information which the analyst had at their disposal when they were using a case. So the historical data

	may have where the crime occurred, but it doesn't have this other information that the analyst had--
Derek Paulson:	Well, I can – I can see that point. And I could also say that if you use the same historical data across all the different software systems, and didn't limit it in any way, that that would be an accurate way. That would be an effective way to measure consistently how accurate they are. Because you're not going to find – no matter what – using that same system, that means that each analyst is going to have to use each system to do every profile, and they're going to have to exactly. They're going to have to do it somehow. I don't know how else you can measure it without introducing some sort of error.
Pat Brantingham:	Speaking hypothetically again, if you however did test data or pass data, and if ECRI was to say well, the trained investigator would never have used the program for that data, you can't use that case in order to assess the value of the program. Could you use that case? Or would you be testing it at a standard they would say was inappropriate?
Derek Paulson:	Well, _____ allowing ECRI to drive the determination of the data. Something ECRI might say is what they would use may be different than what David Canner would use, which may be different from Ned Levine would use, which means they're only coming up with a common standard whereby each person would say no, no, no you can only use these cases that I know will work on this or something like that. Or you could go over a set of criteria where _____ in the first place where everyone here agrees on what is a profile case, and then you go out and try to find that kind of data. No matter what, there's going to be a difficult time finding data. Even historical data. It's going to be not so easy to find. Live data is going to be not so easy to find. But in terms of coming up with a consistent measure, I think historical data is probably going to be _____ —
Pat Brantingham:	Just hypothetically, I mean, I really am speaking from very limited knowledge. Hypothetically there's no contention that Rigel works on all types of cases. They have contention that with the training – some of you have taken training, and you know more about it than I do. It's kind of like some cases are discarded. It's like _____, thrown away. So you're only using one of the restricted range. So

if you're using a broader range to evaluate, you would say that would never be data that would be used.

Sean Bair: As long as they provide us with standards in terms of which case, which types of series get included and which types of cases don't, that's easy for us to evaluate. We can get our hands on plenty of historical data.

Derek Paulson: That's what I'm saying. As long as we agree on what those standards are before, then I don't see why historical data wouldn't be fine, and then we have that same data set for each of the different softwares.

Pat Brantingham: So as long as ECRI agrees—

Derek Paulson: Well, again, as long as it's something – I don't know if it's ECRI. As long as it's standard, whatever the geographic profiling field would agree that it's a case that would be profiled, rather than just saying, ECRI. – I mean, I know there's going to be certain things that they say need to be within a case to be profiled. So as long as there's standards—

Pat Brantingham: So maybe both ways – but one has to be careful in using it in a broad range and just saying, research shows these don't fit, but yeah.

Sean Bair: I think it's just going to be similar to what we all saw on the news this morning, which is this whole study of SUVs and their rollovers and all that kind of stuff. We – the Safety Institute did not contact all the vehicle manufacturers and say hey, we're about to tackle this, if you want to do this, that and the other. They went ahead and just grabbed the software and had a standardized test they were going to run them all through. And ran them all through that. Now every single one of them that performed poorly is now coming out saying well, that the humidity was too high that day, and *[Laughing]*. I don't think it really matters as long as we standardize it.

The commuter marauder thing is the only one that I think could be kind of a tricky part here. Because again, I would argue for them that you probably should not use the software to analyze the commuter type activity, but you don't know that before you—

Derek Paulson:	And that's the one _____ I give to using some commuters. It's a test. See how well they do. I mean, it's not something you're going to say well, they suck on it. But you might just say, they all are bad. But since there's no way in the real worth bottom line is to figure how well this will work in the real world. We want to make it as real world data as we can.
	And if there's no way to determine – again, I would love to be able to find a way to determine _____ during an active crime series. But if you can't, at least find out well, how far off are they? Maybe they're not so far off. Maybe they are so far off. So, it'd be interesting to find a way. I mean, I don't know. It'd be interesting to find out what you do. I mean, in determination, I think other things you can look at is city types. Different crime types. If they work better with certain crime types, they work better with different city types. It's a lot of data. But it would be interesting to see – does it work better in certain types of cities? I mean, we talked about rural agencies. Does it work well – how many different agencies who were small? 90% served less than 10,000?
Keith Harries:	76%.
Derek Paulson:	I mean, it would be interesting to see if it works well in medium size cities, large size cities. Denver. Atlanta. And again, across different crime types. Because as of now, the existing literature has been consistent in a serial murder and some burglary and Ned in CrimeStat did some that just took a cross, but he didn't look and see how well it did across different crimes. He just used a non-random sample of different cases in CrimeStat. But he doesn't report how well it did on different types of crimes. It may do very well on certain types of crimes. Or maybe an area where we can come back and say okay, this works really well for these types of crimes, and maybe improvement in these other types of crimes.
Mike Shively:	If I try to imagine, fast forward to not just the end of this project, but the next project, which is going to be actually evaluating it, the product of that would be presumably a user's guide or something. Right? something – the list of software packages and how they performed. Right? So imagine a nice table, or chart would be these are the crimes that the software has attended to address. And that would

be helpful all by itself. Because, if you've got someone selling you something, saying you get this software and profile crime, you may assume that, a law enforcement agency may assume that it deals with everything. You start reading the documentation and you realize, this is only for property crime. But just, to have that comparison and then the next set of tables would be how do they perform in their intended, as intended. It could be that, there are a lot of limitations on the crime types but then, there's going to be some overlap. It could be that all of them address property crime, and then you'd be able to compare them. In other cases, you'd just have a not available or not applicable in a box because it's not suppose to be.

The other problem – the other thing that you raised that I think is important would be the training issue. And I think, as long as we did it for all of the software, I suppose it could be an interesting exercise to see how untrained people do trying to use it, but it shouldn't be a whole eval – I mean, clearly the only fair – I think the fairest is to each software package, using it, according to the user's manual. and if it says you need a year of training, then it should be people with a year of training, and see how they do.

Pat Brantingham: And include that in the cost.

Mike Shively: Right. Absolutely.

Sean Bair: You know the best thing we could do is actually provide David, Ned and Kim like a thousand crime series and see who does best using their applications. *[Laughing]*

Shari Pfleeger: You could fairly easily write drivers that would do all of this automatically, and you take the user out of the loop so you don't have to worry about using the _____ for consistencies.

Sean Bair: That's what they claim as a key component to operating the software, though, is that – the proper training and the proper, knowledge of all the different parameters, and stuff. Who better than the creator of the application?

Mike Shively: I think that's an important thing. It's a controlled, artificial experiment to kind of peel the onion? So there's this – at one layer it's like let's assume there is no such thing as user. Take all of that out and how does the software do,

how does it do under perfect conditions? And then you start adding in the users, and it could be that you've got two different software packages which performing with automation perform equally, but one is twice as good as the other with the user. You know that that one that performs better is much more friendly to the user and it's, it has better guidance. I think it would be… an evaluation is going to have a lot of different components. There are all kinds of dimensions, a lot of different types of tests. They test different things. But I think that would be – to kind of get it down to its core element, under perfect conditions: What does it do? And then I think if you have cases where, we know where the residence was, but the software doesn't yet, and you just test them. How close do they come? That's pretty straight-forward.

Pat Brantingham: You think they'd go along with it where you never told them the residence. They just send you back the best estimate.

Sean Bair: No, they would never go along with that. *[Laughing]*

Mike Shively: What do you mean by going along with it?

Derek Paulson: I don't think – well, I don't know.

Mike Shively: No. What do you mean by going along with it?

Derek Paulson: Yeah, just giving them data. I don't think it's a great device.

Pat Brantingham: Because Cantor would definitely win that because with his function that none of know what it is means that he can take the data that you give him six or seven points and build the best function from that, and then he'd win.

Mike Shively: So you're saying that having the developers operate it is approximating what you were saying is, having an user error, right? It's under the best conditions and – because in a way I don't know why you'd want the developers to do it, because they're so much different than the users.

Sean Bair: I just said that to _____.

Mike Shively: No, I know you did. But it's been picked up.

Shari Pfleeger: Yeah, I think you would want not to have the developers involved because _____.

Mike Shively: I mean, they wouldn't want to do it anyway. You know. Because even if they did, I don't know that it'd – probably most of it was, the same – they know it better so they're not going to make mistakes. You guys are dying to talk. *[Laughing]*

Tom Rich: I think we have to – in addition to that, though, I feel strongly that we also need to include a sort of user – give these – or interview people that have analysts who have used these packages and gone through having them say, okay, for each case I want you to write down was this helpful or did it tell you to go the wrong direction? And just, I think that's got to be part of this evaluation as well.

Keith Harries: Aren't you going to get a Hawthorne effect? Sort of assumption like well they – what they're angling at here is that they want us to say nice things.

Tom Rich: Yeah, that's always _____.

Derek Paulson: Are you talking about using a control method with these systems? See how – if they're any better than—

Tom Rich: Well, I mean that is one option is to give analysts. Here – here, I want you to try each of these, half a dozen methods on cases, as they come up. And keep track of what, what they told you and which one you felt – or which one, in the end produced the most useful results.

Derek Paulson: No, I'm talking about – I mean, we're going to use all three of these softwares? We're going to determine accuracy? But accuracy in comparison to – I mean if you use, I mean going back to just simple human predictions. We're going to have these analysts do it? Can we have them do it, I mean for – however you do it. Historical data. Whoever you used to do it. Would you also just have people—

Pat Brantingham: Eye-ball it.

Derek Paulson: Yeah, eye-ball it.

Tom Rich: That's one hypothesis there. Is that—

Derek Paulson:	That is theoretic. That's theoretically the easiest way.
Tom Rich:	Right.
Derek Paulson:	And the software involved. You just have them write down why.
Tom Rich:	And I think it's the reason hypothesis that eye-balling is just as good anyway.
Derek Paulson:	But then you've got to have them come up with the next _____ area. The search area. How they do it.
Shari Pfleeger:	The other thing you do is whenever it's wrong, either the software or the analyst, you have to figure out why it's wrong. So that you can figure out what variable's not in the methodology that needs to be in there.
Mike Shively:	As soon as I can think of a – go ahead. I yield. I yield. *[Incidental Conversation, Off-point Remarks]*
Debra Stoe:	I just want to – this is earlier. Part of this process, Tom and Mike will actually be writing up the results of these meetings and during that time that they're writing this up, which I think is in the next month or two, establish that, they may be calling you to ask if you're verifying, you or ask for verification and if you get an opportunity to contribute something. After which point they will take any _____. I mean, _____ keep it and go through it and bring it together and then also at that time we will send _____ your comments and your edits and then we will be looking at it after that point. But I just want to give you some idea of the process that we're going through. So it's very important if you think of something that needs to be added or should be in this, that you make that statement so that it's in the record now so that we can make sure it's in there later. Then you'll also be given another opportunity—
Shari Pfleeger:	Is this going to be a publicly available document?
Debra Stoe:	Yes.
Pat Brantingham:	Can we be sued? *[Laughing]*

Debra Stoe: The point is to develop a methodology. And you guys are doing that, and hopefully, if it turns out to be a very good, rigorous methodology, then the next step would be to possibly find the solicitation that says we want you to take this methodology. We don't know who's going to do it, and evaluate the software. And that's when, we have to take that next step.

Pat Brantingham: Will the document that's written be written in the _____ summary form?

Mike Shively: Yeah, we're not going to just – you don't plan on just taking the transcription and just circulating it.

[Laughing] [Incidental Conversation, Off-point Remarks]

Debra Stoe: In some cases – present it to a very good practitioner _____ so anybody can understand it and, but part of the reason of sending it back out is to make sure that there are no misquotes and that, everybody _____ what you said was interpreted correctly.

Shari Pfleeger: And who's the audience for the document?

Debra Stoe: Right now the audience is us. Because, we're trying to decide whether or not this is a feasible or sensible process for us to move into, you know—

[End of Audio]

Pat Brantingham: _____ like, you know, in the description, this rewrite DVD, you know, all of that sort of stuff will be each one of these claims _____ maybe that's on the Rigel analyst side. It's only printing certain numbers _____ Rigel full scale, but that's _____ an expert, so they may never be totally comparable, but in some ways it is a guidance to know if you want to do that's with Rigel, you should not do that, or shouldn't isn't the right word, but it's like it's more complex. I think maybe it's, you know, I listened to all this, and I think I don't know if I were a crime analyst, which one are you most comfortable handing to an inspector where it may influence who the suspects _____. That's _____.

Robin Wilfong: _____ why just using them as a tool and, you know, I mean do you have to, yes, you have to be careful that it doesn't steer you in the wrong direction also.

Shari Pfleeger:	Then I would suggest, there's something in the software world called feature analysis, so you make your list of all the things you want in the software, and then you check off which pieces of which software packages have which features. I would suggest, as part of the methodology, that independent of what exists now, you make your list of all the features you'd like to see and, as part of your report, if you do the evaluation, you say which features are in which packages so that analysts can not only figure out if you're accurate, but also figure out if they have the kinds of features that we're looking for. And then it's up to them to decide on tradeoffs, perhaps that's something that's less accurate but has the features _____.
Sean Bair:	And along those lines, too, once we identify all these features across the board, can you find those common features across all three applications, and those are which, or those are the ones that we could possibly evaluate them on, right? 'Cause they all share the same features, and they all should perform the same function for that feature, and that's what would, you know, be, I guess the baseline of comparison. 'Cause you can't compare apples and oranges.
Shari Pfleeger:	And the evaluation report could in some sense drive the market toward the features that _____ law enforcement _____.
Mike Shively:	We had a question for Debra and Ron. I've been assuming this, and I don't know if I'm correct in doing. I'm assuming that you would kind of like the, kinda the dream scenario. Basically, just to think big and think, you know, we can worry later about what's more or less costly, what would take longer and shorter, feasible, not feasible, but, you know, with trying to be realistic about it, but still not limit ourselves to too much, to think, if you want to find out this aspect of performance, this is what you have to do, right? And to just give you a lot of options, right? Is that what, how you're looking at it?
Debra Stoe:	We can't answer.
Ron Wilson:	Well, certainly some things that come out of this ____ expect as far as approach to the value _____ underlying theory _____. It's sort of a yes or no in the sense that I think that, yes, that I think that's a good idea. We shouldn't limit our options, because we may be able to contribute to our _____ the ultimate _____ valuable set of guidance papers or literature or what have you that, you know, allows them to pick it up like a consumer reports kind of thing and let them base what they mean by quality but, no, on

the other hand _____ given the nature of the people that are in this _____ applicants, and the science that they're founding this on.

The rigors of a formal experiment will standardize and remove as much bias as possible so no, so we can't get attacked to say that, "Oh, you know, you were thinking this when you did this and that biases this," and so forth, and, you know, with a formal experiment, you're removing, you're trying, you're removing that bias out as much as possible, and even with this diverse group of people without us driving it, reduces that bias even further, so, you know, I'm not, I'm not closed to limiting it, you know, with other options, but one of the things that has to come out of this is something that is very rigorous _____ experiment and, you know, we could come up with a consumer index grid, say for this crime type, you know, _____ what have you and so forth and, you know, but there would be a note along with that saying, you know, this is subjective. This is just based on a feature analysis to give you a guide to what you would select and you can't hold NIJ responsible if it doesn't perform the way you thought it would perform. You know, if that's the case, you go to our rigorous experiment, 'cause that has a scientific foundation. Does that answer?

Mike Shively: Yeah, I think so. It's, I just think in terms, you know, we have, we've got less than a day left, you know, and, you know, what should we try to, what point should we try to get to? And it seems to me that, you know, we should be letting you guys worry about litigation and blowback and a lot of other things, but just say, you know, if you want an answer to this, the best way to do it is this. Now, here's the Cadillac version. It'd be nice if you could do it this way. There are other ways you can still get an adequate answer that are less costly or whatever, but those sort of practical things like we shouldn't, you know, get all hung up on that saying, you know, you can't go there, 'cause it would cost a lot.

Ron Wilson: No, and that's what _____.

Mike Shively: Right, 'cause, you know, certain things like in an experiment, that's the best way to learn certain things, and it's the worst way to learn other things. Right? So, you know, you can answer some questions with an experiment, and it'll be rigorous. You can, surveys and user feedback are the only way to get the other answers, and those can be rigorous. You know, I mean _____ you know, sampling, analysis, you know, instrumentation. If it's all good, those are very rigorous. And it's real world, you know, I mean this is being used, you know, two of the packages anywhere

being used in some numbers out there, and, you know, the only way we're gonna find out in practice things like the user perspective issues is just to find out how it's operating in the field, right? So we should just give you just a whole menu of options, a bunch of evaluation methods, right? Is that, okay.

Ron Wilson: Yeah, and we don't have to come out _____

Mike Shively: Right.

Debra Stoe: You don't have to restrain yourself.

Mike Shively: Okay.

Debra Stoe: We'll do the restraining.

Mike Shively: Oh, I get to be the real wild man.

Debra Stoe: But I do like to focus on the fact that the audience for this in the end will be law enforcement. You know, so that they can take it, they can use it _____ decision on whether or not to use any type of profiling software or not and what their confidence level in that software will be.

Mike Shively: So that's an important issue. I think it comes back to what Jay had brought up early, which is, now two-thirds or three-quarters of the CrimeStat users are not, you know, field crime analysts. They're really academics or something. We should focus our view towards that third or quarter, right? You know, the, we're worried about law enforcement and practitioners, right? We're not so much worried about whether it serves the needs of doctoral students.

Ron Wilson: That is absolutely correct.

Mike Shively: Okay.

Tom Rich: So, and given that only one of these packages has attempted, is primarily marketed at law enforcement.

Ron Wilson: Don't forget, though, that that's now—

Tom Rich: Right, oh, right, right, I know, but if we end up with a consumer report, that has to take into account that these other packages aren't ready for the analyst use yet, because that wasn't what it was built for, but it could become _____ it seems like the evaluation, then, should answer is this whole concept a good one, and not as an, you

	know, rather than let's compare these four packages. Let's answer the question, is this geographic profiling something that police agencies should invest in.
Wil Gorr:	And maybe Sheri's feature list.
Tom Rich:	But that's the key question.
Wil Gorr:	The feature list, they should have, and then the evidence behind, those for which there's evidence, and the judgment that's needed to employ others, which is another way of stating, I think, the same thing you just said.
Tom Rich:	Yeah, because the other, because, I mean I don't think we would, I mean law enforcement agencies are probably, well, again, because Rigel is, they're focused on commercially available software. They're gonna make it easy to use. They're gonna make it attractive for users. That wasn't the point of these other packages, so we just need to keep that in mind.
Pat Brantingham:	Do you want two more, one more commercial and one more research oriented packages that claim to be doing _____?
Tom Rich:	I think that's, this is all, this is the universe of packages, I think.
Pat Brantingham:	_____ two more, there's two more.
Tom Rich:	Are there?
Pat Brantingham:	There's something called CrimePoint™.
Tom Rich:	Oh, I don't know about that.
Pat Brantingham:	Forensic Logics or, it's either Forensics Logic or Forensic Logics owns it.
Tom Rich:	What's it called again? Forensic Logic?
Pat Brantingham:	Forensic Logics or Forensics Logic. I don't know where the "s" comes, dot com.
Tom Rich:	Oh.
Pat Brantingham:	Crimepoint. I can tell you more about that one, and then for one that maybe goes along and is competitive with Dragnet is Flintts, F L I N, I think it's T T S. That's another English one. So I don't,

you know, like I don't know whether you want that, 'cause it sounds like Dragnet is kind of not included.

Derek Paulson: I was under the impression that CrimePoint™ wasn't a profile package.

Pat Brantingham: It has that capability. It's like, you know, if you look at, and it's got real problems. That's why I'm not sure, but CrimeStat does so much, and the journey to crime is only one small part. This other one, the profiling is one small part. So I don't know, you know, so I don't know if you, I don't know if you want to do that on that, so that's another issue you have to come to terms with. That doesn't, the evaluation structure would be similar, independent of the number of ones you did it to.

Mike Shively: Right, well, this is, I think it's an NIJ question whether we want to go the route of is geographic profiling a good idea, and there are these products, and we can kinda rank order how useful they are in certain regards, or is it we're gonna focus on two or three or four or five, you know, and just do a product test and give a consumer report to the field to help them make decisions about which one, so—

Robin Wilfong: The other thought comes to mind here, if you have four products, and they're 100 percent accurate, all four of 'em, that's 100 percent accurate under a controlled, you also have to rely on the person that's putting that in as far as you know, am I putting a series of crimes in? Am I missing some? Are there certain agencies that may do that because their data, you know, that they don't have automated systems. So when you put that out there, if you put all four products are 100 percent accurate, that's only based on what data is put in there, you know, if I'm putting the data in wrong, I'm not gonna get—

Mike Shively: But I think that's the point where the next chapter of the evaluation report is gonna be user issues and cost and all that sort of stuff, so it could be that, I mean obviously, we've got four products that have the same performance, you go with the free one.

Robin Wilfong: Yes.

Mike Shively: But it's unlikely, you know, that when you add in the user interface and the live testing or the field observations of real use, you know, it's probably more aspects of evaluation would lead to a different conclusion about the performance.

Shari Pfleeger: Here's another model that you might want to consider for your evaluation either as a companion or instead of, which is that in the software world, there is often software that you _____ software. You don't want to wait _____ so in most cases, in various countries, there are laws that request what's sometimes called a safety case or dependability case, or some such thing, and there you let the vendor do a lot of your work for you. You specify what kind of evidence you want to see that will give you confidence that the software worked properly, and they have to supply that evidence, and very often it's multiple pieces of evidence, because they can't always gather everything. They can't do all the tests, so they do some of the tests. They do some formal specification. They may have user reports from _____ law enforcement about how well the software worked in a certain situation, and you request all of that in order for the software either to be sold or to be used. You could do it legislatively. You could it, you know, as a, what's that word, an industry association if you have one. Lots of vehicles for that, but the idea is that you don't _____ with any _____ you can put a lot of the burden on the vendor to supply a lot of the evidence _____.

Keith Harris: Is this a natural break point? We are scheduled for a break at this time.

[Incidental Conversation]

Keith Harris: Approaching the last lap, and here's a little synthesis that we've come up with in conversation, just for sake of _____. This would be evaluated by, be a matrix that would be evaluated using drivers intentionally to remove the human element, because we're not testing the human element. We're not testing the skill of the analysts. We are testing the software. So by using drivers as Sheri has suggested, we remove the human element. Then we created a matrix, and this is a three-dimensional matrix, and each cell contains levels of data complexity, so this might be a continuum from a very simple, perhaps nucleated cluster out to disjointed, more complex kind of pattern.

And then on this axis, you have different geographic contexts, rural, urban, western city with a grid, eastern city with leaps and bounds winding streets and so forth, physical geography, land use, and so forth. And then on this axis, you have, actually, no, I misspoke, this is geographic context. But this is where the data enrichment is included. This is where your land use and the physical geography and so forth, and the various functions that you might want to test _____ this axis. Now whether all that can fit on

	one axis, I don't know, but this was just something in we kicked around a few months ago and—
Wil Gorr:	What is data complexity again?
Shari Pfleeger:	You might have things like multi nodal distribution _____
Keith Harries:	Oh, just different, you might _____ pattern complexity. _____
Tom Rich:	Like everybody's gonna solve the case where everything's been _____.
Keith Harries:	Yeah, easy, an easy, you know, an easy one at one end where you've just got a bunch of spots and the residence is right in the middle, you know, that. The obvious one _____. But is there any hope for this? Well, that's _____

[Incidental Conversation]

Wil Gorr:	That's sort of the vertical axis, I believe it's like _____ experimental design. You've got factors that occur _____ geographic context is another way to restate these _____, and then the problem itself is on the pattern complexity. The difficulty of the problem you're trying to solve, so you've got the problem. You've got treatments. _____ and then the real world in geographical context.

[unintelligible…]

Pat Brantingham:	I mean maybe that's what you mean by level of pattern complexity there? Do you want to have for specific types of crimes with your serial offenders, hypothetical patterns _____.
Keith Harries:	Just have a new matrix for each crime type.
Pat Brantingham:	But it's kind of like we've got youth. We've got adults. We've got, you know, the high-motivation. I mean there's enough research in some of these things to come up with what the pattern might be. That's just to, just to maybe add a fourth dimension. You know, that could be in the pattern complexity.
Keith Harries:	If there are three consecutive 2.4 second lulls—
Debra Stoe:	Maybe Sheri could go into a little bit how this would work.

Shari Pfleeger: And maybe I'm thinking, based on past _____, maybe an easier way to think of it is it does affect it, so you've got lots of different factors, and each, so you can describe each situation in terms of a set of factors, and talk to us probably to determine what those factors are, but for each factor, then you look at how much variability is in each factor, so it could be adult and youth. It could be rural and urban. You know, a variety of things, and so the idea is to vary each one of those things one at a time, so that collectively you cover the whole space of possibility. And you look at how the software functions in each of those cases.

Keith Harries: So you do this with scores or weights somehow?

Shari Pfleeger: Well, if you know what the answer is, and I assume since this is made up data, we know what the answer is. We know where we think the perpetrator is, so they either get it exactly or they get it within a certain range or they don't get it at all, and so we can, so it could be an overall score, but it could be score based on the factors, so they always get it when it's an adult, but they never get it when it's juvenile or whatever. And so we have, you're right, we have to come up with some sort of scorecard _____.

Wil Gorr: Actually, Derek and I think it was Ron and I were talking. It is possible to extend the common area measure to include points that fall outside of the commuter pattern, and then it's clearly objective and it can interpret it in very reasonable ways. So there is a measure that's easy to derive, and when you cut across all packages, it's a question of whether you can implement that measure in Rigel right now in terms of what its output is. But there must be other measures, too, that we can design _____ to score performance measures in a single, probably single-dimensional.

Shari Pfleeger: Well, either that or it could be we go back to the Consumer Reports analogy. It could be multi-dimensional, but simple like, you know, the five little dots that they use _____ color, you know, from black, whole black where it's awful to full red where it's terrific, and several things in between, so that we don't just say this package is terrible and this package is wonderful. We show that it's good for some dimensions but not for other dimensions. And then we leave it to the users to decide which of those dimensions are important to them just the way you decide what kind of washing machine or refrigerator to buy.

Jay Lee: We buy whichever one that's on sale. Well, speaking of that, I thought, given the fact that training requirement and functionalities

	are different between two versions of Rigel, I thought that should be treated as a separate package.
Tom Rich:	Yeah, they are, I mean they cost, obviously the cost more than ten times as much. One requires a lot more training.
Jay Lee:	Yeah, I believe I, in other words, I'm suggesting that those two issues not be treated as one item. Should be treated as two.
Tom Rich:	Yeah. I agree.
Pat Brantingham:	Would it be fair, I mean judging from, I learn more about CrimeStat watching the demonstration than I ever knew before. Would it be fair in the experiment, you look at this and see how it's working to have the difference between people who have received some training in more packages be, or, you know, formal training versus reading the documentation? Because I thought, "Gee, even I could learn CrimeStat if somebody was here to tell me what the manual meant." That's not necessarily those levels, but that's kind of how you evaluate it.
Tom Rich:	Yeah, how does the user expertise fit, incorporated there?
Shari Pfleeger:	Yeah, we haven't really addressed the usability at all in this, because it's all automated.
Tom Rich:	Right, so the user's—
Shari Pfleeger:	This is just functionality.
Tom Rich:	Right, the user's expertise doesn't enter into this at all.
Shari Pfleeger:	Right, right.
Derek Paulson:	Well, if user expertise doesn't enter into it, why would you separate Rigel from Rigel Analyst?
Shari Pfleeger:	Is one a subset of the other?
Derek Paulson:	If they have the exact same calculations regardless of the crime, then how would you separate one? I know training's an issue, but if we're not talking about user expertise or anything, why should you separate 'em out? They're the exact same calculations.
Tom Rich:	Oh, it doesn't matter what _____

Derek Paulson:	If that's the case. That's the, I mean that's what I've been told, that it's the same calculations, I mean the people who use the profilers now use Rigel Analyst. If it's the same calculation, which is what I've been told from ECRI, then I don't know if we're trying to get rid of that calculation, if we're gonna use the exact same crime set across all, then it shouldn't be treated differently.
Jay Lee:	No, my suggestion was based on the need for different level of training _____
Derek Paulson:	Yeah, I mean, that is another evaluation factor in terms of, you know, that would go in almost like a, well, it would go in to cost. I mean it's a non-financial cost. It's also a financial cost, because you have to take a year to be trained, but that would be another function of the cost. But in terms of accuracy and performance, it shouldn't be measured, I don't know if you'd need to use Rigel. You'd have to test it separately from Rigel Analyst, I don't see what, why you would, in terms of just doing this, these calculations. That make sense?
Tom Rich:	I mean if they are exactly the same _____ yeah.
Derek Paulson:	But in terms of all the other aspects, it definitely has _____.
Tom Rich:	Maybe the user's expertise comes into, you know, again this issue of this is only as good as the analyst's ability to piece together cases. So that's, I mean that's a whole separate methodology than what we're talking about.
Mike Shively:	You mean investigator ability or analyst?
Tom Rich:	Well, you know, yeah.
Jay Lee:	Would it make sense, as your next phase of, or next project, to do something along the line of inviting a group of those people, the law enforcement people to give them proper training _____ and then have them run cases in a focus group setting.
Mike Shively:	Well, that's one of the, you know, things that we were just throwing out that I mentioned earlier in the day, you know, I mean what are, you know, there are bunch of different ways you can, you know, test these systems and, you know, one thing would be to, you know, have a race, right? You know, you give 'em a box and, you know, a day of training and then you say go and you see how they do. I mean that's, you know, it's not ideal. There's a lot of problems with something like that, but, yeah, but, you know, if

	they're designed and intended, and if all the instructions are set up so that there are different levels of training, I think the more realistic thing to do is give 'em whatever training they say that they need, you know. If it's a year, I mean I don't think, experimentally, we're gonna send someone to training for a year or anything but—
Jay Lee:	No, well, the evaluation is not an easy thing. I remember Saskatchewan, they spend more money in evaluating GIS software than the money they actually spent to buy that.
Keith Harries:	Isn't it preferable to remove the human element for the purpose of testing, if that can be done?
Jay Lee:	In its pure theoretical sense, but your eventual objective is trying to see which one can help the personnel more.
Keith Harries:	So user friendliness is not evaluated in an automated setting.
Jay Lee:	Depends of what their ultimate objective is.
Shari Pfleeger:	Yeah, I think you're answering different questions. The automated part answers the question of, "How good is the software at solving the problem?" The user friendliness is about, "How good is the software at allowing the analyst to get what he or she wants out of the software?"
Mike Shively:	And I think, you know, the output, between the output, you know, formatting, and the training, everything that went, whether things are being interpreted in a way that's helpful. You know, in real world terms, 'cause I, and it could be that algorithms correctly calculate certain things and point to a certain spot, but, you know, if one package has a lot of inputs, you know, user inputs, so that by the time that you're using it in practice, they're not doing the same thing anymore, because they've chosen different, you know, user parameters, or if the output's so obscure that, unless you're really highly trained, you don't know what you're even looking at. If it gives you a bunch of like, well, I don't know, _____ values or factors or scores of some kind, and, you know, if the training isn't sufficient for it, then you can end up, you know—
Derek Paulson:	Might be interesting to have the drivers do one set of data, and then give it to analysts, and doing the exact same data, and see if they're as accurate as the drivers.
Mike Shively:	Yeah, that was one of the hypotheticals I mentioned earlier was—

Derek Paulson: I mean that'd be really good thing to, to really, to see, I mean if in a vacuum it does this, but when you just let analysts loose on it, how do they do? With just the, I don't know if you want give 'em the basic training or just _____ give 'em the box and say, "Go figure it out." In case of, you know, I mean with Rigel Analyst, you get your, well, and I don't even know how their training is working now, because it was going through NLECTC Southeast, and now it's switched, so it might be different. You might send 'em through that exact same training for Dragnet. Give 'em the manual and say, "Go." So it would be very interesting to see the difference between, see how that user part comes in _____.

Mike Shively: Well, it'd be nice to know, 'cause it'd point to a few things that, you know, that'd give you some basis for constructive criticism for improving what's out there for one thing. The other thing is that it would point you to, you know, training is necessary, no gaps in training, 'cause it could be the software is functioning decently. It's just that, you know, with the recommended training or with the documentation, people just don't know how to use everything properly, so it, yeah, I think, yeah, if you had three packages that all basically got you to the same place when you take the user out, and then when you introduce the users, you end up all over the place, then that'd be important to know.

Keith Harries: Shari, is a practical method is developing drivers in this kind of situation very expensive?

Shari Pfleeger: I don't think so. I don't think so. As long as the variables are specified, it shouldn't take, you know, well specified and the ranges are specified, it shouldn't take very long to write software drivers; you're talking about sending out _____ perhaps getting training _____

Keith Harries: But you'd actually need expertise in the software, would have to go along with Rigel drivers in it, because decisions would have to be made within the drivers, and only someone who is intimately familiar with the software would be able to assist with those decisions.

Shari Pfleeger: I don't know, that I don't know about. I would think if you have a decent user manual that explains what the software expects you to do _____ without knowing what the insides look like; in fact, you might get biased by knowing what the inside looks like. You don't want that to happen. So, for instance, if you knew how the software worked, and you knew that it did some calculation in

floating point numbers instead of integer numbers, you might provide it as floating point, whereas law enforcement people might not know that, so they might type it in as integer and then crash the software. I mean I'm just making this up, but, so there would be some value in not knowing how it works on the inside, because you would want to know those situations where the system would crash.

Sean Bair: Then what you're saying, the fact that if, throughout the method it returns results you have to act upon given the type of result like that, it gives me an exponent of five, well, I need to know that it change this or to modify this to reflect that value I've gotten or—

Keith Harries: Or just any decision point, you know, as you move through the software, how does the driver know which decision is more appropriate, so _____

Tom Rich: Wouldn't you just try all of 'em? I mean just, and you enumerate all.

Shari Pfleeger: Yeah, but I think what he's saying is that you need to know the sequencing, so you need to know that you put this in first, and then there's a calculation. You put something in second, there's a calculation.

Keith Harries: But the choices also, you know, I mean there may be a bifurcation, and the driver might not make the appropriate choice in a bifurcation.

Shari Pfleeger: Right, so I'm assuming, maybe this is not a good assumption, I'm assuming that there's at least some documentation to work with that tells you what the sequence of steps is. Either that or you have to work with an analyst who's used the software before, just as Derek showed us. Somebody needs to show us how the software works.

Keith Harries: What came to mind was someone like Derek, you know, looking over the shoulder of the person who's writing the driver to make sure that the appropriate decisions are made.

Jay Lee: Alternatively, as Sheri mentioned earlier, if a set of data which contains different levels of complexity or different type of patterns, just _____ for them to report back _____ specific layout ask me for _____. Now, one may argue, "Oh, this one is more difficult to learn to use than the other one," and so forth, and then those at the stage of benchmarking is not critical. The assumption is, once

you determined this is more accurate than the other in terms of output then you can do some bench, or try to improve the learning process _____. So that I remember you mentioning earlier as a possibility, and recalling, that used to be what GIS people were doing. They developed maps and so on, you know, asking the vendors to come back _____.

Shari Pfleeger: The only problem with doing it that way is that we lose some of the objectivity. You don't have that consistency of applying the same data exactly the same way, 'cause you don't know what the vendors have done essentially.

Jay Lee: Is it critical, the cases, is it critical? In other words, if, in one software package you have to take five steps to get to that, and in another, you only need to take three steps. But you're getting the same thing at the end, so does it matter if you need to do five keystrokes versus three keystrokes? So I guess—

Shari Pfleeger: Maybe not, and some of it is resource dependent. NIJ has only so much money, and it's a lot cheaper to ask the vendors to do a of the testing _____ then the tradeoff is a little bit of the objectivity. But, certainly, the upside of that is that the vendors then can't come back and say, well, but you didn't use our package properly because they supply the data. And they supply the results. _____ they are the ones who _____.

Pat Brantingham:: There's something really nice about seeing if there's some way to get them to respond, because, in looking at 'em, I'm thinking about now I've learned more about CrimeStat, I mean you've got five functions, and then you've got different exponents. You've got different constants. Well, if you've got data, go on for six months trying to find which of those combinations gives you the best answer. And is that the one that counts as the correct answer? If you do it, you know, that's like which one, which of the functions, which one of the functions do you pick? What exponent do you use? Or do you use all of them and see if any of them fit?

Shari Pfleeger: Well, that's, yeah, that's really what we had in mind, that you'd run through all of them and you see how far away, I mean you see what the range of responses is.

Pat Brantingham: So you want to see if within its confidence limits at the extreme it falls. We can decide that right here in this room. You know, one only gives you one answer. One gives you uncountable number of answers and Dragnet would give you uncountable number of answers if you knew how to enter in a function. So—

Wil Gorr:	Michael had a range of different kinds of tests, bench, on up, and before we get to the software test itself, how it's implemented, back at the methodology level, seems to me what's desirable is to have an automated way to do a whole batch of series, completely objectively, automatically with no human intervention, except you run 'em through a research package that has, it's like CrimeStat. You've got all this functionality, and then you optimize over the choices. You know, in terms of using them all, and so forth. And then when you're done with that, you ____ the test bed for this is a large sample of data.
	That's the other point to address. In that setting, you can provide, on a research level, a representative look at the point complexity and the geometric context, which I think is desirable. When it comes to software testing, it seems to me with human interaction with each series you look at, then you have to look at a much smaller number of cases, and you're testing for, perhaps, different things than the overall accuracy of the methodology. So I just wanted to throw that out. If we were talking at the software level, but before that, it seems to me it's very desirable to have researchers in a research environment make a determination. Then you have the guidelines. Use an inverse decay function with an upper whatever it is that comes out of there. So there's two test beds.
Keith Harries:	There's a lull forming here, yeah. *[Laughing]*
Tom Rich:	So is that what you were saying?
Keith Harries:	We were half a second away from a terminal lull. This is post-terminal lull. Perhaps all the words have been spoken _____.
Shari Pfleeger:	It sounds as if we need a methodology for picking our methodology.
Tom Rich:	Well, we've got, all right, so we've got our automated test bed. We've got our researcher guidelines. I think we need to have another component is feedback from users. Did this help them solve this case or no, it put us in the wrong direction. Often, you know, for that case. So I think that needs to be part of this evaluation.
Sean Bair:	Why does that matter?

Tom Rich:	Why does it matter? 'Cause that's, I mean ultimately the purpose of this is to help people do their job.
Sean Bair:	Why do you need crime analysts to tell you that it worked? Why couldn't the researchers decide that it worked through the data?
Tom Rich:	Well, because—
Sean Bair:	'Cause you're going to get this bias, where she's gonna like Rigel, 'cause she's spent a year studying Rigel. I'm gonna like Dragnet, because I had lunch with a guy. Somebody else might like, you see what I'm saying? I mean _____
Tom Rich:	Well, right, but if you, yeah, but if you've got a crime analyst that has been using Rigel for four years, they could tell you that in a certain percentage of the cases, it was helpful. And in another percentage of the cases, now, it, you know—
Sean Bair:	But I would be concerned about this skewing of data where she's not supposed to have included that case, so she's been taught that after the results come out, oh, well, you identified a commuter, so you don't include that in the final results of your geographic profile. I would remove the end user altogether. It's no different than asking a Ford Explorer user, you know, do you like your Explorer? Well, yeah, had been clipped on the Edsel. I love the car, you know.
Mike Shively:	Well, I think there are a lot of different things you can get from the users, saying if, you know, if you're trying to use user feedback to determine whether it works or not, basically, then what you get is perceptions of it working. You know, you don't necessarily get that it did solve a crime, necessarily, but you get the perception that it did, which is, it's an important type of information, I would say, you know, but it isn't like the proof that it works. I mean if we do some bench testing in drivers and all kinds of other things, and it just is like this is crap. You know, doesn't get you anywhere, just, you know, you might as well throw darts blindfolded. And all your users are saying, "Yeah, this is fantastic," you know, I mean so this is a problem somewhere, and I think it's, you know, important to know where it would be, but it could be that our tests were, the bench tests were all screwed up, that the driver's written wrong, but, you know, the things—
Sean Bair:	What's that measurement that it proves successful? Is it the fact that it got so close that we were able to operationally deploy resources to do a door-to-door canvass and find the individual? Is

it such that it reduced my database volume down such that I could search it now because, through, you know, kind of geographic refinement, I'm only dealing with a thousand records, and now I can manually go through those and look for individuals. What's that measurement of the status?

Mike Shively: Keep going. I'm going to start writing these down.

Sean Bair: No, but that's exactly, like I, I don't, I'm not in a position anyway to kinda arbitrate and say yes, those are good ones and those are bad ones, but I think the point of the whole exercise in the panel is to just brainstorm about this, you know, to think a criteria. I mean what is working? What is not working? You know, and, you know, if you get a crime analyst to say, "Yeah, we never would have cracked this case, you know, without the software." You know, I don't know, maybe that's erroneous. Maybe they would have cracked it, you know, it's hard to really like determine the truth of that, but there are a lot of other things we can learn, and a lot of other ways, you know, you can determine efficacy.

And I think, at the end of the day, we're gonna have, I would imagine, again I don't, pragmatically, I don't know what NIJ's gonna be able to afford to fund. I don't know what sort of, you know, proposals they would get, and all that, but, you know, I would imagine that if you could just as a thought exercise, imagine all the types of evaluation that you wanted to use, that you would get all kinds of feedback about the software, and then just triangulate the information. You know, and you would have matrices where it's, _____ like you were saying earlier about, you know, this software's a little better at doing these things and not as good on others. This software seems to perform a little better, a little worse, but I think the sort of things that you were pointing at are really important, and that's a, this is a great group to try to figure out, you know, how do you know success? You know, I mean what does it look like?

Tom Rich: I mean ultimately, it seems like a success might, I mean _____ might be, are these people purchasing upgrades? You know, because they think, wow, you know, man, that might be one indicator that they really like, you know, they really like this package. But I think that's where, you know, you're gonna get to the heart of the issue of is it worth their time to use this. Is it, you know, I mean basically the analyst has the option of investing all these hours trying to understand this package, or they can just do an eyeball, and I think understanding how many of them decided just to go with the eyeball approach would be of interest.

Mike Shively: Personally, like why do you use it, and why, under what conditions do you decide not to, and is there a, you know, software package, you know, I mean just—

Sean Bair: Well, here, and I can't speak for Robin, I'm sure she's got different uses for it. I never found a use for it, because, typically, the area returned of my geographic profile was so large, it was not operationally useful. We couldn't go out and canvass that area, because it was too large. You know, there was, now that I've got an area where my suspect lives somewhere in this quarter mile area, so what. You know, that's might help me reduce my database size. Again, you say, all right, what I was dealing with four million known offenders, but now, through this, I'm able to refine the fact that I know these known offenders live in this area. Now I can go ahead and, you know, maybe hand search those.

But, honestly, the databases that I was familiar with, and they had hundreds of thousands of records in there typically, it was nothing for the computer system of SAS or SPSS to crank through that, to narrow down my data elements. I would be looking for suspect characteristics. I would refine my data that way as opposed to geographic features, so, you know, if I knew the suspect was a white male, yada, yada, yada, I could refine it much more quickly than I could, you know, allowing the geographic profiling software to narrow it down further. So it went pretty fast in terms of, you know, with, to do that.

Now, if it could provide me a one or two block area to say, "Look, you know, based on all the distribution of this individual's points, I think he may live in this area." Now, that's something pretty helpful. Now we can go out. We can maybe, you know, do some, put some surveillance units there and actually look for people on, you know, foot or driving by major, you know, thoroughfares and whatnot, and actually seeing people to identify an individual, but as a data reduction tool, I never used it that way, 'cause I didn't deal with such a large volume of data that I couldn't reduce it through other means. Or just search the whole database entirely.

Mike Shively: So is it ever useful?

Sean Bair: No, it never was.

Mike Shively: Can you imagine it being useful for other people or—

Sean Bair: I can, I can imagine there being, and here's the problem, it could have been useful in the Beltway Sniper had everybody else not got on the television and said, "Well, you're doing geographic profiling, and we're looking for this, and we're looking for that." And it impacts the individual's, you know, spatial selection and stuff. But, yeah, I do think there are spatial and temporal behaviors, everything we do, and I do think that it can be beneficial in narrowing it down for particular types of series. You've got a much larger jurisdiction. She's got a much larger jurisdiction than I had, so maybe, you know, by refining something down geographically, and then only searching through those data that exist in that geographic area might be more applicable for her, 'cause she may be dealing with ten million records versus my million. You know, it's not feasible for her to mine a million case, or ten million cases. She would need to kinda reduce down further to begin to actually do investigative, you know, analysis of the data, qualitative analysis of the data.

Wil Gorr: I had one small response to your earlier, or an idea triggered by your earlier problems with profiling in terms of asking individuals whether they liked it or not. And that's from expert system design, the verbal protocol analysis, which is that, you know, experts don't, they can't say what it is they do unless you really work intensely with them and when they're, you have 'em talk aloud. And that seems unfeasible here, but maybe it's possible to pay somebody a hundred bucks, say a crime series, and have 'em keep a log of everything they do as data, as opposed to saying, "Do you like it or not, and let's see what you did in, what you do in the next ten crime series," as a more concrete and detailed record.

Shari Pfleeger: There's software that captures keystrokes. _____

Wil Gorr: Keystrokes, too, would be another point, yeah. But, so, you know, lots of flaws with asking people what they like or don't like, you know. I think Keith raised one earlier, it's because, you know, you want to see something favorable come from, I'll say something favorable, so I don't disappoint Keith.

Derek Paulson: They found that in police studies when they went out and asked, you know, asking officers how much of their time is devoted to doing something each shift, and, you know, they had them record in journals, and then they went out and actually put people out there with them in the area. It was 70 or 80 percent of the time was just spent preventive patrol when they followed 'em, when they actually sent someone out watching 'em, when they got journals, it was a lower percent that they actually captured.

Keith Harries:	And if you ask people about their experience retrospectively, which I assume is what would be done, now a journal would overcome this. But if it's done just by recollection, then you'll get telescoping, and people will bring up more distant events and bring them up to make them more recent, because that's the way the mind works. How long ago, you know, did you go to such a, oh, it feel, you know, seems like a month. While you look at the reality of it, it was like six months ago. So that's, yeah, that's telescoping, so you get all sorts of distortion _____.
Pat Brantingham:	When I was called on a victimization survey, I telescoped, yes. With what you're talking about here, if you set it up so that, for the ones where you can like change the function, and you run a whole range of options to see where there is at least a overlap of similarity, do you in the end have to include then what the odds that you would come up with the correct answer? Because there's no real guidance unless you're calibrating it on larger data. There's no real guidance that will tell you which of the functions to pick and which of the exponents to put in. So how would you tell? You've got one chance in 10,000 in picking the right function? Isn't that part of what goes on in evaluating which is better? I'll try that again. Like you were saying there'd be a broad range.
Tom Rich:	In CrimeStat, that's a huge issue for CrimeStat, yeah.
Pat Brantingham:	Yeah, so what are the chances of picking the right one?
Tom Rich:	Right.
Shari Pfleeger:	Well, but to turn that around, you could look at how far away you get with the ones that are not spot on.
Pat Brantingham:	Absolutely, so we need to know like the range of, you know, if you could, you know, you got five functions. You've got all those exponents, you know, if you take within a certain range, how much does that cover? Basically, another way of putting it would be then back to Ned to reduce his functions. I mean you're doing the work that ends up saying don't get five functions with unlimited number of exponents. Drop it back to two functions and limit the exponents to two, three, or four. Which would be very helpful. Does that make sense?
Shari Pfleeger:	Yeah, it does make sense.

Keith Harries:	Should we begin to review? The agenda calls for a kind of wrapping up and reviewing what was said. Are we there yet? So what if we go back to each of the main points that we've looked at today and see whether we have any summary points. Would that be a reasonable way?
Shari Pfleeger:	Can I just interject one thing? We never got, gave Robin a chance to talk about why she uses the profiling software ____.
Keith Harries:	Oh, I'm sorry.
Robin Wilfong:	Just basically, again, I've had where there's a 90-square mile area that somebody's hitting, you know, stealing things or, and it narrows it down to a seven or eight-square mile area. Like Sean said, you can't just send somebody in there and go door to door or something like that, so in that kind of scenario, it might not work as good as where I've had a smaller series, set of series going on, and it's narrowed it down to less than a half mile area. Then I can go into other means, other software and one of the things that I was telling somebody about earlier, was we have what we call facts matrix where you can put in a zip code and it brings in all your offenders that are known to live in that area [*unintelligible*] … that are interviewing people that are not supposed to be in that neighborhood. Does it match maybe somebody that they've seen running from the scene, you know, and so, again, utilizing it with several other things of, did it help narrow down, yes. In the cases that I say are successful, they weren't successful that they actually solved the crime. They were successful in that the subject lived within the area of the profile, and all that, along with all the other things that the offenders, that we know live in that area, the FIR reports, aerial maps of the area, etc., etc., have then helped the investigators. So, hopefully, that answers your question.
Tom Rich:	So if the geographic profiling told you these areas, you would feel confident in going to the investigator and saying, "Oh, this is, I think you oughta—"
Robin Wilfong:	Yeah, and a lot of that is commonsense based, too, I mean just knowing, you know, our particular area, that's probably a pretty accurate, you know, I mean can look at profiles and say it doesn't look right to me. It's throwing it off, and, or I will refuse to do one because I know that this person is coming over from another area just my knowledge of the area. So I'm building some of my knowledge of 27 years of experience in law enforcement into that as opposed to somebody who just sat down and said, "Here's geographic profiling." They just started this week. Are they

gonna be able to do the same thing? I doubt it, but, so I think what you have to be careful of with that, any of the software, is tunnel vision, utilizing it for just a standalone investigation.

Shari Pfleeger: Has the software ever been really wrong?

Robin Wilfong: Yes.

Mike Shively: Has it been counterproductive, like say you have several different ways an investigation could go and, I think in, what you're, what I'm hearing is that, you know, if you have an intuition, you're, that's gonna override the software most of the time, or not intuition, but, you know, you have reasons. You know, the just regular investigative work, you have reasons to believe certain things. You're not gonna let the software, you're gonna say, "Oh, the software's probably wrong." Right? Or the alpha, but when, if you need sort of a tiebreaker, it's like, jeez, I don't know, we could go any direction here, and it's narrowing something down for you, then you'll prioritize the way it's leading you a little bit, right?

Robin Wilfong: Yeah, to, you know, if you're looking at something that has a 60 or 70 percent chance of working, I mean how do you sell that to investigators when 30 percent of the chances are it might not work at all? Same thing with forecasting, when we forecast when somebody's gonna hit next or, between this and this date, and this and this time range. It's something to take into consideration in investigation, but I don't think, again, it's the be all, end all, you know, that you shouldn't solely rely on one product.

Mike Shively: But have there been cases where you've used it and it's pointed you in a certain direction, and then later it turned out to be the wrong direction, and you wished you hadn't taken it into account, like it's been counterproductive, basically, pointed you the wrong way.

Robin Wilfong: I really haven't had that happen yet, and some of the cases that haven't been successful, you know, sometimes just because of the systems that we have. We haven't figured out where a person, you know, there may be some open investigations where we haven't figured out where a person lives to this, you know, maybe it's an open case, like I say. Or just because of address issues, if it hasn't been successful, you know, whatever I entered into it may have been wrong. You know, I don't know if you could actually figure that out what made it not successful. You know, was it the software itself or the, what was entered into the software? Was it that the subject was moving during that timeframe and, you know,

	you didn't really realize that, that they were going back to the same area that they were comfortable with and still hitting with, in a patterned area. You know, there's a lot of different considerations that you can take as to why it wasn't successful.
Keith Harries:	Thank you very much. What's your pleasure? Would you like to try to wrap up, summarize or—
Mike Shively:	We just put it in the agenda just kind of as a buffer _____ you know, not knowing how the conversation was gonna go, whether we needed to kinda bring everyone back in off various ledges or try to like, you know, or anything, but, I don't know. It's up to the group. Or think about, you know, how we want to point things for tomorrow.
Keith Harries:	Well, any suggestions? We're open to anything that may come down the pike then at this point.
Tom Rich:	I think if tomorrow we can, I mean it seems like we've identified a couple of key parts of the methodology, and, you know, are there other key parts we haven't thought of, that's one question, and then once we're comfortable that we have the key parts, then it's the question of adding more detail to the extent that we have, you know, we have time. But if we could come to some sort of agreement that, yeah, these are the key parts of our methodology. We've got the automated testing. We've got incorporating new comments from users or, in some way, you know, I'm not sure exactly. Input from researchers, things like that. Are there other major components to this methodology?
Jay Lee:	I think it would help me more, maybe to others, too, to see some bullets so I can sleep on it tonight. Discussion that I can tell what we discussed can be summarized.
Keith Harries:	I'll make you pay with my rotten handwriting. Tom, would you like to fire away?
Tom Rich:	Well, I think that the key one is the automated tester.
Jay Lee:	I kinda worry about this. I know for commercial packages then maybe we need to put in time and effort to do that, to develop drivers and so on. But for say Dragnet, if the person is willing to put in the extra time, seems to me that when you say _____ always catch _____ would he be willing to put in _____.
Tom Rich:	Well, I don't think he _____

Derek Paulson:　I don't think we'd get any, I think it would be—

Tom Rich:　It would be somebody else.

Wil Gorr:　We do that with custom software, the research _____ and incorporates the methodologies.

Pat Brantingham:　In this automated testing, since these are made up cases, is the end result—

Derek Paulson:　I don't think they're made up cases. It's just, and I think that's a key thing. I think we should not have any made up cases.

Pat Brantingham:　Okay, good.

Tom Rich:　Well, that's good to mention, because I think that's what we were talking about earlier, so—

Derek Paulson:　I don't think that, well, I didn't read it that way. I read it that we were gonna have the, we were gonna real cases tested by drivers in a vacuum, so to say, just have the software working on historical cases or whatever cases _____, but I think to use automated, to use made up data in, and I've talked with Kim about this, Kim is very good at picking out fake data. We went through the training, he was down there for the first week, and he could tell when it was real live case, and when it was a made up case, because, depending on who makes it up, it's very different as to _____

Shari Pfleeger:　But you can't test the boundaries of what the software can do unless you push the data for various boundaries.

Derek Paulson:　In what ways are you—

Shari Pfleeger:　So, for instance, if you want to look at multimodal data, data that clusters in multiple clusters, so you would make up cases that increase the number of clusters, and you look at how well the software still pinpoints where the made up perpetrator is. And you see how—

Wil Gorr:　But practitioners will say that was made up data.

Derek Paulson:　Yeah, and if it doesn't happen, there's no need to _____

Wil Gorr:　And it does happen. We can get those types of cases.

Derek Paulson:	Yeah, and that's the thing.
Sean Bair:	It's just a matter of identifying those different types of series. They're different types.
Derek Paulson:	If we identify, yeah, and I agree. We find the types of things that we're looking for. I mean I read a piece of work that was done, and we talked about this. If you've got fifteen cases tested in at number five, tested number six, number seven, number eight, all the way up to fifteen to see well, how well does it improve through that whole series. But you've actually got a real live case with fifteen cases. You've just tested five, six, seven, eight, and so on through. I think that that's possible to get that kind of data. That's something we just, again we're just trying to find out the best case scenario, but I think using made up data will be problematic, and I do not think practitioners would like to see, well, it sure worked on fake data. No matter anywhere on there, I think that even the people who created the software would also have a problem with it. I don't have a problem with it, so I just think it should be real world data, and I think there's enough, there's enough cases out there that we could get from other people that we can use that.
Shari Pfleeger:	How do you know, though, that, how do you know how much confidence to have in the software for things that have not yet occurred? _____
Wil Gorr:	Well, then you use a holdout sample kind of experiment. And you can use a resampling design for cross sectional data such as we have here, so _____ series where you randomly take 90 percent of the data, calibrate your models, and then take the calibrated coefficients and work with the other 10 percent. And then report the performance on that 10 percent. Take your data again. Take another random 90 percent, and estimate and then again on, so you can reuse, use your data a great deal. That would get the most mileage out of your data. But in that way you're seeing how it performs on new data. Data the methodology hasn't seen that was calibrated. I think nobody's done that at this point, as I said earlier. And that would get you a much more realistic performance results.
Shari Pfleeger:	I guess what I'm concerned about is looking only for the things you already know about. It doesn't tell you anything about what the software can do in totally new kinds of situations.
Wil Gorr:	But I think the data also, when you go find real cases, you'll find things that you couldn't imagine.

Derek Paulson: I don't think we've tested it. I don't think it's been tested much at all. I don't really know a whole lot about it. _____ It's only been tested on serial murder and serial, I mean if you want to know the size of the data set, 13 cases for one, 73 cases for another, 10 cases for a case that's coming out, and 50 non-random samples for another. That's not very large, and it's been serial murder, serial murder, and burglary, and then a random set, again a non-random selection of 50 cases. There's not much that they really do know about it in terms of those things, but we can get that data on a variety of cases, a variety of types of crime, a variety of cities. I think that's easily attainable, and any of that that we get will be stuff that we don't have. We don't know it functions on different crimes. We don't know how it functions from, you know, if you've got five crimes up to 15. We know a little bit about it. We don't know how it functions across city types. We really don't know a lot about it. So I think there's a lot out there that we can get from real data that we don't _____.

Wil Gorr: And the real benefit of simulated data is in cases where you can't know the true outcome. Where, while flawed, if we have solved serial crimes, there's certain flaws with those data, you do know the answer. Okay, and so I think, you know, quite a variety of simulation is where I couldn't get that answer, and I still wanted to test the procedure. We can have data with the thing we're looking for, the answer.

Mike Shively: I thought that, I thought when you were talking about historical data, that, well, I guess it depends on the types of testing that we're putting the software to, but cases where you ended up, you know, ended up knowing where the person lived. You got a serial offender, five crimes, lived here. You know the answer. And then you just—

Wil Gorr: Yeah, worked there, had a girlfriend there, preferably.

Mike Shively: Yeah, whatever, but, you know, I mean you end up knowing it, so then you see, you know, okay, let's leave out the answer or take it out, and you just run all the software at it and see, you know, which ones—

Wil Gorr: Precisely, that's, yeah, and then in the end after you're done, you then bring in where the person actually lived.

Mike Shively: Right, right.

Wil Gorr:	As your basis of, you know, the true outcome.
Tom Rich:	Well, and is that, well, I think with the idea Will suggested about having a research panel looking at the underlying theory. That way _____ there was a comment that I—
Mike Shively:	It was a long time ago.
Tom Rich:	A long time ago, at least an hour ago. A blank bullet there?
Mike Shively:	There's a—
Tom Rich:	Oh, guidelines on, guidelines on how it should be used.
Jay Lee:	That's what she said also. Developing a methodology for _____.
Wil Gorr:	Right, incorporates all of the, that would be the output of the automated testing with real data would be to _____
Tom Rich:	Okay, right, okay.
Jay Lee:	So real data, yeah.
Wil Gorr:	Yeah, okay.
Tom Rich:	Yeah, anyway, some, you know, incorporating the experiences of actual users in some way as a whole different group. And, again, that's, there's a whole bunch of possibilities there.
Derek Paulson:	One of them was the idea of having actual analysts use the exact same data as the automated, seeing the difference.
Tom Rich:	Well, actually I would put that in a separate category.
Derek Paulson:	I would, too. I mean I think it's two, that's was _____ things that you're talking about, talking about users' comments like we went through. I think that's one part, and I think this would be a good—
Tom Rich:	Yeah, I, right, I would create one more here, which actually puts underneath automated testing, is testing by analysts, analyst testing.
Derek Paulson:	Same exact thing as _____
Tom Rich:	In artificial conditions. I mean, you know, have 'em come to a big room.

[Incidental Conversation]

Derek Paulson: And you can shoot it down, but I'd also like to see that same data that would be used with the analysts in the automated testing with some sort of control method, some sort of other thing just, you know, eyeballing it or some other spatial measures. Something just to have yet a third, three basic tests, one, a vacuum, one with analysts, and then something else to say are either of those first two any better than just something

Sean Bair: We could do some type of random thing. I'm thinking where maybe identifies, the software identifies the area that a person's likely to live. Maybe we calculate the centroid of that area, as we have an actual point, and then maybe what we do is just generate, you know, use a random and just say, okay, randomly generate a point on my map. Did it fall or did it not fall and compare the results of the profiling software against random data that's where your PhD types kind of a valid comparison or what you would want to do as compared against random results.

Mike Shively: Yeah, but I think, you know, do you beat chance, and do you beat a human analyst with the software?

Derek Paulson: _____ good just to have someone eyeballing it. Something just real simple, something basic.

Sean Bair: The problem is, though, how does the analyst, 'cause the analyst, again, and the random thing is both going to produce a single point whereas this software produces _____ areas.

Derek Paulson: Just, it would take, I mean, if we're using NIJ's endless stream of money, we can come up with ways, I mean if you can just have an analyst say, draw an area of where you think they live, and give a, give reasons why. You can have 'em sit down, I mean for; sit down in Arc View, create a shape file, just have 'em draw it. You can use _____ take a pen, draw an area and now you've got an area you can measure square mileage and you can then use it even to create a hit score.

Sean Bair: How problematic would it be to have us calculate the centroid of these identified _____ that would be the easiest to compare.

Derek Paulson: I think using several measure. I mean you can use the center, I mean Ned Levine used the center, _____ mean center _____ distance triangulated _____ a bunch of different means, using

| | those as, I mean I'm just thinking very simple measures and an eyeball measure to just say, okay, if you've got something, if you're just Joe Bubba out there, wherever you, how would you do it? Is that any better than the other two? |

Sean Bair: Or random.

Derek Paulson: Yeah.

Tom Rich: This is part of the analyst testing.

Keith Harries: Eyeball and centrally, calculate it centrally?

Derek Paulson: I just feel it's just like a simple, I mean if we're trying to say it's good, you know, this is accurate, how do we know it's ac— like accurate against what?

Tom Rich: Right, well, I would I put this as one type of testing under the analysts. I mean this is one of the things—

[all speaking at once]

Tom Rich: If we got a group of analysts together, this would be one thing we would definitely do.

Derek Paulson: Well, but that's, but there's other ways to do it as well.

Sean Bair: Well, oftentimes, the investigator, quite frankly, or the other person's more apt to use the software. I know we _____ it's called Rigel Analyst and this and that, but in terms of number of police agencies out there that are within, you know, under 100,000, most of 'em don't have crime analysts. The investigator/chief/you know the horse guy, who's responsible for doing all these different types of things, so that includes investigator _____ as well. The other thing, getting back to my other point. What then I would assume is just calculate those points, the random point generated, the centroid of the area that it generated, and then the eyeball, X marks the spot generated, and then calculate the distances from those points to the actual home offenders, or home location of the offender, right, and that would give us a measurement.

Pat Brantingham: Then you're getting some distance measures _____.

Derek Paulson: Well, I mean we still haven't even decided on, we've only really come up with one, but is one measure enough? It's just using the hit scores, does that tell you anything. Does that tell us enough?

Pat Brantingham: It's like that's one of the things that is a critique of Kim's, but also he uses the Manhattan metric and theirs are using the straight distance. But then we talked about whether it should actually be the, you know, some measure of the shortest path assuming there's one algorithm for determining. I mean they're using different measures of distance.

Wil Gorr: I can tell you the large comparative time series studies said use multiple measures, and then you can pick out the one you think is best. It's one way of covering, or making the research more useful I guess. Somebody believes in one measure, but not another one. Their choice.

Tom Rich: A fourth or fifth, Sheri suggested itemizing different features, whether compared to what you would really want to have in a package and does package X have that?

Shari Pfleeger: Feature-analysis _____.

[Incidental Conversation]

Wil Gorr: You know, I think you ought to have one to use multiple forms _____. I sensed agreement on that _____.

Shari Pfleeger: I don't know if you want this as a separate bullet, but I think early on we agreed that whatever we do has to apply to *any* software, not just the several packages that we saw today.

Keith Harries: The, ah, have a generic, or have a generic quality to it?

Shari Pfleeger: Um-hum.

Wil Gorr: The feature analysis really goes a long way to providing that.

Pat Brantingham: That's actually quite nice, because all these _____ indicate that none of them have that feature. They don't. We've mentioned it once or twice, but say you come up with these test cases, do you want to actually send it back to the different people who develop these programs and find out whether they would say their program could analyze it?

Tom Rich: Or should.

Pat Brantingham: Or should, because then at least that is something like does not fit within parameters of, you know, the program.

Tom Rich:	Of course, there you run the risk of them sort of trying it first, and if it's way off, oh, no, no, shouldn't use that one.
Sean Bair:	Well, they're not gonna know the results, though. They're not gonna know where the offender lives.
Tom Rich:	But they could do that. Well, you're right.
Sean Bair:	They don't know where he lived, and they might have got it right, they might have got it wrong. I mean, we'll never know.
Tom Rich:	That's true.
Shari:	Although, you say you're using known data sets and maybe really what _____
Sean Bair:	Oh, good lord, no, not even close. All they're gonna have is points and there's gonna be distributed. They're not gonna know what crime series.
Pat Brantingham:	But these things may fall into classes so unless you're sort of saying, you know, if it's highly like the classes that created the things we're sending out like these are highly dispersed points, and if they say, "No, it doesn't apply," then, you know, you've got all these categories of types of patterns that _____.
Derek Paulson:	What might be interesting is to contact them and have them come up with a list of cases that they think profile and what are not, and get a list from each set, and then come up, take those lists, and then use that to drive how you come up with a data set. I mean, you know, if they say, "Well, ours has these assumptions. These are the kinds of crimes that we say it can work. This is the kind of stuff that has to have a minimum number of this. It can't be, you know, can't be this or that." Get that from each of the three groups, take those three lists and then work from there to develop a data set. That way you don't have them coming back and saying, "No, no, no, no, you can't do this kind of crime," because, well, we've got their list saying—
Wil Gorr:	You could have a random sample of crime series, and flag the ones that people think you can't but analyze them anyway.
Derek Paulson:	Oh, no, I would love to see it.

[all speaking at once]

Derek Paulson: No, I think it would be very interesting to see how well they can work and how far they're really off. They say they're way off, you know, we're doing, if we're doing a hit score that may, you know, instead of being 20 percent, it may, in some cases, it may not be that far off. It may be _____ be interesting to see. And that would go back in the feedback to them. To find a way to change that item.

Mike Shively: Something that NIJ's been doing in program evaluation, not software, but, you know, programs, is first doing an evaluability assessment, you know, before investing in a full-blown evaluation, and I'd like to see that sort of step here, too. You know, and one thing that's pretty clear, informally, we've pretty much subjected Predator to an evaluability assessment, and I think that, you know, Dragnet may be fairly weeded out on certain levels, you know, from really being evaluable.

Tom Rich: Well, also it's currently undergoing a lot of, it's gonna undergo a huge upgrade pretty soon, so _____

Mike Shively: Derek, when you were talking about, I'm sorry, I don't, I lost my train of thought. It just totally vanished, so never mind. It'll come back tomorrow.

Tom Rich: Yeah, so I mean if we're not, if we can't get access to a package then it's obviously out.

Derek Paulson: Well, in the case of Predator no one can get access to it. It's really not—

Mike Shively: It came back, the train came back to the station. When you were talking about cases that software, you know, shouldn't deal with, you know, it's not designed to deal with, I'd prefer to kind of look and see what is published, documented from this point on, like if we say okay, we're gonna do an evaluation, right? Now tell us, you know, what your software's really designed to deal with. You know, and especially I'm thinking about Dragnet more than anything, is since it's pretty much of an unknown, right, it's really so informal and it's so individual, and it's not widely distributed. It's not highly documented, but, you know, it can basically, defensively just narrow it down to practically nothing, right? And I think that would hurt _____ the objectivity, you know, the perceived objectivity of any evaluation to say we allowed the producer of the software to stipulate the conditions, you know, somewhat. I think we'd pretty much have to determine, you know,

if he hasn't said or it's not in print or in the documentation or pull down menus or whatever, if there's nothing in there saying it shouldn't be used on these instances, then we should assume that it can be used for it.

Derek Paulson: Well, Will made a good point – whatever they had in print, flag it, but test the data anyway.

Mike Shively: Right, yeah.

Derek Paulson: To see if can it really _____ if it's off, and how far off it is.

Wil Gorr: We'd verify that it's off? How would we know?

Derek Paulson: Yeah, you've gotta remember the data that's out, the analyses that have been done so far have been very limited data sets, so what they're gonna say in terms of applicability that's been published, has been, it is very limited.

Tom Rich: So maybe one of the things we can talk about tomorrow is what size data set is appropriate. How many cities? How many cases would you need?

Sean Bair: Oh, plus we should include the original evaluation set, right? We might as well start there with the prime series that they evaluated, and then just build from that. Replicate their studies if possible.

[Incidental Conversation]

Wil Gorr: I was commenting earlier that, too, if you want to accelerate the research cycle for your terms of the extensions and the complexities and so forth is to make this test data public, or at least accessible by researchers including the GIS maps or anything else you need, so that you don't have to go out of your office essentially into the field to get the data. This is what was done in the forecasting field. There's a thing called the M3 competition, the third one, and there's a 1001 time series, 1001 nights, but there are papers being written today, I mean this data set's you know, 10 years old, and there's still papers being written today where they're reanalyze this data with a better method, and then the benchmark methods, the original ones that are always brought up as by a way of comparison, but I think that, you know, the original methods were fairly simple, but it's a way of getting a lot more people to participate in the extension of the basic methods.

Derek Paulson: It's like the X Prize. It's the X Prize that they're doing them now. There's that million dollar giveaway if you can send a man into space. _____ send a man in space and you make it into a competition, here's the data set, who can do, you know, and make some specifics on what can you do with it, and _____

Wil Gorr: In addition, you have to have lots of documentation like the performance measures have to be very concrete and replicable. The existing methods that have been used to date have to be all well documented, all for replication, in the process. That's what was done. So you could go to a web site, and you could get the data. You could get the performance measures. You could get the existing methods. You could download them all as your starting point. [*Unintelligible*] The reason why it was M3, they didn't get it right with M1 or M2. Seriously, and they were criticized, and they finally got it right with M3. M4 attempted to do it, what's the right word, contemporaneous? Where people would make forecasts right now for things in the future, to get that bias, potential researcher bias out. But I don't know if you gotta, you know, a four version here. One and two had serious flaws from a variety of perspectives. Mostly in not representing, well, I shouldn't say that variety of dimensions, problems. Stuff there.

Tom Rich: Is there any, would there be any problem with a police, you know, I mean they're gonna have coordinates and they're, I don't know what the privacy issues are.

Wil Gorr: We got permission to do our forecasting grant for locations of offenses. The crime incident, no suspect data, no victim data— It has street address, and—

Shari Pfleeger: Isn't that in the public record anyway?

[all speaking at once]

Pat Brantingham: To be fair to all of them now, you talk about crime incident, does that mean, say someone is into abduction-murder. You need to get both abduction and the killing site. You get multiple locations if an event that has multiple locations.

Tom Rich: Well, and then again, this is an issue that I think that the people from ECRI mentioned to me is that, as to why they don't think that this after-the-fact testing works, because they felt that all of the information that would go into creating one of these profiles is not going to be available through police records after the fact. So, you know, which is going to make it appear as if it isn't accurate,

when, in fact, if you had, if you're able to incorporate all the information the analyst had, then you would be able to get a more accurate answer, so that was their point.

Wil Gorr: Well, then you just say it can only get better than this.

[all speaking at once]

Tom Rich: So this is a worse case scenario _____

Wil Gorr: If it's good, or acceptable, just gonna get better. But—

Shari Pfleeger: And the flip side of that is that if you can't do a good job, even with very good data, then you can't expect it do a good job with less than good data.

Mike Shively: Well, doesn't using historical data and only the data that's in a database, doesn't that put at a disadvantage the software packages where you have to input some parameters, and I guess that's where the data comes into play, right? Where you're saying that an analyst would know other things, you know—

Tom Rich: Yeah, where they hooked up for lunch or whatever.

Mike Shively: Well, how does that enter into telling the software how to solve something.

Derek Paulson: Yeah, you can't put any, I mean the thing you gotta think of, while all that other data, I mean I don't know where that comes in, in the actual analysis.

Tom Rich: So in other words, there's isn't a place to enter that data.

Derek Paulson: Right.

Tom Rich: You can't treat it as another pseudo-crime location kind of, or—

Derek Paulson: The research that has been conducted so far has all been using historical data. Some of it gleaned only from, I mean I know that Canter's data set is all serial murder data that was gleaned only from newspapers. They got all of their crime information from the newspaper.

Pat Brantingham::   With real problems with the geographic coordinates.

Derek Paulson: Right, I mean so that comes, I mean so if we're gonna talk quality
data, there's stuff that's already been published, there's issues with
it already. So I think this makes, this is actually a more sound
case, or at least as sound a data set as that's already been
published. I mean there's gonna, there's no perfect data set with
crime, so we're just gonna have to, you know, make it as good as
we can.

Mike Shively: We have connections with people at Pinellas County.

Tom Rich: We can get some good data.

Mike Shively: We have connections with people at Pinellas County.
Mike Shively: We can get access to some really good stuff there.

Shari Pfleeger: Yeah, I worry about things like data from the newspaper, because
often the police book somebody on one charge and then change the
charge later, so—

Derek Paulson: Well, but with murder, and these were, that was strictly serial
murder cases, and it was at that point, several years past, and the
theory, and although I can sit there and go on, my dissertation was
on the newspaper coverage of homicides, I can tell you how good
it actually is and how good it actually isn't. And so that, there's all
kinds of arguments about it. But the one thing that generally is
covered was even if the name isn't mentioned, the address
generally was. But there, I mean you're right, there's, newspaper's
not a very good source.

Pat Brantingham: But you're saying, but for murder, that's the best.

Derek Paulson: Well, you know, actually of all the, of any crime, it's the best
crime news. If you're gonna look at newspaper studies. And if
you want to have the best study, if you want to use the best crimes
of homicide, then you should look at only murders involving white
women who were either offenders or victims _____ were
wealthy, 'cause those are the most likely to be published besides
that, the garden variety murders, not gonna make it.

Mike Shively: No, newspapers are terrible.

Derek Paulson: And if you want to get into the nuts and bolts in Chicago, only
13% of all homicides are covered, Los Angeles, 27 percent,
Miami, about 60, and _____ only about 70, not even everybody
gets covered. Your death isn't all that important.

Shari Pfleeger: And if murder is the best, I though one of the things we were thinking of doing was stratifying by crime.

Derek Paulson: But you're talking newspaper coverage, not official data. Why things would be covered in the newspaper is totally different.

Tom Rich: Seems like the least well covered one up here is how to incorporate experience of users. That one's pretty fuzzy. We'll need to spend time on that tomorrow a little bit, too.

Mike Shively: Well, that's, that is coming up tomorrow, right? That's another way to say we need to stop right now.

Tom Rich: That was not my intent.

[all speaking at once]

Pat Brantingham: Just to add one thing, and since it is time to quit, to think about while we're saying use real data, I don't think we can necessarily kick out the idea of using some actually created data that maybe what we don't have is a location of where the person actually lives, but we're finding out how similar are the results you get from the different systems. And that's one way you can start taking care of the things like, you know, there was a bridge, and it's over on the other side of the water. Several islands or, you know, things like that, or it's a long main road, and see how different the packages are in what they produce.

Shari Pfleeger: It also let's us do a sensitivity analysis so that we might find out, for instance, that some variables that people play with don't have, make that much difference, and you can just forget 'em.

Keith Harries: Well, if you're going to have a testing axis that is a degree of complexity of pattern, would it be feasible to actually blend real and artificial data in order to ensure that you have that continuum, 'cause it may be extremely difficult to *make* that continuum, just based on real data.

Shari Pfleeger: That's right.

Sean Bair: What about that original rambling that I had about incorporating just travel patterns of regular people like many of you've done with your students and stuff, to compare that again, again, if it does well in that well, okay, some of the theories seems to be correct, it's just for some odd reason not performing well against crime, spatial pattern and stuff, so maybe doing something like that.

Tom Rich:	That's something that might be interesting—
Pat Brantingham:	Um-hum. We went back and found out where people stop and get gas for their cars.
Derek Paulson:	That's what I was thinking, is gas station, right, 'cause those are all over. We just have people make a list of where they grocery shop. I mean what I do, it's where do you get your groceries, where's your gas station, where is your boyfriend, girlfriend, friends, etc. What are the top ten places you go on a regular basis.
Shari Pfleeger:	But if you use students, you have a very, oh, what's the right word? Very simplistic population, because they tend to lead very similar lives and do similar things.

[Incidental Conversations]

Sean Bair:	I wouldn't use students. They don't have the same habit travel patterns as the typical adult does.
Derek Paulson:	But I'd use 'em all.

[unintelligible]

Mike Shively:	I did a self-reporting crime exercise in my criminology classes and had built up an _____ four or five hundred, and it was over 90 percent that are criminal offenders. 70 percent had committed felonies.
Pat Brantingham:	Felonies.

[all speaking at once]

Mike Shively:	No, but, you know, if you weed out drug offenses _____. Yeah, but you know, there's trafficking, there's assault, you know, there's burglary, there's vandalism. A lot of sexual assault.
Derek Paulson:	Yeah, I was gonna say victimology and offender. I've done both, and I've had sexual assaults in _____ victimization and—
Mike Shively:	Oh, if you got a class of 10 women, you've got victims, you know, yeah, so, and if you get a class of 20 men, you've got someone'll say they've done something, so—
Derek Paulson:	You'd be amazed how much people say in class.

Mike Shively: But, and I think the point is well taken, that they, you know, I mean their living in, you know, generally la-la land, these little Disney environments that don't represent the same sort of travel and housing and use of public transportation and all of this, so there's a lot of homogeneity there, so probably not the best.

In terms of the historical database, I just want to come back to this again. We're talking about having cases where we know the outcome, but to test the software, we don't give it the outcome. It has to come up with that, but we would also have cases that the outcome is unknown in the database?

Wil Gorr: It would be hard to use some.

Mike Shively: Well, you can't test accuracy, but what I was thinking though is, if we're talking about real data and a data set that contained only cases where you end up eventually knowing the location of the offender, you're only talking about solved cases, and it's likely to be a very biased data set, because there's probably something where you eventually figure out where the person lives. I mean you've identified the offender. Most cases are unsolved, and there's some differences between solved and unsolved cases in terms of, you know, offender type and characteristics and law enforcement, you know, effort put into them, and all that, so, you know, in practice, people are gonna be using this at the start of it by definition, I mean you're not gonna do it on solved cases. It's only unsolved, which is gonna contain some that get solved and a whole lot that never get solved. So the historical data that only has solved cases is not likely to be like real data. This is a bias issue that we'd have to deal with.

Sean Bair: I see your point, how do those help the research, though? I mean it does, you're right, it does make sense that they're might be some bias to why certain crimes are solved versus certain ones aren't, but having those unsolved crimes in there, how does that contribute to the research here?

Mike Shively: Having the unsolved ones in there?

Sean Bair: Yeah, how would that actually help us get answers?

Mike Shively: I think it's kind of an empirical question to figure out how different they are, you know, I mean to figure out how different the solved and unsolved are, and it could be that they're, maybe solving cases

has a whole lot of randomization in it, and there isn't anything all that systematic in it. I don't think so. I mean I think—

Wil Gorr: It's just the police get lucky on some of these.

Mike Shively: Well, no, no, but I would argue that, you know, that, you know, just take race as one issue. I would say that, you know, it's empirically demonstrated pretty strongly that more resources go into cases in which you have middle class and upper middle class white victims and non-white offenders. You know, all that stuff, you know, all that, so the cases that eventually get solved, there are some biases, you know, in terms of the characteristics, amount of violence, the, I mean it could be four assaults that all get the same criminal code violation, but there is some variation, brutality, there's race issues, there's a bunch of stuff in there that may not be, you may get, you know, you may have a lot of bias if all you take is the solved cases.

Wil Gorr: Sounds like a caveat, you know, the results, but I don't know how you operationalize it into research, I mean come to what you do with it analytically. I mean if there's, if the point patterns are extremely different, there's a segment of those unsolved crimes that have a kind of point patterns you don't see, or it's more highly representative. You have, you know, ten times more of something spread out along the line than you do with the solved cases. Maybe there's something.

Sean Bair: Okay, there's a lot of, I mean what do you consider solved? Somebody in jail? Is it the fact we moved the series to another jurisdiction? Did we, I mean, there are a lot of factors. Did the series stop? Are they now incarcerated on some other unrelated charge?

Mike Shively: Well, I think if the point of geographic profiling is to identify the residence of an offender, for our purposes, solved is just that the person's been identified, so the answer to the question that the software is designed to give you, you know, has been obtained.

Pat Brantingham: I think it's to identify the offender, not the residence.

Mike Shively: Like where they happen to be at a moment? No, it has to be—

Pat Brantingham: No, I mean like one of the nodal points might be a school, so you end up finding 'em by going to the school, so that's not—

Mike Shively: So is it where they're apprehended? Is that where you—

Pat Brantingham: Well, no, it's finding the person.

Sean Bair: Kinda their home base?

Mike Shively: At what time, though? They move, so I mean—

Pat Brantingham: _____ one of their known, well, like the sort of stuff got used with an arson case in Burnaby, and the way it was done, was it was clustered around a high school. So you walk into the high school, and they say, "Oh, yeah, since so and so moved here, we've had ten fires, too." Boom. So it isn't always a home location that it's giving to you. Could be that, you know, the main thing may be it's telling you it's along a bar strip or something like that. You may find the person not, may never tell you where the home is.

Tom Rich: I think, right, I think we're using the home, the home in a more broad sense – base of operation. So we should substitute that word in the historical record – base of operations.

[Incidental Conversation]

Pat Brantingham: And we seem to be only dealing with serial offenses committed by an individual, not groups.

Derek Paulson: Do you want to deal with that? I mean or we can put it, I mean—

Pat Brantingham: No, that just makes life worse. And these models don't address them.

Derek Paulson: That's what I was going to ask you: Is it something that needs to be included?

Pat Brantingham: These models don't address them.

Derek Paulson: That's what I was gonna ask you, is it something that should be considered?

Pat Brantingham: I don't think any of these models address that.

Derek Paulson: Is there any research that shows how many serial offenses are committed by groups versus those that are committed by—

Pat Brantingham: One of the serial sex offenders we studied is actually doing it under contract.

Mike Shively: Well, with organized crime and gang crime, you know, I mean it
depends how you define the group. I mean there's a million cans
of worms that the whole issue raises.

Pat Brantingham: But this guy was like if you break up with your girlfriend, you're
angry, you know, _____ hire _____

Tom Rich: Be hard to catch him with the software thing.

Pat Brantingham: _____ come visit us in Vancouver. It's very pleasant.

[Incidental Conversation]

END OF DAY 1

Day 2: August 11, 2004

Derek Paulson: It would also be wise to get a measure of the total area or do a proportion, or some other measures so that we know how large that search area is, because, as you said, if you make the search area, the discussion issue is why can't we make the search area extremely large, the size of the jurisdiction, then you're right, I mean then it can be 500 square miles, and then, sure, you're gonna have a 2 percent—

Wil Gorr: Then you have a 2 percent—

Derek Paulson: Right, so I think it would be wise to also have a measure that says how large that search area is, so that you have some sort of _____ ratio or do whatever, something to have...

Pat Brantingham: Actually, I think maybe you should only have the size of that search area, the smaller one, because you do get to control that bigger one. So if—

Derek Paulson: That's true.

Pat Brantingham: So someone who wants to critique what you're doing will say, "Well, you just made the search area bigger than you should have." It should just be that final thing.

Wil Gorr: But it probably should not include any extensions. They should be the bounding rectangle of minimum bounding rectangle for the points.

Pat Brantingham: …but it depends on whether what you're gonna do is depending on the probability, what do you want to take, 90 plus, what's the area of that? So that could be several nodes, you know, 80 percent, what's it? You set your standards. I wouldn't use a search area, I wouldn't use any denominator.

Wil Gorr: I'm sorry…?

Pat Brantingham: Oh, I wouldn't use any denominator.

Tom Rich: Oh, so you would just measure by the area that encompasses both…

Pat Brantingham: Well, it depends like, you know, yesterday was excellent and leaves you with lots of questions which I noticed you had for first thing. But it's like they're doing different things. So they're apples and oranges. Is there a way to even have a search area defined by a common standard? Derek's the only one who knows. Is there a way to say like… like if you pick the 90 percent that Kim uses or that Rigel uses, is there anything comparable in….

Derek Paulson: You can take Kim's. Okay, what you can do, it'll take you a little bit, but you can take Kim's, you can't alter the way Kim's search area is created, but you can then find the left and top right corners, and input them into, get the coordinates for those, and input those into CrimeStat. And then you can take CrimeStat and ArcView and you could approximate it into Dragnet as best you can. That's the only way you can try to standardize the search area across all three is using…

Pat Brantingham: But if you standardize like that, then you're introducing the knowledge-base for the user. I mean isn't it, I mean if you're, I mean there's a way to do it if you're doing it, testing it internally, but if you test it with users and they get to define it anyway they want, Kim's will give you one answer. The others, you could have 50 people, and you could get 50 different answers. So how do you handle the one against the 50? Not with this, they don't define the search area. You do somehow in what you do in CrimeStat. So you can't use a percentage of the…

Tom Rich: Well, can't you use the, some sort of relative measure of the most likely point, according to the algorithm compared to where the, to the offender's actual address, and, you know, some, you know, if here's the most likely point and, but if a person actually lived here, isn't there some way to measure that? I'm not sure what it is, but…

Wil Gorr: I think that's all alternative measure; it's a different one. I guess we should report it. I don't think it's as usable….

Pat Brantingham: You want the search area, like, say, well, you want…

Tom Rich: It's not how far it is, but it's the relative likelihood of it or something.

Pat Brantingham: Well, are you, or you could say like, we're not getting into it, you know, what the density is in an area you're looking at,

but, you know, one level, they're just telling you if it's like the, you can say like the, put it at 90 percent, a high coefficient, and you get like the, just a very small area. Can you do something similar to that in CrimeStat where you say you just want the top 10 percent in the probability?

Derek Paulson: No, but you can, I'm trying to think, can you do the…

Sean Bair: Well, it returns just the value sort of grid squares, so it can just calculate it against that.

Wil Gorr: We have the, the score and say in Canter et al's paper is completely, it's clearly defined as subjective. This additional 90 percent part is not in there. It's, I think what, you know, Tom was saying, you start searching from the most likely grid cell till you get to the grid cell index of the offender. There's only one answer for that area.

Pat Brantingham: But with the way that, from what I learned yesterday, and I learned more about these systems than I ever knew, but from what I learned, you could end up with the way that it's going, it might not be appropriate to say take the highest proportions. I think even in Rigel, it would make it like you have a cut off point of, but what you might have is a long street, like a whole long distance, a line, you know, a very narrow one, which would be, so it's which point, any point within that line, how close is that to the home of residence? So it's not point to point. It's, could be, it's polygon to point.

Sean Bair: Well, it's centroid polygon to point, too, we could also do.

Pat Brantingham: Well, doing centroid to a polygon's not fair with the way these programs work, because it's not, I mean it's not necessarily, you know, say you've got a strip that's like this, you know, which you could out of any of the programs, then what would you do? Take the centroid? No, it ought to be something within the strip.

Wil Gorr: I think there's two parts of this. There's one how you measure an individual crime series. Then how do you use the results from a large study that has many crime series, and that percentage part gets into that latter, I believe, so if I'm doing one crime series, I can very clearly state unambiguously a measure that has enumerator, denominator, report them both, their areas. You need to divide them so you can get a number that's scale-less, so that you can compare across, you

can, just me just finish, that you can compare across studies. Then and how will policemen use the results? They say, "Well, I want to be able to put in a threshold for this new case." In the literature, it's ranged from 15 to 25 percent, or whatever kind of numbers. This, you need, then, so I can include 90 percent of the cases in the literature. See what I'm saying? You may have gotten some with only five, you got it down to 5 percent. Some to 10, some to 20, for the total search area. I have to go in there and pick a level with a kind of overkill, so I can get 90 percent. To be sure I've got a better, an inclusive enough area. There's an implementation issue, and there's an original measurement issue.

Pat Brantingham: Oh, I absolutely agree, and that's part of what it is with CrimeStat is you can put in a function that's gonna hit the home address, no problem, if you know what coefficients and which program you want to pick. You're never gonna miss with that. It's a question of which function at the lowest possible numbers can you, I mean how much can you reduce the area to get the point? And I have feeling, I mean I haven't done it, but I think that with the variability you have in CrimeStat, you can get it down to close to zero, but you might have to try 10,000 functions. I mean not manually, but you can adjust it to almost anything. That's what those distributions are like. I mean you can change your coefficient. You can change your function.

Wil Gorr: That's in fitting. That is not in prediction, though. That's a problem with methodologies when you over fit the data, you've missed the pattern. You're following the errors. And that's what, and so you can over fit the living daylights out of the data, but when you go to use 'em on a new case, it's not gonna work, because you haven't gotten the general behavior. You've bounced up and down with the data.

Pat Brantingham: So how do you know with crimes, this is like, it was a great dinner last night, and this morning while you were running, I learned more about, I thought more about Rigel, and, you know, I really, maybe my husband should have been here. He supervised Kim, so he knew more about it, but can we actually compare the two? And, because what Rigel is saying, if I understand correctly, is, and they don't have their expert system working, but it has a series of criteria before you'll ever consider it, like I learned more, like, it's like all Kim appears to be doing or appeared to have done in Rigel was try to identify a series of activity nodes. And if I

understand correctly, what happens in the training, like if you're talking about Rigel Analyst, so we're talking about property crime, or talk about, if you talk about bigger Rigel, what they learn is to throw out any points that go from an indicator of a safe comfort zone. So they're working on the premise that if, let's say example is a robbery, say there's a robbery, there's a point, and then a block down you find the gun, another block you find the purse or the briefcase.

What Rigel would say in its training is drop the last two, because those represent like a fleeing trail, and its system does not use those data. It's making a judgment through the training of those things which fit the characteristics of being a safe zone. So if you were to take data that included any of those other points, sure you'd get an answer, but it wouldn't be what you would get if, you know, like, as if, you know, they can't make their expert system work yet, but they're using like training. It's like figuring out what should the denominator be. They've got a training that says, I think you have to, I mean I don't know for sure, you have to go to the site, you're supposed to look at what the land, you, all the things we were talking about with expert decision, that's what their training is, to kick points out or to kick cases out. So they're only looking at ones where they think it's within a comfort zone.

So if we're gonna compare the two, what is it? Is it really just a comparison of CrimeStat against cases Rigel would handle? Or are you gonna say Rigel, can it handle points in general, and no one, I mean I'm not speaking for the company, but nobody would ever assert that. You have to have training. You can't even look at a serious case without doing it with someone who's had the training. So how do you compare them? 'Cause they're not saying they're doing the same thing, or saying it another way, Kim at least has said his critique about CrimeStat is how you pick which function. You know, you can put in any data, and you get anything out. So which is it? I mean this really was, so what do you do? Do you end up taking your cases, this goes back to the experiment, do you take some people who are trained in Rigel and some people who are trained in CrimeStat and give it to 'em and see what they do? And use their answers? That's more like what you'd get out of it. 'Cause you can't compare the formula, 'cause one of 'em is already throwing out things that won't work.

Sean Bair:	Well, CrimeStat, most analysts would not use CrimeStat, and actually input evidence, drop locations…
Pat Brantingham:	Ah, so using the same rules.
Sean Bair:	Yes, absolutely. There are other techniques that an analyst could use, lopping and lobbing to triangulate evidence drop sites and, you know, target locations and stuff like that. No, but for our purposes, I think, all we're going to do is look at the actual crime location.
Pat Brantingham:	Well, let's say it's an abduction-murder. This is like Kim when he gives his talks, he always has, you know, was the person killed at the same site? Or were they dropped somewhere else? And I don't really know, I have a guess about, he never says it in his talks what he would do, but I have a feeling if the body was dropped differently from where the abduction took place…
Sean Bair:	That's very important.
Pat Brantingham:	I don't know if he'd drop the dump site.
Sean Bair:	I don't know. I haven't been through his training. All I'd say is for property-related crimes, which is what, now they're saying we should do this on, we're not gonna use those. Or we shouldn't use those.
Pat Brantingham:	So maybe what we want to do, maybe the only thing we can do is look at property crime, which, you know, and that's, maybe that's all we can look at, because that's the one where they don't require that you bring in highly trained people. Otherwise…
Derek Paulson:	But, and there's a good argument for it, just for the simple fact that if you want to have the most utility out of a piece of software, how many serial murders are there a year?
Pat Brantingham:	Yeah, that's why…
Derek Paulson:	There's not a lot of that serial crime going on despite the fact that my undergrads think there is. It's not that common.
Pat Brantingham:	Yeah, all undergrads think that.

Derek Paulson: Yeah, I know, they all want to be profilers, and I don't mean this… but I mean, yeah, it's a good point. I mean it could be very valid. We did a, we could also, depending on how we decide to buy the data set, we could include, you know, if we want to still do, you know, you've got the automatic one, we use cases that fit the bill, and then we give the analysts in the little fake setting, control setting, you know, a description, rather than just give 'em points, you give them a scenario, like maybe at NLETC we did a scenario with information about the cases and some things about it. You can give them that, and then, again, let them go out and do what they will, and I think you're right, Sean, analysts who use CrimeStat to do this are gonna use some sort of logic with it or without it. It's just that ECRI says you need to have training. Whereas … software, do what you will. It doesn't preclude training. You can still use the same exact rules to do it. It's just that ECRI actually goes out and says, "These are the rules. This is what you should do," and, you know, whereas Ned just says it's a piece of software... So I think we can, how you do, how you deal with that with the analysts, though, do you make sure they all have the same training? Do you want analysts that don't have training? I mean that's something you need to decide.

Shari Pfleeger: And even if they have the same training, you could still have a lot of variability…

Derek Paulson: Well, I think, but I don't think that's a problem. I mean I don't think that's a problem, but I think that's why we're testing that, isn't it?

Pat Brantingham: Yeah.

Derek Paulson: If we weren't, then there'd be no reason- then we just stick with the automatic. If we just want to see how it works with the automatic, and we don't care if we don't want variability, then we don't test the analysts. But we want to see what analysts do with it. How they make their decisions and how they get something different than if we just use the computer to do it. I think that's good. That's the whole purpose of doing that. So, you know, I think it might be wise to get people with different training, different experiences. I mean does an analyst do it different than an investigator? Does someone from five years experience or someone who was a cop versus someone who has just been an analyst. You

	know, I think all these things would be interesting to figure out.
Shari Pfleeger:	But the more factors you have, the larger the set of analysts you're going to need to use the software.
Pat Brantingham:	But if you don't use that, if what you're trying to do is develop something where you can actually say, you know, what are the conditions under which it will work or this works well if it turns out that, well, you know, you have to have at least five years experience in order to get an answer that even comes close, you have to have five years experience. You have to have this, you have to have that in order to get, then you need to know that, 'cause that has a cost associated with it.
Derek Paulson:	I mean that's a very big issue, but if we want to use people who have been trained on Rigel, we don't know at this point how large of an N that is. Unless Rigel people can probably give us a good estimate of how many people have gone through there.
Sean Bair:	It's not 30.
Derek Paulson:	And so we've got that. And that's, if we want to have people who've been trained only on that, we've got 30 people to work with from there _____ 'cause it's not a huge number to pick from, and they're all gonna have different experiences, as well.
Robin Wilfong:	I think there's 14 more out of Texas that came last night _____ through a school, too, a two week school that, I don't know how close the training was…
Derek Paulson:	Right, I know it's _____ now that Kim…
Tom Rich:	So did we answer your original question about, you know, I mean there is, I mean most of these packages do compute this ratio, but we've just seen that you can—
Derek Paulson:	Actually, they don't.
Tom Rich:	Manipulate.
Derek Paulson:	They don't compute the ratio. Only one computes any kind of ratios.

Pat Brantingham: Dragnet.

Derek Paulson: CrimeStat doesn't give you anything. Dragnet doesn't give you anything. Dragnet, you'd have to, _____ have to do something else with it, but only Rigel creates the profile. It gives you an area.

Wil Gorr: Right, but let me just follow up on that, if you're in a research setting where you know the solved crime. Then you compute, you have some surface that you computed it, and you know where that point is, person lives, and you see that that's, cuts across so that it's 10 percent of that surface at that point. That's a number that can be pretty well nailed down.

Tom Rich: And it's independent of the size of your search area, is it?

Wil Gorr: No, it's not. You have to define what you're gonna very carefully and objectively what the search area is. But nevertheless, that could be done. Now, when you have a new case, of course you don't have that solved crime, so you have to take the research that says 90 percent of the cases we've looked at, if you want to get 90 percent of the cases, you've gotta go as big as 25 percent of the search area, so you have to integrate and use all the past solved cases to come up with that fraction. Then you cut your surface at 25 percent, so you have 25 percent of the area. It's like a choropleth or isopleth map, it cuts that mountain, and then where you cut it, that area is the search area that's large enough to have included 90 percent of the historic cases that have been solved and you've computed that statistic. Most of them, say half of 'em, are at 10 percent. But to get up to the 90th percent so that you've got a good coverage. You don't just have half the crimes. You've got most of them, you've got to expand in that distribution. The one with the high tail. But that's the Rigel.

Pat Brantingham: But you're giving them like are we comparing Rigel and CrimeStat based on a higher level of knowledge for the users of CrimeStat, 'cause they wouldn't know that by reading the manual, you know. You know, if it's unknown, go to 25 percent, you don't know that.

Wil Gorr: It becomes a requirement on our list of things. I mean if people aren't doing this, you do have to pick a degree of

	confidence. It's like the same thing in inventory control, they want—
Pat Brantingham:	But I meant for the use—
Wil Gorr:	You don't want to stock out, so you don't look at the mean or the distribution. You pick something in the tail. But that's an implementation issue. It's not a research issue to determine how well these things work. It's how do you choose to implement that?
Pat Brantingham:	But are you gonna end up then testing to see whether people using CrimeStat, who've never had the kind of training you're talking about, how often they pick the right number.
Wil Gorr:	Separable issue. I don't think there's a right number. There's how safe you want to be. It's a matter of preference at that point.
Pat Brantingham:	So in one, but that's I guess what I mean. Yeah, you can do it to make a comparison, though they measure distance differently, so you, you know, but that's not really a difficulty, but you do that, but if you've got users, and you've got one that goes through training, and that's a requirement, and then the others you can download it for free, and they receive no training, when you're comparing users, you can't really give the CrimeStat people training.
Wil Gorr:	What you can do is you can have on your interface at the beginning, you could say do you want to be 90 percent confident, or do you want to be 75 percent?
Pat Brantingham:	But it's not there.
Wil Gorr:	Huh?
Pat Brantingham:	It's not in there.
[all speaking at once]	
Derek Paulson:	We're assuming that those who download CrimeStat and actually uses it during the crime function have done nothing but just read the manual and know nothing else about profiling. I would assume the opposite. I would assume if you're actually gonna do the profiling, you may actually know something about, something about it. I don't know.

But there may be some prior knowledge already out there about profiling. If you're going so far as to try to figure, if you've gone so far as to figure out how to use CrimeStat and do use it for a geographic profile, you've probably got some other knowledge about geographic profiling already in your head.

Pat Brantingham: You might be, so you may have a preference.

Derek Paulson: But I don't know. But we could also give them, I mean kinda like we were saying, when Cantor and Snook did their little announcements, they gave a couple simple heuristics to the, when they had them eyeball it. They came 'em a couple little simple heuristics, you might do the same thing with CrimeStat. You might do it with all the analysts. Give them a little sheet about profiling. Some ideas about why you drop out a case, why you wouldn't to kind of standardize it across. I don't know. I mean it still, it depends, we'd have to figure out what it is we want to test by bringing the analysts in. Are we wanting to test accuracy? Are we wanting to test prior knowledge of the analysts with the software? What is it we're wanting to figure out? Are we wanting to see how well the software works with analysts or how smart the analyst is that's using that particular software. You can take an analyst who knows Rigel, has gone _____ training, give 'em CrimeStat and let 'em figure out how to use it. And they may be better than someone who's only used CrimeStat. So we have to figure out exactly what it is we want to test with that. What it is we're trying to figure out.

I've got one other thing I have to say about Rigel and the calculations. The calculations and statistics that you get with Rigel, like when I showed it yesterday, and it said 7.9 percent. That's not accurate. Okay, that's not actually, it did not actually find the home base in that case _____ 7.9 percent _____. That was, it said 70 percent of the time it would, but it didn't. Okay, it didn't actually find the home base yesterday. It didn't find the home of that offender at all. Okay, so that is an incorrect statistic, so we'd have to find a way to get into Rigel _____

Pat Brantingham: But that's part of Kim's. It's like it could have been an activities base, so his is, in a way, non testable. I thought of that more, too.

Derek Paulson:	Well, unless we, well, what that's based on that particular data. If we had, it depends on how again, if we set the data in a different way. If you put in a couple different activity nodes, and it still doesn't find any one of them, but it says it's 70 percent expected _____ 7.9 percent, and none of it, none of the activity points are in there, then we'd have to expand it out. You know, you still have to get into Rigel and find a way to put the grid on there, find out what the actual percentage was. In other words, the way Kim imported it in his, well, his book and his dissertation, that hit score, you cannot actually calculate it with Rigel, 'cause it does not actually take into account the points that you put in there as the suspect location. The way it makes its calculations. Does that make sense?
Wil Gorr:	The hit score is—
Derek Paulson:	What Kim did his, when Kim printed his results, he actually found on that home offense or whatever _____ choose in the activity node, he actually found how far he had to go to find that. With Rigel Analyst, you're just getting a theoretical hit score. It should be within that 7.9 percent, but it doesn't actually, when it creates that, it doesn't actually look at, and you won't in the real world, maybe not even half _____
Wil Gorr:	So they never solved that series.
Derek Paulson:	Right, so it's just give, it will always give you that hit score. But it will never take into account where the actual home base or activity node is that you enter into that software. So that's just a theoretical point. That's just a theoretical hit score as opposed to an actual hit score. Does that make sense? So that's something you have to take into consideration. You have to find a way to actually get into the software or throw a grid over it or somehow, to get in there and do it, and that's why, but one thing it does give you, and that you can say, is you have the area of its top profile. You have the area, the search area, and you can say what percentage of the search area did it reduce it to. Whether or not it found it or not. I don't know.
Pat Brantingham:	But does that mean then that what we're gonna look at is property crimes.

Wil Gorr: I don't see why _____.

Pat Brantingham: Well, because otherwise with Kim's, I mean and I'm, he's
                        not here to speak for, what I know, but with his, what he
                        would say is you can't put in all those data points, you know,
                        and you have to look, there's like decisions if the sort of stuff
                        you're talking about with _____ say they're sex trade
                        workers who are being abducted and killed. Well, they're all
                        coming from one location or one small area. So he'd say you
                        can't use it.

Derek Paulson: Can't use geographic profiling.

Pat Brantingham: You can't use geographic profiling. Now, so what do we
                        impose our there, do they impose their interpretation of
                        Kim's year-long training into a series of rules that restrict the
                        points or the data that's looked there, looked in the analysis?

Shari Pfleeger: I don't think there's anything wrong with applying it to other
                        kinds of crimes. It might just validate what he says, that it
                        doesn't work for other things besides property crime.

Pat Brantingham: But you don't know whether he would say it would work or
                        it wouldn't work for any particular set, because somebody
                        who's gone through his training hasn't ended up, or he hasn't
                        ended up saying this would work or this wouldn't work.

Derek Paulson: Well, a way to take care of that is to just throw out, just not
                        use it for serial rape and serial murder. You've got arson,
                        commercial robbery, residential robbery, street robbery,
                        burglary, everything else, auto theft, larceny if you want to
                        do that, which in all reality is gonna kick out in terms of the
                        total percentage of crimes that are committed, total
                        percentage of all serial crimes committed each year, such a
                        small percent. I don't think that it's that big a deal.

Wil Gorr: I would say that for validation work, it's probably a good
                        principle not to just have successes, but failures, but
                        demonstrated empirically.

Pat Brantingham: I don't know. I feel compelled to speak for Kim.

Wil Gorr: No, the answer is totally obvious.

Pat Brantingham: I feel compelled to speak for him in a sense that he might say
                        well, you're using _____ one's a company, one isn't, so the

company would say you're using data to validate it that is not data that our trained people would ever use.

Wil Gorr: Well, if you have a representative sample of a particular crime type, and whatever method you use fails, I mean that's a clear demonstration, don't use it here. Otherwise, maybe there's just a pure logic.

Pat Brantingham: That's a different standard. Now, that one I think you could say like, okay, if you want to have a feeling for, of all the serial offenses we know, you know, if this one, you could say Kim's failed, I don't know how you'd ever say CrimeStat fails, 'cause how do you pick which function you're gonna use?

Wil Gorr: Well, you optimize over in your fitting set.

Pat Brantingham: So you got a better chance of finding it, and you've got a much better chance in CrimeStat than you—

Wil Gorr: Well, then that's a problem with Kim's package is restricting us to only one function.

Pat Brantingham: No, but, that's true but with CrimeStat, it's unlimited in the functions, but how do you know that the users would ever use that function?

Wil Gorr: Unless they had a guideline that said, you know, from this group, always use this function.

Pat Brantingham: And they don't.

Wil Gorr: Right.

Pat Brantingham: So then you're saying we're gonna train them at a level they're not trained now, so you're not comparing what it is. You're comparing what it could be.

Mike Shively: Robin, you're a Rigel user, right?

Robin Wilfong: Um-hum.

Mike Shively: Do you use it for anything but property crime?

Robin Wilfong: No, and I signed a MOU that I can't use it for anything other than property.

Mike Shively: Is that one of the reasons that you're also adding on CrimeStat to try to—

Robin Wilfong: No, I seriously doubt, the reason we're adding on CrimeStat is to afford it to all the analysts, as opposed to just one particular person. I'd really seriously doubt that we would use CrimeStat for major violent crime.

Derek Paulson: How many major violent crimes _____?

Robin Wilfong: And the reasoning, pardon me?

Derek Paulson: And how, have there been any series that you would want to use it for?

Robin Wilfong: We, yeah, they had five murders a year in Pinellas County and the last serial murders we had were, well, years ago _____ so, but my thought on that would be the potential would be more for me to be called into court on a major violent crime using a particular piece of software to say this is where the offender lived, would I be an expert witness? You know, or can I just say, well, _____ software _____ and so I think our agency would limit that.

Tom Rich: I think in terms of the evaluations to be more important to devote resources to property crimes, just 'cause there's gonna be more, you know, more agencies are gonna be interested in how it works for that than these other ones, just 'cause they're more common.

Derek Paulson: That's gonna be the _____ vast majority of _____.

Tom Rich: Maybe we should move onto evaluating utility and—

Keith Harries: You know, the agenda has changed a little from the draft that you had originally, and so I think you have the new edition in front of you. So we are at evaluating the utility. How can we assess the relative and individual utility of GP software packages in actual practice? This seems to be a rather vexing question.

Tom Rich: And, again, this is other than through the automated testing or things like that. I mean can we, what kind of information can we get from users that have actually used these packages in the real world, so to speak. We talked yesterday about

	how if, you know, there are problems, we started asking people what do you think? Is this a good package? _____ you know, and they'll say, oh, sure, you know, so, but we'd be interested in hearing from you all what you think we could potentially get if one were to do a, some sort of survey or interview with users of the software package.

Mike Shively: That agenda, too, that's second line under, you know, the, it shouldn't say bench testing there. Test cases — bench testing, if you're trying to get real world feedback.

Pat Brantingham: _____ real world feedback, the only thing that, meaning it's this group that said such great things yesterday. You probably have to ask the users of CrimeStat which function they used and why, 'cause that's the unknown thing. You can compare them, but which one are they using? It doesn't say default, but there always is the first in the list and the lowest coefficient is what comes up, and which one do they use? Because then, if it turns out like, you know, it's which do you do first if it turns out that 80 percent of the time they use this, is that truly the more reasonable comparison against, I don't know, and if they use different ones, what does that mean? But I think we've got to find out which one they're using.

Shari Pfleeger: The perception of what they do and what they actually do may be different, so it might be worth asking them if they would run a little piece of software that captures their keystrokes for a certain period of time.

Pat Brantingham: And never tell 'em why you're finding out which function they're using.

Shari Pfleeger: No, no.

Keith Harries: What kind of survey do you have in mind when you say survey? Would this be sort of an anecdotal, open-ended kind of thing? Or would it be some sort of scale.

Tom Rich: You know, I don't know, and obviously one would have to be careful in how you phrased questions, and I'm just thinking that if you're gonna buy a car, you know, how are you gonna make that decision? Well, you're gonna want to look at past repair records, and, but also wouldn't a, some kind of a user survey, if you found out that 80 percent of the people that bought that car thought it was the greatest thing in

the world, whereas 20, only 20 percent of people who bought this car thought it was great. That would be useful information, and I'm just wondering if there's something that's analogous here that we can find out with people that have actually used these packages.

Keith Harries: You're gotta have enough years of each package to promote a valid comparison.

Tom Rich: That's an issue, certainly.

Mike Shively: Well, you know, if you're talking about 30-something Rigel users, you know, in that case, you know, I mean it's not a big challenge to get the entire universe, in which case statistics don't matter other than just descriptive. You know, you don't have to estimate. You don't have to sample. You got 'em. That's nice.

Tom Rich: On CrimeStat.

Mike Shively: And then, you know, with CrimeStat, you know, if there's, you know, if you want to focus on practitioners and not, you know, academic types of researchers, you know, I don't know, maybe there's a thousand active users of it. And, in that case, you know, it's a resource funding and method sort of question about how many _____ but either sample or you get 'em all, depending on resources. And, you know, that's a pretty substantial thing. I mean the problem, the challenge is, if you're just making point estimates like saying all Rigel users, how do you like it, what do you use it for, what sort of, you know, approaches had, at what point in an investigation do you actually use the data.

Then that's fine, but what you can't do is break it down by, you know, much in terms of urban, you know, types, you know, region of the country or the, right, and, you know, job category and law enforcement agency, that, all that, so, you know, you can't do many breakdowns there, but some of the things we're thinking of just, you know, Tom and I were going over what you can get out of users. I'll just kinda throw out a list of things, you know, that we're thinking you could ask users that could be important. And some of it's descriptive, you know, because you really don't know exactly how they're using it, and part of just describing how they use the software is, you know, stage of investigation, you know, early, middle, I mean do you narrow things down

to a certain point, and when you get stuck, you use it as kind of a tiebreaker? It's like, gee, I don't know, it could be any one of these things. Let's see what the software says, and if you see something interesting, you know, it can lead you somewhere, as, you know, at what stage.

Another way of looking at it would be is it used to try to find an answer, like where is the person, or is it used to generate questions? You know, for example, you know, one of the things I was noticing yesterday is these, you know, these areas, you know, that get put around a point. They're not all round, right? They have little dipsy-doodles and some of the reason is physical, but let's just say some of it is based on, you know, it's all based on the algorithms, but let's say that part of what caused some big indentation is demographics or something like that or you know, local crime occurrence densities or something like that, so you get this big protrusion, and, in the absence of anything else, you wouldn't know where in the circle to look, but you see this big protrusion, and it generates a question, well, why did we get this protrusion. Why have the probabilities higher in this little thing that sticks out or lower in the stents, I mean it can lead to questions.

Now, is that how it gets used in practice? I think we would want to know that sort of thing. Types of crime, you know, depending on the software, you'd get some variation. What staff uses it in terms of physically handling it, and what staff may, accesses the results, right? And then, so there's description and then there's also perception, not that they're entirely mutually exclusive, but, you know, how do they feel about things? Do they think it's useful, not useful, helpful, not helpful, could be improved in certain ways. For example, the documentation, is it any good? Do you wish it were better? What are you missing, and do you make mistakes because the documentation isn't good or, does it take you longer than it should to learn it? Same sort of issues about the training. Ease of use, does it _____ contribute to errors, usefulness of output, what's missing, what you would like to see added to it, things like that.

Now some of those things aren't necessarily totally on target in just evaluating the performance. But some of those things are directly related to performance, so, you know, it could be that you have an artificial environments or automated testing, you get identical performance or close or something. But

	they can perform very differently in practice, and you'd want to know why, 'cause it could be design features that are definitely a part of the software, so user interface. So it's like, you know, cockpit design. If you got a cockpit that leads to a lot of crashes, the engines don't fail, but they drive 'em into mountains 'cause they hit the wrong button an accident. That's a design feature, and we want to make sure they're not driving into mountains when they don't have to.
Keith Harries:	Mike, don't you also actually need to ask whether use of the software has been abandoned and whether some other software may have used and been abandoned in order to get at the reasons why abandonment may have occurred, because abandonment may be a certain form _____ the kind of positive reactions, you know, to _____.
Mike Shively:	Yeah, I mean you'd want to get former users, too. Then we could be, you know, do to the associations, you know, or the—
Tom Rich:	I mean, you know, we used to use it, but we found that it wasn't worth the cost, because we felt we could eyeball it just as well. That's a, I mean to me that's important information. I mean I'd like to hear other people if they think that this sort of conversations with users, if that's, you know, a worthwhile activity in that evaluation.
Mike Shively:	Especially if they've abandoned one and picked up another one. It's like, yeah, we stopped using this and we tried this 'cause it works better for us, you know, well, why?
Sean Bair:	Most times I've found analysts will abandon something because they don't understand it. They don't understand the results. They don't understand how to interpret it or articulate it back to their command staff or anything like that. _____ thing that I was thinking of, is it almost seems like we're coming up with ways to, an analogy would be like to study for phrenology and how we make sure that it works and all this. Where we haven't even decided that phrenology is a viable law enforcement solution here. Does geographic profiling, as a theory, work? I mean we're assuming it does, and I don't think we should assume that.
Tom Rich:	Well I think that's the kind, _____ think that's the kind of thing, though, that could only come from you, from analysts and investigators.

Sean Bair:	I think that's what we should study versus studying whether or not the applications kinda show that it works. I think we should study whether or not it's, the theories hold true.
Tom Rich:	That the whole concept is viable.
Sean Bair:	Right, I mean kinda make it simple. Maybe I'm oversimplifying it, but just find out based on crime series, forget about all the geographic profiling software, whether or not the people have activity spaces inside the areas of their crime points. If they do, then maybe that does mean that there's some, you know, some credibility to the whole geographic profiling, you know, theory here, and then we can begin to study, you know, _____
Tom Rich:	Is that a question for researchers?
Sean Bair:	Well, I think so. But I agree with it, I mean, you know, I agree that people commit crimes where they live work and play and that they, you know, typically have little home bases and they shoot off from there, but I think we need to study that and prove that that's, you know, that theory holds true before we start studying whether or not these applications can properly predict that.
Derek Paulson:	There is some research on that. Rengert and … I can never pronounce his last name, but when he talked to suburban burglaries, he's got a, well, he actually talked to offenders. Now, again, you're always gonna have a caveat with, when you talk to convicted offenders, and he asked 'em about, you know, where they commit crimes as opposed to where they live and how they found, and it is based on reading through the book, good book, and there's a couple, there's a few other books kinda similar, or they at least touch on it—
Pat Brantingham:	Cromwell's book.
Derek Paulson:	Yeah, but they'd go in and they actually, they'd talked to offenders about where, then there's, oh, was it Decker? Where they actually talked to current, active offenders as opposed to those that had been arrested. And he has a street robbery, and they go in and they ask 'em, and the theory does seem to, yeah, it's a very small sample. It's qualitative research, but _____

Mike Shively:	What's the theory?
Derek Paulson:	Just, well, again, talking about do offenders, and how do they find crime sites, and do they, is it because of their activity spaces? How are they going out and finding places to victimize, people to victimize. Are they just randomly picking a place on a map? Are they finding places along activity spaces, or on routes to activity nodes that they have, and in the interviews that Rangart and others have done, that is what that they have found, that, you know, it's rare that someone just randomly picks someplace completely different. That most of the time, it's along the, and again, it's—
Sean Bair:	But that's a qualitative study that has been done. Maybe we should focus more on a quantitative study and actually putting the dots on the map and, you know, measuring it.
Tom Rich:	So is this something that an evaluation needs to do a more systematic examination of that whole question, is that— it's really one of the most fundamental questions here.
Derek Paulson:	I think that it would be a different, would be totally different than what we're talking about here. I mean that's a great _____ thing, and I can tell you I'm trying to do something like that in a qualitative and quantitative sense. I'm actually gonna go into a prison. They're, I'm awaiting for approval. I'm gonna to into several prisons in Kentucky and actually interview as many offenders as I can, and have them actually draw up maps and put as many quantitative points down as possible. How you can find it any other way, besides actually interviewing offenders, I don't know. So there's always gonna be a qualitative part to this, 'cause there's no other way to really get that expansive, I mean how else are you gonna find out their activity nodes and everything _____ it's very difficult. You can't, you're not gonna get it from police data.
Mike Shively:	That's not qualitative. I mean you're gonna aggregate things, right?
Derek Paulson:	Right, well, it's the combination.
Mike Shively:	Yeah, well, everything is.

Pat Brantingham:	And one of the critiques is what do you define as an activity node? I mean what's an important one? What's a minor one? _____ do they know the space or do they routinely use it or is it an important one? Yeah, are they going to a crime attractor? You know, what—
Tom Rich:	But if, but does this—
Pat Brantingham:	All those things matter within the theory.
Tom Rich:	Yeah, I mean does the whole evaluation, though, of these packages hinge on this question of whether or not the whole concept—
Derek Paulson:	Absolutely.
Tom Rich:	Yeah, and we sort of pooh-poohed it a little bit, but maybe—
Derek Paulson:	_____ from existing research, if I was gonna say from existing research that I've read of this, it points to being correct. I haven't anything that's so contrary that says it's not.
Sean Bair:	Well, on the marauder sense, but not on the commuter sense, 'cause there are those people that do go to areas to commit crimes and then come back home and you can't use geographic profiling to find their location, so—
Pat Brantingham:	And that's what Kim would chuck those out.
Sean Bair:	Exactly right, but you can't chuck it out pre-analysis. *It's* only after, exactly right, so maybe what we should do is study whether or not people are marauders or commuters, and if they can, well, if we can answer that question, then we can begin to use the software.
Derek Paulson:	Well, a great piece of research would always be how do you ever determine a commuter from a marauder while they're active.
Sean Bair:	They may be ways. There may be the, you know, we use the great circle method. Maybe the size of the circle is some indication of what type of individual they are. Maybe the distances between points and the mean inner point distances or something like that. We don't know, 'cause we've never

studied this. But maybe the distribution or the way that the individual's crime series is distributed gives us some indication as to what type of person we're dealing with here, and then we can make those decisions.

Wil Gorr: The hit score as it can be amended will reflect the commuter by being higher than 100 percent. That's a measure that would be compatible with both commuter and marauder.

Pat Brantingham: But marauders frequently they, I mean the students who have looked at that, they find it's a prior residence. We call it a marauder. Or they're pizza delivery.

Mike Shively: There's kind of a, there's a practical issue here, I think, though, that we can't, you know, I hope we don't lose sight of or I think it's important, anyway. Which is, you know, you're probably talking about a five to ten year research program to really feel good about an answer, and in the meantime, every year more and more law enforcement agencies are investing in this without any idea whether it works, so, you know, I think, you know, if I'm, again, I don't, you know, correct me if I'm wrong, if I'm to try to, you know, portray an NIJ's interest, it's really, you know, unproven. There is a huge public investment in it, and it's continually growing and can we try to get some kind of answer about whether it's a waste of time or not. You know, relatively quickly, and I don't entirely, I'm, you know, I've spent a lot of time studying criminological theory and victimology and I know it's important, but you don't necessarily have to have a great theoretical understanding of what's going on in order to have something that's helpful and useful.

I mean Newton's Laws of Physics were, they're wrong, but they're extremely useful. And, you know, they carried physics for 300 years, even though they've been basically overturned, so, you know, I think you can kinda luck into having something be useful without understanding exactly why, and I think we can kinda get to a pretty interesting answer by just having a sequence to an evaluation.

Tom and I were talking about this last night, where these components were, you know, these six major pieces, you know, evaluating utility, evaluating cost, I think there's kind of a sequence on, in the methods that we could apply that would, I don't think these are all just equal things, equal

things that can be evaluated. I think, if we put the software to automated testing and bench testing or lab testing, whatever you want to call it, and none of it does any good. It doesn't outperform chance, and it doesn't outperform guesses or intuition, then it's impossible for it to be a useful tool for law enforcement. They may think it is, but it isn't. You know, it's snake oil. Now—

Pat Brantingham: But speaking for Kim, you've gotta look at it another way. I mean he's not here to defend it. I can't believe, but what happens is he'd say well, yes, but that's not a fair comparison, because you would never have, you'd say, there's all sorts of varieties and this only works for a certain selective subset of those.

Mike Shively: No, well, okay, but—

Pat Brantingham: So then you couldn't say, because _____ you have training—

Mike Shively: No, that means, those things need to be build into the lab tests, and everything, so like if you're testing, if you're doing your lab tests and you're, you set up your automated test in a way that's fair to the software, like it's really testing its performance in the way it's intended on the types of crimes it's intended to, right? Then, and it's still doesn't outperform chance, guesses, intuition, then—

Pat Brantingham: That's different.

Mike Shively: That's not different, that's just implied in what I was saying. You know, I mean—

Pat Brantingham: Oh, I thought you were saying kind of like the bench testing would be or any kind of—

Mike Shively: No, but I mean if you give each one a fair test in controlled conditions, and it doesn't do anything for you, it doesn't outperform chance or anything like that, then you don't really need to go on to find out, well, let's see how it works in practice now. If you get it to work in a lab, then you still need to find out in practice, 'cause it could be that the user interface or the things that the user controls are so poorly designed that people screw it up in practice, right? I mean it could work but it doesn't usually. I mean that's the next step that I think, so I, but in terms of, you know, like do we

understand the theory and stuff? I don't know. I mean I really don't know. I mean human behavior's one of the toughest things in the world to get a grip on, and, you know, you can look at aggregates and have theories about, you know, mass behavior that are very helpful, but in terms of saying, oh, here's a person doing something. What are they gonna do next? I mean people have been working on that forever, and, you know, I don't think we can wait till we understand that to say now we can test software. I think we gotta say this is what we have now, people are using it, and then I think if we have a sequence like that, then we could get some pretty helpful answers.

Pat Brantingham: But from what I saw yesterday, I mean it was really great to have the demonstration, but all of them are trying to identify activity nodes, like you have CrimeStat saying it's journey to crime, like from home location, but in all of them, they're identifying, could identify multiple nodes, so how would you ever test whether it works or not if all you have is home address? Because—

Mike Shively: I think we have to assume that we can test whether it works. I mean and that's the challenge. I think that's what, you know, I hope we can kinda try to get some ideas about this, is what does success look like? You know, I mean—

Wil Gorr: To follow up on your point, if it's narrowed down to a smaller area search, and you ask _____ if you ask Sean, he said didn't work for me yesterday. Had a smaller jurisdiction and it just, I had, I could use MO instead. Location wasn't important. But somebody else, so you're focusing investigation, did that help is the next question I think. Was that valuable for you? Because of the handoff point. Geographic profiling doesn't give you the point location, I mean it can, but that's not very helpful. It gives you an area to look in, very likely to contain an activity node. Is that helpful to you? Did that make it easier, more productive?

Tom Rich: Which you would get from users.

Wil Gorr: You get it from users. That's the point, but in this case, Sean just asked a more fundamental question a moment ago. I think it's more fundamental to ask does geographic profiling work rather does, is Rigel the better package.

Tom Rich: Oh, sure, yeah.

Wil Gorr: Yeah, I mean that's the, we're at such a low point of penetration and use in the market. The big question is, is this something I should, first of all, should I be doing this? And then secondly, later on _____

Tom Rich: If yes, then, well, what package?

Wil Gorr: What package. And so the, but the question I heard yesterday was it didn't narrow it down, I mean it narrowed it down, but I didn't find that useful. So what that it narrowed it down?

Keith Harries: I got a secondary sort of background question is whether it works better in some geographic contexts that others. For example, it might be more effective in a relatively homogenous kind of environment where you have similar population density and distribution and similar transportation grid over a relatively large area. As opposed to the hills of Kentucky where you've got very linear and totally different kind of physical layout, so although that wouldn't be the central focus of the investigation, it could still be a background consideration to kind of look out for that sort of effect.

Tom Rich: We've been talking about these testings. The testing procedures as a way to sort of compare package, compare these other packages, but can we sort of pool the results of all of these to make comments on the overall, on the overriding concept. Does this whole thing work? And by using all these packages together and integrating results in some ways.

Wil Gorr: I think one of the questions to enable that is to assess whatever the package was, was it a valid, or did it follow the guidelines that exist, you know, was there training of some sort? Some background, but to say that it was a good implementation of geographic profiling regardless of the package, then you could, you know, you could sort those into whatever package it was that they have a useful result overall.

Keith Harries: And could or should this kind of investigation be a launch pad for improvements and enhancements of these systems? The analogy, it seems to me, is that _____ weather forecast, you know, we have right now a very blunt instrument. It's like knowing that we have seasonality. You

know, we know it's gonna be warmer in the summer and colder in the winter, and this is the analog to knowing that there's a distance decay function. You know, we know that most people are gonna do things closer to home and fewer are gonna do things further away, and that's about as crude as knowing that we have summer and winter. But then the difficulty comes in figuring out what the intra-seasonal variation is going to be, and that's the really tough one, because you've so many variables. And that's where these models, I think, lose their effectiveness is when you get to the details that go beyond that general principal of distance decay. That's where the failure would seem to lie.

Pat Brantingham: That's a great analogy. That's perfect. It's like these are about the crudest you can have in the way of thinking. Yeah, it's winter or summer or Indian summer?

Wil Gorr: Oh, we spoke yesterday that we should have on our master list there all the caveats, you know, to make sure that it's clear this is the crudest possible approach.

Pat Brantingham: We might want to choose a different word that crudest.

Wil Gorr: By the way, now we were talking about comparing package to package, but I really picked up on what Sean yesterday, maybe we should compare this to MO methods in terms of workload reduction. You know, there's an entirely different set of approaches to use. You have clustering methods that they can, you know, have a vector of MO criteria, and that reduces the workload of all the suspects you have to look at. It's not geographic, but it's based on their personal attributes. It's a way to focus investigation, and why not compare geographic profiling to its major competitors, which seems to me to be an MO-based personal matching.

Tom Rich: Well, again, I think maybe this is where we can ask our colleagues down here. I don't know if they can answer, but I mean this is a question that I've had for a while is, are we just looking at these four packages or are we looking for, or should the evaluation look at this whole field, vis a vis, MOs or eyeballing.

Derek Paulson: Well, see, then that, I thought that was kind of implied, and that would mean some of the control methods, like we've _____

Tom Rich:	Sure, right, right, but I guess, you know, we just to make sure that that's, is it an evaluation question? Is it one of the questions for the evaluation? How does geographic profiling work relative to eyeballing?
Ron Wilson:	Keeps them from _____ one is we should be able to _____ any geographic profiling software, or _____. Two, remember, this has to be about the software, not the theory. This evaluation needs to be about the software, not the theory.
Pat Brantingham:	So it's a black box. You're not supposed to think like what we did, so it's not distance decay, summer/winter. It's black box.
Shari Pfleeger:	But if it were to evoke, would that be okay?
Tom Rich:	Maybe I didn't understand what—
Debra Stoe:	I don't think that we can separate them completely. I mean there's no way that you can evaluate the software without questioning the theory. You know, but the design of the evaluation should be addressing the software, and whatever you capture that you can use to either validate or support or, you know, whatever, for the theory, you know, maybe that's something that we can build on, but if you try to address both, you'll end up with neither.
Pat Brantingham:	But you got the reverse, is do the models fit the theory they claim?
Mike Shively:	Well, I think if you—
Debra Stoe:	But you can do that without establishing whether or not the theory is valid.
Mike Shively:	I think if, you know, again, assuming that it's a well-designed test that actually gives every software package a fair chance and the environment that's assumed and all that, if they all perform equally, and they're all no good, it doesn't really matter what, I mean they're all floundering around, right, and it could be in the operationalization, the basic theory, all that stuff. If you find differences, if you find that some perform better than others in a way that it just exceeds kind of randomness, you know, if you get some performers, or if they all perform pretty well, then you have a good answer to

whether it's helpful or not or could be helpful, but you may not know why, and if you've got variation, then you gotta ask those questions why, you know, I mean why does one perform better than another and that's where it opens up the question about maybe they got a tighter fit between the theory and the code. Or maybe they're basing something on a better theory or something.

Pat Brantingham: Or in one, it's the training.

Robin Wilfong: What kind of success rate would you build that on, whether it was a success or a failure as far as the software? I mean if it was 50 percent of 'em worked but 50 percent didn't, how would you determine that? If you're basing it just on the offender. I'm just curious on that, but—

Mike Shively: Well, you know, I mean I think, not that this is the statistical or analytic approached you'd have to use, but I mean if you just think in terms of analysis of variance or something, you know what I mean? It's, you know, I mean that's a classic experiment, you know, you've got four different things all lined up, and there's variation within and performance, like you keep running through all these tests and there's variation in how close it gets to whatever criteria you said, and then there's variation across, and if the variation across, right, exceeds certain thresholds, then you assume that there's something going on, and it's not just random fluctuation, you know, from package to package. You know.

Shari Pfleeger: Your comments about five to ten years to answer some of these questions really struck me. But it seems to me that the perfect is becoming the envy of the good here. That we're trying to find the absolute best tests for everything, and maybe we need to moderate a bit, and maybe we can design something that's good enough to answer most of the questions that we have. So what I'm about to say is colored by the following.

I had dinner last night with a woman who works for NIST, the National Institute for Standards in Technology, and she's a usability tester. So we were talking about how you'd test this kind of system and other systems for usability, and they have to make a lot of compromises, too, for obvious reasons. There are so many factors that if they tried to test all of them, they'd never finish testing any of them. So it seems to me that in order to address some of the issues like what would

Kim say, or what would Ned Levine say, if we used their
software, maybe we should ask them to provide the best that
they can as part of this kind of competition, so that some of
those issues go away. If we get the best analyst, then Kim
can't say, well, they didn't have enough training, and, if we
vary some of the scenarios that we use so that some are
property crimes and some are not, and it happens to work
well on property crimes, then that's okay, and so we get good
enough results by just running a bunch of scenarios that we
think are representative, and based on what we find, we
might want to do follow-on testing or we may not need to, if
we find that eyeballing always works better than any other
software packages, that indirectly addresses the issue of
whether geographical profiling works or not. Even though
we'd still be focused on the software, if we find that some
software works better than eyeballing, then we do a follow-
up study about why. But, you know, maybe we should just
focus on the first tier of the evaluation. Without trying to
exhaustively do every possibility.

Tom Rich: So you're guessing that sort of a set of, give a set of
scenarios, to Kim and Ned.

Shari Pfleeger: Either to them or to people that they—

Tom Rich: And have them solve it.

Shari Pfleeger: That they designate, yeah, and at the same time, we might
ask Robin and Sean either themselves or to designate
someone to be analysts who would use their own methods or
to eyeball or whatever and compare them with what the so-
called best analysts from Kim and the others to do, and that
way, we're eliminating, in a way, we're not eliminating
variability, but we're trying to optimize on some of the
variables by using the best analysts or the most expertise.

Derek Paulson: I would just put out that I don't think it would happen.

Shari Pfleeger: Pardon?

Derek Paulson: I don't think it would happen.

Shari Pfleeger: Why?

Derek Paulson: 'Cause I don't think, what if he loses? This is essentially a
competition. If Kim Rossmo loses, then his software, which

is a company, loses. He does not want to lose. The best way to not lose, don't play. Why put yourself at the risk?

Sean Bair: Cantor and Ned would do it, 'cause I think they're both still kind of a research _____.

Derek Paulson: But I just, I would find it hard to believe that you would get all three to participate in a way. But you also wouldn't have them, I just don't think it, I think what we need to do is take them out of it. That's the whole purpose, is we need to take them out.

Shari Pfleeger: Well, fair enough. So suppose Cantor and Ned say yes, and Kim says no. So then we say in our evaluation that Kim said no, and so we took, we found the best-trained Rigel analyst we could. Maybe we use Robin.

Derek Paulson: But aren't we doing that anyway in the analyst part?

Shari Pfleeger: Well, I don't know. I mean—

Derek Paulson: I mean I just assumed we were gonna get people that had already, I mean I meant in a way, we can handle that and still do the automated. That, if that's what we want to test with the analysts, then we do that with the analysts, but I still think it would be wise to set apart, to get that data set as tight as we want it, make every caveat as we can to get in, so that we have a data set that is gonna pass, again, you're right, it's gonna compromise, you're gonna have to have, the, this is one of the things, this is gonna be published academically some way. People are always gonna critique it. That's our job, to criticize the research.

Shari Pfleeger: But I guess what I'm saying is that wherever we can, we try to diffuse some of that criticism upfront.

Derek Paulson: You're right, I agree. That's why I said we get the data set as tight as we can. We have it automated, and then we also have a best analyst, and we also have a, other methods to see how does it work in a perfect world? How does it work with top analysts? How does it work against the other methods that are not even a software system? Some other way. So that you kinda cover all the bases across with the same set of data, so that there cannot be a, well, you use a different set of data, _____ something that's there.

Tom Rich:	How do we control for expertise and knowledge of the area in which these crimes have been committed? I mean if an analyst, you're gonna use your expertise to no, I know it couldn't possibly be over there. In this, in these scenarios that we do, I'm thinking of kinda homework problems I guess you might say, how do we, how does, how do we deal with the, well, you know, I mean, tell me what this area's all about.
Wil Gorr:	Keith and I talked about this the other night, too. There's some very simple things to do. I really should take the dead areas out. I think we talked about this in this group, too. It's a lake, I mean the distance decay function doesn't know that, but you can have those overlays in there, cemeteries, where people can't live and, they're all dead.
Tom Rich:	But don't you need to give, you know, people a profile, different parts of the cities.
Derek Paulson:	Uh-huh, but you can do it in the write-up. If you give them _____
Tom Rich:	So you're gonna be constructing an artificial city.
Derek Paulson:	But you, no, you just give them wherever the data set comes from.
Tom Rich:	Yeah.
Derek Paulson:	You give them a, you know, a detailed description of the actual crime series, what actually went on.
Tom Rich:	So this'll be an actual city, like one of the homework problems might be from, you know, Cleveland or something.
Derek Paulson:	I'll give you an example. When we do this training down in Charleston, they use created crime series from down in Charleston. One advantage that I had over the other people that went through the training is I had spent an inordinate amount of time in Charleston. Got a lot of family down there, so I knew Charleston better than the other people, and I could say something, but we also had two people who had lived in Charleston most of their lives there to ask questions to, because the scenarios were only like a paragraph or a little bit longer. But you could write that into the scenario. You could put that in as; you can put it in the base map saying

what this is. Give 'em a legend, show what the base map is. It may be a little packet for each crime.

It may take them a while to go through these, but you can give them enough, I mean, in a sense, that's what Kim does when he would go out as consultant. He doesn't know these areas. I mean _____ going around the world. He would show in a location _____ training, he had to go _____ and do a consulting. Going around, he's asking questions. They give him a base map. He would look up and find as many things as he can and go with it. So we can give them as much information as we can, and it's gonna have to be detailed, but you can do that in the scenario. Again, we have to, it goes back to making sure the data set is a good set of data that takes into account as many eight points as we can. It takes into account as much about the city as we can, instead of just giving 'em five points. You know, we really want to test how it impacts the analysts, and we have to give 'em a lot more information _____.

Shari Pfleeger: Can you make it anonymous enough so that people don't know what city it really is from, so that they don't, so that individual people don't have the advantage, because they happen to know that city?

Keith Harries: That's very unlikely.

Tom Rich: Somebody's gonna recognize, "Oh, yeah, that's Cleveland."

Keith Harries: People are mobile, you know, you can hand somebody ____ they have no idea, and they might have lived there most of their lives, and,

Derek Paulson: The fact that I knew Charleston was just the fact that we'd vacationed there for my entire life, and I had, my wife's uncle lives there. So we just, you know, I just happen to know it, 'cause I really love the city. _____ could put it in, I've lived in way too many cities to, so, I mean, and that's gonna happen with a lot of people. We are a mobile society, so I mean I don't know if you can, I don't know if you want to. I mean if that's what we're trying to get, I mean what are, you know, what are we trying to get at with that analyst part? 'Cause we already know from the computerized part, that's gonna take every variable out. It's just gonna be running it through there.

What do we want from that analyst part? What are we trying to control for? As much as possible. I think that's what we really need to discuss. If we're gonna have analysts do it, what are we really wanting to find from that so that we can try to control for those other factors, education, whatever. I don't know what we want.

Shari Pfleeger: So maybe we need to do a post-test survey of the analysts to ask them questions about, especially for the ones who are more successful, to ask 'em questions about what things they used in addition to the software, from your experience, from your expertise, that affected the way they used the software.

Wil Gorr: And so, I haven't really noticed myself, but the, it's almost like expert systems pulling out those rules, the rule base. And so those folks have learned that the best way to do that is to talk aloud protocol. So it's hard in retrospect to pull that information out.

Shari Pfleeger: But we could do that. I mean we've done that with software design testing, too, where we just have people talk as they're doing designs, and there's a graduate student writing everything down.

Wil Gorr: Yeah, they videotape it and somebody codes it up.

Shari Pfleeger: But all these things are gonna make this test and evaluation expensive, more expensive.

Wil Gorr: Yeah, right.

Pat Brantingham: Then there are two other things to be fair to CrimeStat. I mean Ned does say the best thing to do would be to calibrate it and then somehow pick it from burglary. So that means for all of your, the situations where you're developing a test, if they're from real cases, you have to go to that city and get for some time period, he doesn't specify whether it should be one month or six months or a year, you have to get all of those crime data, so you can calibrate the models, so it's not just his function to get to the calibration side. That really ups the cost.

Derek Paulson: _____ problem with _____ calibration. Despite the fact that y'all had very good data, not going very well.

Pat Brantingham:	Well, then that's something that has to be included, 'cause that's clearly, if I read this correctly, he says, you know, pick one of these formulas. I won't tell you which one were calibrated, that's the best way. So if you take into account at some level training on the Rigel side, you gotta take into calibration on the other side, 'cause that's what he's saying is the best way. And you're saying that's tough to do?
Derek Paulson:	Well, it's just _____ data set. How easily they can get it out and put a _____, and that's gonna be, you know, and if we're, my guess is, I don't know with this data set we're gonna be creating, we're talking about geographic variation, probably gonna want different cities. I don't know how many different cities we'd end up with CrimeStat's from, that's a lot of calibration.
Pat Brantingham:	But that's also a test of the model, you know, is the data—
Derek Paulson:	That's just as if running, you know, the five, it's just in their default mode to be a test, as well. I mean if you could do it either way. I mean I don't know what to tell _____ you're right. I wouldn't know except through say you pick the one you want, tell us why you picked that one.
Wil Gorr:	If you go to the field and you go to users of these packages, doesn't that simplify a lot of these things we've just been talking about? You just want to ask those folks in a careful way, has this really helped you out, and, no, you want to check and make sure they're doing, you know, good uses of the, aren't doing stupid things, they're just using it in some state of art practice. Once you've established that, we just say, "Okay, now, let's figure out if this has really helped you out or not. Has the workload reduction, has it reduced your work, and do you think that it's led to more arrests?"
Derek Paulson:	Yeah, I mean, you know, it sounds like we think that they analyst, that they're getting these of group of analysts in here and going through these tests would be, has lots of potential problems. And certainly going to users and doing things like you were saying, that has its own problems, but probably wouldn't be as expensive.
Wil Gorr:	It's probably more meaningful.
Derek Paulson:	And it would be more, yeah, uh-huh.

Wil Gorr:	I mean we're trying to micro figure out best practices it seems to me, and that all the information _____ so forth, and a lot of that's art. I mean as we continue to talk about knowledge and just want a good set of analysts who are doing it right, essentially.
Mike Shively:	No, this is in addition to an automated type of test, right?
Wil Gorr:	Yeah, the automated test says use this function, calibrate your own data, preprocess your data in these certain ways, post process it in other ways, objective. It comes up with the best quantitative practice, objective practice. When that's done, judgment takes over and uses that in investigation, some fashion, now whatever that was, was that, is that being done well? And did it help? But I think that there's a little bit of separation here, because, in part, the automated part talks to future software packages, future uses, guidelines, and it's sort of been parallel to that. You've got the existing users who are probably doing a good job. But they might even be able to do a better job after this automated research, or some of the questions they have of why should I do it this way or that way, there might be a better answer. And, too, might be able to improve practice.
Keith Harries:	Do we need to move on and talk about costs at this point?
Mike Shively:	I think so, what time are we?
Keith Harries:	It's about five of ten.
Mike Shively:	Okay, yeah, why don't we do that. Thanks, Keith, yeah.
Keith Harries:	So the cost questions, how do we assess costs? What are the opportunity costs? What are the sacrificing that we do geographic profiling, what might be done with those resources otherwise? Use cost-benefit analysis principle.
Sean Bair:	Well, the pubic will always argue that, you know, you can't place a price tag on, you know, somebody being victimized, so if that $60,000 stops one woman from being raped, well, it was well spent. But, yeah, if it never does, then it's a couple of cops for a year or, you know, whatnot. I don't know how you're gonna place a monetary cost on this. Just FYI, Dragnet actually costs $250.00. That's, I did get a cost quote from him on that. I know we've been tossing around that it's

kinda free depending upon who you are, but if you're just Joe Schmoe off the street, it's $250.00 U.S.

Shari Pfleeger: But haven't there been some studies about things like the density of beat officers and things like that so that you could weigh the difference between preventing the crime versus finding the criminal afterward? If it means that two more cops will be on the beat by hiring two police officers instead of spending $60,000 plus whatever the training is for Rigel, could you do _____

Sean Bair: More cops is never the answer.

Pat Brantingham: I've never seen any study that shows patrol helps at all.

Sean Bair: It's smarter allocation of your resources actually. Yeah.

Shari Pfleeger: Well, I mentioned this to several people yesterday. In Fahrenheit 9/11, there's a scene where an Oregon state police officer talks about how he works part-time. This is the guy who goes up and down the coast, coastal highway in Oregon, which is about 200 miles of coastline. And he was curious to know, at any point in time, how many state police officers are on duty in Oregon, in the whole state, and the answer was, he found out, eight. So I guess where I'm coming from is, if it's a choice between buying a profiling software or hiring some extra police officers in the state of Oregon, so that when you call 911, there's actually somebody on the other end of the phone, or somebody who will come and help you, then to me that's a clear tradeoff.

Sean Bair: Well, sure, but I would argue that instead buy one piece of, or one application of SPSS, and, you know, they'll have much more opportunity to do better research and analysis altogether than this one piece of specialized software, so—

Robin Wilfong: And a lot of the agencies contacted me about the Rigel product. It's a $6,000 package, the Rigel you're talking about is for profilers as opposed to analysts. They're approaching in a grant form, so it's not really costing the agency. They're trying to approach it in a grant form.

Sean Bair: Yeah, but I never liked that argument. Well, it didn't work, but we only used grant funds.

[everyone speaking at once]

Sean Bair: No, I know that, but I wish they would stop doing that.

Shari Pfleeger: Yeah, one of you talked about those, the jurisdiction that's small and only gives parking tickets or something, but they have a copy of Rigel.

Derek Paulson: Oh, that would mean, they have just have ArcView they just have mapping. They don't—

Pat Brantingham: But if you ended up showing, I mean I don't think you want to buy into that, 'cause if you end up showing that, and you did a big study and you found that if you add one more police officer, and you end up being able to reduce response time by .5 seconds, which is better? The people on the other side would say saving one life or reducing response time by .5 seconds.

Derek Paulson: But that's assuming response time _____ it all, which it doesn't. So I think we're going down the wrong road trying to figure out if you buy Rigel, it would have any impact on an officer. We're talking costs and stuff. We need to talk _____

Tom Rich: And I think we can talk about, and, again, this is something that can come from interviews with users, is how much time did you invest in learning, getting up to speed, importing data. You know, was it one hour, was it a hundred hours? You know, and what are we talking here?

Pat Brantingham: That's good.

Shari Pfleeger: _____ probably more of a time spent _____ a classroom.

Mike Shively: Yeah, I think we started kinda the outside edge of what we would want instead of the other, what we can gather in. I think we start with the good first and, cost benefit, I mean you know, presuming benefit is the hugest challenge that we're talking about. We don't even know that, so it's had to do a cost benefit, but just simply documenting the total investment, 'cause I don't know if we have an idea about what it costs, like, you know, is it the case that, you know, Rigel obviously, especially the main version, takes us, you know, a huge investment in training, but it could be over five years period that it's less expensive to get that state of the art training right upfront and use it efficiently, than CrimeStat

where you're basically kinda floundering around teaching yourself, you know, and I think descriptive data just on how much time do you spend till you feel like you're proficient? How much time does it take to get to do this sort of type of analysis?

I mean the details can be worked out, but I think a lot needs to be done just descriptively on, you know, training, on, you know, startup time, you know, incidental costs. You know, did you have to buy hardware to be able to run it? You know, what's the total investment in looking at the output? You know, for example, if an analyst basically just talks to a lead investigator, you got two people committing time to looking at the output generated by the software. Do you use it in briefings where everyone's gonna actually take action based on the output of the software, you know, I mean trying to really just have a really good description of every type of potential cost in terms of time, you know, more than anything. In addition to whatever.

Shari Pfleeger:	Is there some benefit also to looking at the dependence on local knowledge, so that, for instance, if it is expensive to have someone with Robin's skills, maybe she'd be better as a national resource or a regional resource so that, especially for these small jurisdictions that may never need a profiler. Maybe it would make sense; maybe that's something NIJ could decide, I suppose, would it make sense to have regional expertise where it would be worth investing time in the training?
Pat Brantingham:	That's what Rigel does now. I mean I think you were telling me that if you go beyond the property crime, you have people you phone.
Shari Pfleeger:	Right.
Pat Brantingham:	Who are the regional profilers who've had the long training.
Tom Rich:	So like, you mean people like from ATF or something? Is that what, who you would call or—
Robin Wilfong:	There's actually I think seven profilers _____ profilers in the world that if I had a major violent crime in my county, I'd _____
Derek Paulson:	I think three of 'em are in England.

Robin Wilfong:	Or if I needed assistance on a crime that I had questions on, like I had a bank robbery series where I got with a profiler up in Canada, and he assisted me with this particular series, so we have an internship, per se, I guess.
Keith Harries:	Coming back to the point that benefits are apparently more or less impossible to measure. Is there really any point in going down this path if you cannot measure benefits, then what's the point of worrying about costs and benefits.
Tom Rich:	Well, I think that, I mean when I talk to the ECRI people, they said that what they do, if I recall correctly, is they keep track of out of all the cases that the analysts uses their software in what percentage of them was the information that they provided to the investigators useful? You know, was it 10 percent or was it 90 percent? So that's one—
Keith Harries:	Isn't it still essentially impossible to prove dollar value?
Tom Rich:	Oh, yeah, I would argue, right, I would argue with it, yeah. But at the same time, you know, it is useful to know, well, was it 10 percent or, you know, was it 80 percent? I think that's of interest.
Wil Gorr:	But have the cost benefit folks figured out how much a particular crime costs individuals at this point? Like who is it, _____ the cost of a life of crime to society.
Pat Brantingham:	Yeah, there are studies that look at that, and then it starts to be, are you talking about a city, the cost per city of 100, are you talking about police costs, you're talking about correctional costs, are you talking society costs, well, you know, boom.
Mike Shively:	There have been a, you know, there have been a bunch of attempts to attach dollar values and adding, you know, indirect things, pain and suffering and, you know, loss of , you know, loss of productivity to victims and all that stuff, but I don't know if it, you know, really is all that helpful for something like this. But I mean clearly what you can get is perceived benefit. Obviously, you know, if the investment means that there's some perception that there will be a benefit, then it may be useful to know why people are doing, I mean is it that you're dissatisfied with other methods? Do you want to be on the cutting edge of, you know, something

or other as a liability to make yourself look like you're doing every possible thing you can to prevent crime and catch the bad guys. You know, I mean there's a bunch of things we could find out, but the cost benefit, I mean there are, you know, government standards for doing these things, you know, like doing cost benefit analysis, and I don't think we're gonna have the data.

Wil Gorr: No, but actually people like John Caulkins, who's on my faculty, he's done, looked at prevention versus enforcement in drug enforcement, and so forth. They do really kind of back of the envelope simulation models for the whole country, and sensitivity studies and so forth, and you come out with some pretty comfortable or confident feeling that, well, prevention's the way to go. And we don't go that way, but they make a pretty persuasive argument out of it. Why couldn't some simulation model be built here that looks at the whole country and set up all the major cities to do profiling. This would be the impact.

Mike Shively: Is this a second stage sort of question? Like the first one is, you know, does the software do anything it says it's trying to do? You know, and if it's not, then a lot of these questions, I mean how can you do a cost benefit analysis.

Derek Paulson: Yeah, I mean I guess _____ come out with a percentage of times that they were correct, then we could possibly factor in, okay, _____ how many serial crimes there were each year that you could profile, is this percent correct?

Robin Wilfong: I know that, thinking about this, they, I know in Dr. Rossmo's product, he says it's a good investigative tool. It's not an X marks the spot. So if you're using this software strictly to solve a crime, I think an agency would be mistaken to do that, because there's a lot of other things that can be brought into it to solve crime. Again, it's just an investigative tool, so maybe whoever the proprietary people that have put this together, are they careful to say that, that it's not the be all, end all. That it is a good tool to use, but is it the only thing to use to solve an investigation?

Tom Rich: Would you be able to, I mean let's say that, if prior to the evaluation we came to you and we asked you to go through your cases which you've used, would you be able to pick out ones that didn't help here, helped a little bit there, really helped on that one, didn't help, is that, would that be possible

	to do? I mean is that something that you could, or maybe keep track of?
Robin Wilfong:	It would be possible, yeah, to show you the cases, the ones possibly, or the ones that didn't work? Again, I don't know if that individual maybe had worked in that area or had a girlfriend in that area. Sometimes our knowledge on that is very limited. Like I say, sometimes the deputies will put down that the county jail is their place of residence, so, you know, when we go back to try and search that, sometimes it's very difficult to find why didn't it work.
Tom Rich:	Right, yeah.
Robin Wilfong:	You know, so I could show you the ones that did work, and I could show you the ones that didn't work, where they were able to determine the residence. The ones that are kind of an "iffy" area, I don't know how you would determine that.
Tom Rich:	Right, and we have to be careful on what you mean by work, you know, obviously, things like that.
Robin Wilfong:	Right, right.
Tom Rich:	I mean did it provide useful information? I mean that's, again, kind of vague, but I think, you know, we can maybe try to quantify that a little bit.
Mike Shively:	I think it's a good piece of user feedback, 'cause asking, you know, what do you need to know in order to make use of it. You know, I mean what are the pieces all around the output, you know, or what do you need to feed into it, you know, in order to interpret what you get. I mean that's something you can only get from a lot of use.
Keith Harries:	Well, are there any other cost issues that are of interest?
Male:	I think that's probably more straightforward. Should we take a break before we go to the last topic?
BREAK	

Day 2, after break

Pat Brantingham: The one's he is doing is the ones where we're not likely to find
                      an activity center, those are the ones that--

Sean Bair: Okay, he used the term in his own connotation here four times –
                      residence. The software will help you to identify the residence
                      of the offender. The potential residence. The likely residence of
                      the offender. It doesn't say activity nodes. It doesn't say activity
                      states. It says four times residence.

Pat Brantingham: But that's it then. In the training, that's that. That's it? In the
                      training—that's that piece?

Sean Bair: That's what the software has claimed.

Pat Brantingham: In here. Yeah. But when he does the training, when he talks, it's
                      just a comfort zone. So it could be a school. It could be work
                      you work. It could be near--

Sean Bair: Sure, but also he – they make claim to that, though, and they say
                      that, you know, for the most part, it's the residence, though.
                      Usually the residence.

Pat Brantingham: Usually the residence, and always the residence are really
                      different.

Mike Shively: But you know what? You can't – so you're saying that it's really
                      just a little bit of information that's going to be used with a
                      bunch of other stuff, and – but the thing is, and you were talking
                      about narrowing the scope, so let's just say that absent the
                      software information, right? So let's just say absent it. You've
                      got like a five-square mile area that the investigator thinks
                      there's somewhere in there Rigel is saying – someone using
                      Rigel could say I can narrow it down I think, and chances are a
                      little better in this two-square mile sub-set right?   Now what can
                      you test is that. I mean, is it the case? If there was a high
                      likelihood. I mean, how often is it the case that they were within
                      that higher probability area and weren't--

Pat Brantingham: The difficulty with him is that it's a comfort zone and so it may
                      not be where they live--

Tom Rich: Right, so--

Mike Shively: Well, whatever it is, you know, you define it whatever.

Tom Rich:	But you're not going to be able to – but if you go by police data, it'll have their residence. It's not going to have their girlfriend's residence.
Pat Brantingham:	Right.
Tom Rich:	You know, the shopping mall where they always go to get coffee. It's not going to have that data, so you're not going to be able to--
Mike Shively:	But I mean, I think having it be an open question is a gigantic problem. Right? Right – if they're saying like you're going to invest sixty-thousand plus labor in order to get something that is inherently untestable, and we can't even tell you whether we're helping you or not.
Tom Rich:	Well, it's untestable except if you ask people, you know--
Mike Shively:	We've defined our goals so--
Tom Rich:	But is that the best we're going to do? I think that's the best we're going to _____.
Sean Bair:	The crime analysis community. That's predominant in measure of work that act on _____.
Pat Brantingham:	Yeah.
Sean Bair:	Yeah, you know, like I did have a cousin named John once. How do you know? Madam Cleo or something like that. We'll _____ how are you able to read my mind like that? You know, we've got to be careful about that type of evidence.
Mike Shively:	Right. If you ask an 18th century doctor, they're all going to swear that application of leaches has a high cure rate. At this – I mean, it's kind of flip to use that as an example, but--
Sean Bair:	I almost used that yesterday, so yeah--
Mike Shively:	Is that right?
Sean Bair:	It's the exact same thing. It really is. It's not a proven technique.
Mike Shively:	But I mean, I think having it be an open question is a gigantic problem. Right?

Pat Brantingham: Well, not--

Mike Shively: Right. If they're saying like you're going to invest 60,000 plus
labor in order to get something that is inherently untestable and
we can't even tell you whether we're helping you or not.

Tom Rich: No, it's untestable except if you ask people, you know--

Mike Shively: We've defined our – we've defined our goals so--

Male: But is that the best we're going to do? I think that's the best
we're going to _____...

Tom Rich: Crime analysis community, that's predominant in measure of
work that act on _____. You know, yeah, you know what? I
did have a cousin named John once. How do you know?
Madam Cleo or something like that. Well, how are you going to
read my mind? You know, we've got to be careful about that
type of evidence.

Mike Shively: Right. If you ask an 18th Century, you know, doctor, they're all
going to swear that application of leeches has a high cure rate.
Right?

Tom Rich: Exactly.

Mike Shively: If this – I mean, it's kind of flipped to use that as an example,
but--

Tom Rich: I almost used that yesterday. So, yeah.

Mike Shively: Is that right?

Tom Rich: The exact same thing. It really is. It's not a proven technique.

Keith Harries: Tom.

Tom Rich: Yes?

Keith Harries: Would you like to talk about _____?

Tom Rich: What we wanted to do in the remaining time is to try to put it all
together, and you know, recognizing that in any evaluation you
have to decide where to invest your resources. What questions
are the most important. What you absolutely have to know

versus what's good to know. Things like that. And so we thought that one way to organize our remaining time is to sort of take a look at all of the evaluation questions that we've been talking about over the last day and a half and, which are in this handout here, this you know, one could frame an evaluation question around output accuracy, you know, how accurate is that, software, things like that. And then sort of talk about you know, which ones do we see are the absolutely have to answer the question in order to be able to say anything. You know, get some idea of the relative importance of each of these.

And talk about okay, you know, this is a critical question. How are we going to answer those? And yesterday we talked about different ways of answering some of these questions. Through automated testing and analyst testing. User feedback. Things like that. So I'm not sure what the – I don't necessarily want to poll everybody on say, you know, what's your number one most important question here, but that's – I'm open to suggestions on what the best way is. Sort of talk about the relative importance or if that's a good way to go and--

Mike Shively: Now just, you know, we're needing the witnesses here to also *[Laughing]* is. But we – this is kind of the rough order that we came up with last night. We had, you know, the output accuracy and utility at the top and then the other – the theory and implementation, although you know, you can debate about all of this risk saying it may not be the most critical thing to answer at this point in a program of evaluating these things. And the other things are kind of in the middle there. But that's – that's where we're coming from. I just wanted to have full disclosure here about the way they're written down. And what we want is feed back like, you know, disputes. Arguments. Other opinions. Consensus.

Tom Rich: I mean, we've been talking a little bit about the pros and cons. The difficulties of measuring accuracy. Testing them versus the utility – or, not the utility. That's a bad choice of words. Of going to individual users. And was this useful. And kind of those are the top two there. And you know, one would go by answering these questions in very different ways. And is one way – I mean, if you had to – if you only had a certain amount of recourses for your evaluation, where would you put your money? Or what would give you the most useful information? Would it be the automated testing in some ways, or would you know, some type of survey of users getting feedback from users, or are they equally important?

Pat Brantingham: Maybe I will throw in the one thing.

Tom Rich: Okay.

Pat Brantingham: So you'll probably know how I'll fill this out. I really thought a
lot about this and you could say why does Kim do or why do
they do it with ECRI? But they never claim that they're going to
locate anything. Except provide some additional-- *[Laughing]* I
know. It sounds like it's apples and oranges. You come in,
analyze it independently, CrimeStat independently, Dragnet
independently, but they're each claiming they're doing
something different.

Sean Bair: We'll measure them against themselves.

Pat Brantingham: Measuring them against themselves is perfectly fine. I – the
difficulty I have is comparing them, because all that – all that
with Rigel they claim, or I would even make it just Rigel
Analyst. I wouldn't go with the full-blown thing. But with what
it is, all they're saying is that this is an additional bit of
information that's going to go to the investigators. And it could
be like a psychic. You could do it that way, or you could do it
some other way, but they don't make any assertions that it's
more than that. I don't think you can test the accuracy because
what they're saying is that they're identifying – or what he does
by the things that aren't included is he's just identifying some
undefined type of activity node. And it's kind of like you give
that information back to people who know the area. They'll look
at it and say oh, shopping mall. And they'll think oh well, you
know, there are lots of people are using the shopping mall. That
doesn't really help us much. Or it might say, oh, this is an area
where it's a drug user, and drug users and drug dealers – and that
narrows down the search area a bit. Or it could turn out that the
spot is – turns out to be where, you know, it's something like a
school. Then that narrows it down, but it's only if that
information is fed into a base of people who know the area –
who's see the site. Who know all the connections between them.
So if it turns out that it doesn't – it doesn't necessarily relate in
many, many cases, but it doesn't necessarily relate to home
residence. So how do you ever test the accuracy on any existing
data? Because the police generally don't find out what these
activity nodes are. So it's non-testable. And--

Sean Bair: But what they're claimed though, in their documentation, are the
residences. And I agree with you that there are going to be these,

you know, circumstances where after the fact we'll learn that he may have driven through that area once and maybe that had some impact on why he chose this area. But I don't think we can measure those things. I think what we might do is measure it against the fact that they're claiming--

Pat Brantingham: Well, that maybe the claim there.

Derek Paulson: The training focuses on residences?

Sean Bair: Yes.

Pat Brantingham: Then okay, then you have a complaint about the training. I see – I've only seen his presentations and in his presentations he doesn't focus in on residence.

Sean Bair: And he's quoted right here in--

Derek Paulson: We always go after the – every piece of data we use is always individual residence.

Pat Brantingham: But let's say – let's say – that with that you get it back and let's says one of those activity nodes is a shopping mall. You don't consider that a residence.

Derek Paulson: Well, we can go with this, and you're right. But what's basic? The users are doing well with--

Sean Bair: Residences.

Derek Paulson: Most likely residence, or something else. And you're right. What they're looking for is this activity node, but the best way we have t to test and the way they can do this test as far as I could tell in other research, is with residence. And the standard way that all the software has been tested has been with residence. So we're going with this standard that's been used and published and accepted research to test it with residence. It's a caveat and they can criticize it, but it's been done previously. You know, the research. Using the residence. And we're comparing it – we're using it the same way with all the others. Now--

Pat Brantingham: Except that with Kim's he says give it back as if it's more information. So if you're looking at the area to be considered and it's given back, and it's your town, and this is a shopping mall and that area's out. This one turns out to be a commercial

<div style="margin-left: 4em">
downtown center. That's out. Leaving one node that's in a residential area. That then becomes the search area.
</div>

Sean Bair: That's what he's saying?

Pat Brantingham: No. I'm saying, like—

Derek Paulson: That we're making an untested piece of software.

Pat Brantingham: I think it is un--

Derek Paulson: Well, but then we could never prove that it's good or--

Sean Bair: Well, how do they prove it?

Mike Shively: Bingo!

Tom Rich: If it's untestable, then it can't – then we shouldn't--

Pat Brantingham: Untestable meaning--

Tom Rich: Untestable via output accuracy, but not untestable versus does this provide value to the user.

Derek Paulson: But what does that really provide us with, though? Then you're just asking – then you're just going around and asking people a subjective question. Does Rigel provide any value? Sure. I love it.

Tom Rich: Well, we have to do more than that. *[Laughing]*

Derek Paulson: _____ provides. I don't know what that's really going to provide us.

Pat Brantingham: But you're the one who--

Wil Gorr: With the automated testing, with assault cases, there are objective measures that you can minimize or maximize to give you information. And be totally objective. When you're done with that, you still have then the next usability issues like, and was it valuable? That's what we're talking about. The second stage.

Pat Brantingham: No, I would think that they would have a legitimate. *[Laughing]* I think that they would have a legitimate complaint if you tested

	it on past data and you did not use the additional information that an investigator would have.
Wil Gorr:	No. I think it's separable
Pat Brantingham:	If you presented it--
Wil Gorr:	There's a hand-off from the software to the investigator. What's handed off? Then they add their expertise to that and they narrow it down more. But you can – you can test it objectively on the hand-off from the software to the _____. What do they get?
Pat Brantingham:	I don't think – yes, you could. I think--
Wil Gorr:	And I think that's valuable.
Pat Brantingham:	I think, though, that that by itself should – is not necessarily something you should be presenting.
Mike Shively:	There's something – you said there's a piece of information that gets handed to investigators and they do what they do.
Pat Brantingham:	Right.
Mike Shively:	If that thing is so fuzzily defined that we can't think of a way to prove whether it is helpful, not helpful, valid, invalid, accurate, inaccurate. If it's that squishy, how can we possibly say it's worth investing 60,000-plus?
Pat Brantingham:	Well, I think you'd better move back to the 6,000 away from the sixty.
Derek Paulson:	Well, still if it's--
Mike Shively:	It's an investment of time, you know.
Derek Paulson:	If it's – it we can't prove it valid or invalid, then I guess my recommendation to people would be don't use it.
Pat Brantingham:	Well, that may be the – it may be, but it does depend on who it's handed to. Because--
Derek Paulson:	Well, I agree.

Pat Brantingham:	So it depends on the skill of the investigators. So they're not saying this piece of information – well, I'm speaking for Kim, you know.
Derek Paulson:	But then, no, you're right. It's all three of them. It's not just Kim. No, I understand that point of it completely. But we're not really testing it in that way. What – all we're trying to determine is getting it to that point before you hand it off. You know, it's one of the football analogies. The quarterback hands the ball to the running back. The quarterback can't hand the ball to the running back, then who cares if the running back is any good?
Keith Harries:	Can the peak of jeopardy surface be used as a box for the location of interest?
Pat Brantingham:	I think from what – like I didn't – I don't know enough about – I didn't – I learned all my Rigel through you yesterday. So this is limited knowledge. But from – that's what it is. These different peaks are telling you comfort zones. So if you want to say does knowledge of those different peaks – does that aide investigation? That's a very different question. And if that's the question--
Wil Gorr:	The local maxima?
Pat Brantingham:	Yeah.
Wil Gorr:	Well, we try to operationalize a point to go for an unsolved new crime. In terms of what you do investigating. So--
Keith Harries:	Comparing points on the other programs then perhaps we can come up with a reasonable proxy for a point in Rigel.
Pat Brantingham:	Rigel. And I don't know what it stands for.
Tom Rich:	But what are we comparing this point to? I mean, if we're comparing it to the home residence, that may not be relevant.
Pat Brantingham:	Yeah, you can't do that with Rigel.
Wil Gorr:	Some of these services are too fuzzy and true to use a point.
Tom Rich:	Okay, but even if we don't use a point, we're comparing some service. What are we comparing it to? I mean, it may not be the home residence that--

Pat Brantingham: It may be in most cases it turns out to be residence, but in passing the information on to investigators, if it's a residential area, or it's a home residence, might be where they used to live. It might be--

Tom Rich: Or where they go to get coffee every day.

Pat Brantingham: Right. Where their girlfriend lives. That's what they frequently find in this – there'll be some link to, you know, to some family member. Not necessarily their residence. Or maybe like they're highly mobile. You know. It's prior residences.

Derek Paulson: There's a way to get around this. I think. What did Kim use in his dissertation? What did he compare it to? When he found hits, what was the thing he was _____?

Pat Brantingham: I have no idea. I never read his dissertation.

Derek Paulson: I think it's valid to use residence.

Pat Brantingham: Well, I know from what he said about it, he's used residence, past residence, local shopping malls. And the examples gives all of those. Like the best one is we had a serial murderer and it wasn't the one in here. It showed an arsonist. But it was one where what you had was where he used to live, where he then lived. The other high areas in the risk surface were the major shopping malls. He used to pick up teenage girls at shopping malls by offering them jobs. There, and then he belonged to two churches. And those churches stood out. So it was activity nodes.

Sean Bair: It's like – it's almost like the Kevin Bacon game here. We could almost say okay, well, I can trace it back to any of these areas that, again, he's one day driven through, oh, one day he drove through there. So, you know, the software has value. It showed you that one day he drove through here. We can't do that. We need to pick something. I think it should be residence because that's what the marketing material stipulate.

[Outside interruption – loud speaker announcement]

Pat Brantingham: But they have a clause in there? Usually.

Sean Bair: No. Usually _____.

Derek Paulson: Depends on how you develop the dataset. And I think that's what keeps coming back – if we can come up with a dataset in which we could get – I mean--

Pat Brantingham: I think it's untestable.

Derek Paulson: There's no way to perfectly test it. And whoever's going to do it is going to make criticisms, but that's the way – there's no perfect research design for anything.

Pat Brantingham: I think if you want to test it, you could say from these known cases that it identified – you could say it identified the residence in X percent of them. That's different than saying it's incorrect.

Wil Gorr: The beauty of this method is that what police are going to do is you're going to have this mountain range, this jeopardy surface, they're going to slice it at some horizontal level. And then they have a peak over here and a peak over here, and a peak over here. One of them has got their residence. Another one's a shopping mall. Another one's a workplace. You're going to get all those.

Pat Brantingham: Right.

Wil Gorr: But we're still just validating that it does pick a residence, too.

Derek Paulson: Right.

Wil Gorr: It doesn't mean we're going to throw out the shopping mall stuff. It's still going to be there.

Derek Paulson: Right.

Pat Brantingham: But then that becomes a question of what you state as accuracy. If you're saying it either supports – it either supports or it doesn't support – I mean if it doesn't identify a residence, that isn't saying – you could say what percentage of the time do you find a residence. That could be very, very low. What percentage of the time does it define some other major activity point. You could say, oh, it doesn't even identify major activity points. But then you could say oh, it's identifying low activity points. Well, that increases its value in my mind. If it's identifying not – this is like going through what Ned wants to do next which is with moving transportation up to the location type model, which is identifying major activity areas. So if it identifies a cluster in a minor activity area for the city as a whole, that's a plus. But this is

getting into the sort of reasoning that the investigators use. So I'm not sure it's testable.

Similarly, when you look at CrimeStat, because you've got five equations, to be fair to it you'd have to put in the underlying surface of all crimes for that same city. If he were using – if Ned had used the Manhattan Metric instead of the straight Euclidean distance, you could find in his functions – you could find Kim's algorithm. So how do you say they're different? You could find a version of his functions if you view Kim's output. He just gives you more options. So then in his are you identifying what percent of the infinite number of observations are correct? Or possible location? I mean at one level they're comparable. That's the side of comparing – with CrimeStat it's more of a user side. You can find any function you want in CrimeStat.

Wil Gorr: But the uh--

Pat Brantingham: Same with Dragnet. You could add it. Have the default.

Wil Gorr: But the automated testing would come out for a given crime type probably with one function, it would recommend it.

Pat Brantingham: But that's what--

Wil Gorr: And that's what Kim is still _____.

Pat Brantingham: That's a limitation of Kim's is that it's one function.

Wil Gorr: Or maybe it's the benefit of it that he's already optimized over all the five functions.

Pat Brantingham: Or it could be that what he ends up picking is the one that when you do the user part of the study, you find is the default option they pick all the time.

Tom Rich: And also just to avoid confusing you. Because if, you know, if I pay $6,000 for something, then I have to find that I have to pick one of these, you know – it's like I don't know what to pick.

Pat Brantingham: You know, but at least, and you know, that may be from looking at the usability side, you know, people can take the things Kim says and they can say that helps or that doesn't help. And they have a product – I don't know. It's like I'm not sure you can test accuracy without being open to quite serious and legitimate complaints.

Jay Lee: I cannot – I cannot restrain myself. *[Laughing]*

Tom Rich: Unrestrain yourself.

Jay Lee: I'm sorry. I've been trying very hard not to, you know, because we've got someone supporting one and one--

Pat Brantingham: I'm not supporting it.

Jay Lee: I don't want to upset anyone. But I do agree that the accuracy part is really not mechanically testable. And I learned from Sean and Robin that they are really not hoping for accuracy here. Because from what I heard it was a reference to, and then so all you – I can pull myself out of this because I don't have the expertise _____. All of you have been blessed with that expertise and also the _____. I keep thinking from _____'s viewpoint. There are phrases _____ there knowing there are more and more expense being put into acquisition of this type of software, they wish to provide us advice. And what we are discussing now are not helping the cost. We are probably doing more academic pursuit than trying to help _____. To my experience, maybe it's right, maybe it's wrong – I – when I was editing software review for _____ I send the software out to a number of people. And I just take out all those possible variables. I simply send it to a variety of people and get their responses back. And in this particular case, especially when the users are not _____ that when you put a case in, and you have the software pin it down to a particular place, that you can find where a criminal is then let's not put accuracy at the top of our _____. I would think considering from the origin that my perception was right, considering the origin of the purpose of this round table, the testing _____ should be designed such that we don't need to worry about it. And such that we are now _____ in terms of user background. In terms of departments for _____. To be _____ into this process. So I don't really care for whether the theory is correct or not. I care how I work is that if they can _____ comfortably then _____ based on this expert discussion we have the other day. Based on user survey, we had _____ we are taking a risk buying this, and is 50% or 60% of users were happy with this particular product, 60% of the users were happy with that particular product, that serves the purpose. I'm not trying to be vain here. I'm trying, you know, trying to get back to what we should set out.

Wil Gorr: I'm pretty upset, too. *[Laughing]*

Jay Lee:	But I forgot who said that. This kind of detailed research may take four, five years. And that doesn't seem to be something we can accomplish--
Tom Rich:	And it really comes down to, you know, given a level of resources for the evaluation, what would you do? Well, if you had a long time and a lot of money, you would do one thing. If you had one year and you know, $100,000 or whatever, then you would do some other approach so, you know, maybe that's where we're headed.
Jay Lee:	Maybe I put it wrong, but that's what I feel, you know. We can talk about doing this in right way or be fair to this, be fair to that. But that, to me, would take much longer time.
Wil Gorr:	I'm here. _____ these available to the public. Unleash swarms of analysts. That's one cost. I mean, long-term. So there are ways to get at the spherical validity or accuracy of it as well. Even if there isn't a budget to do it now, but I mean the character of that is that you have a great software package, a wonderful user interface. Beautiful output color. Everything else, and it's nonsense. There's no – but no empirical validity to it.
Tom Rich:	Would you be able to pick that up through – I mean, through interviewing users? Would they – would you be able to tell--
Wil Gorr:	No. No. No. You'd have to do the research. The empirical research with a representative sample of solved cases. I mean, there's no other way to _____ validity.
Tom Rich:	So in other words you run – you run the risk of the testing showing this is garbage, but the _____ software but you talk to the users they say it's great.
Sean Bair:	It happens all the time, but the National Law Enforcement Corrections Technology Center tests and evaluates different types of law enforcement technologies. And one of the things they just evaluated – I can't mention the name, but basically what it did was it was a box that went and was suppose to sniff out drugs. Well, how great is that? That's the newest, greatest invention we could have. You use this box and it goes around and it finds drugs. And the bottom line was it worked – there were agencies that spent upwards of hundreds of thousands of dollars on this box, and have claimed that it did it – it found, or I'm sorry, not drugs – bombs. They found the bomb that it was

able to do that. Only when the engineers opened the box up did they find just – this little microchip, not connected to anything, little wire sticking out of it. They're like, functionally this cannot do what you're saying it does. So we need to evaluate the tool and see how good the tool is, and not evaluate what the people are saying about it. Because the people are going to tell you that it's doing good for them.

Derek Paulson: Do you ask people the perception of crime? Perception is not the reality. For what the purpose is to try to find as close as we can, maybe not do this perfect, but as close as we can to the reality of how well these things work.   And then we can also get a perception, but I think _____ is when people ask them, does this work? Rather than having to just send out, you know, I think if we just got people's perception – all people would tell you, you know, you say just don't – just send an e-mail _____. Say, does anyone like it? And then we just get people's responses back and you can say, well, people _____ said they liked it. That would be the cheapest thing we could do and we could get that same thing _____ representatives _____ perception, so what we want is to try to get as much as we can of that reality rather than perception. Then we need to do some sort of test. It may not be perfect, and it can't be perfect. But we've got to find a way that we can test it as close to and evenly as we can across them all. Why do I say we could use – we could use home residence because in the research that it's been published by Cantor, by Rossmo, by _____, by others. They've all used home residences. They've all used different datasets. So we can do that. It's established procedures. How we come about these evaluative methods are different, but as a standpoint – we can spend hours and weeks and months coming up with a correct dataset for how to do it, and we can do it. And that's where you need to put a lot of focus if you're going to check for accuracy, and really work hard on the dataset. Okay? And try to find a dataset that works as well as possible, but I think what they want is when people say what should we do is to have some sort of reality – as close to reality as we can rather than just a perception.

Wil Gorr: That just places a lower bound on the value because you get more than residences. You get other anchor points in the process.

Derek Paulson: It's always going to be a caveat.

Tom Rich: Okay. Again, I'm not arguing knowing that. I mean, we generally don't have to say one or the other. You know, it seems like a combination – you know, each one has its own value.

Derek Paulson: As long as we delineate in the research, okay? We assume that the anchor point, and again, as you pointed out, in that literature right here, if it points out residence – most of the time the residence. And that's an assumption that is generally taken as the anchor point. Okay? It's not always the anchor point, but again, in research there's always a mistake. The assumption in this research was that it was the anchor point. Unless we know differently, you've got look at the dataset. Well, we know that there's multiple data points – or multiple anchor points in gathering certain crime series.

Pat Brantingham: If we could go that route, that's great. That takes care of the last two. The answer is no, and neither one works _____. That theory. Location theory, I don't remember enough about.

Derek Paulson: I mean if we could find out something contrary if we've got multiple anchor points. It depends on how we get the data, who we get it from. I mean, I would say that there's probably some crime series that you can get where you may know some agencies may have multiple anchor points. Depends on the crime. Depends on where _____. If we have multiple anchor points, then there's a way we could probably test that see how, you know, how well it works with that.   Barring that, that's still caveat _____. We can assume that was – again, it's convention. Is convention perfect? No. But that's the way it's done.

Wil Gorr: It's a _____ limitation that we don't have additional anchor points, but I know for example New York City and Detroit have special databases or database attributes and so forth for crime series. Where they, you know, it's a part of the mission to – and protocol, how you identify a crime series, and then they get tagged and I don't know whether keeping additional attributes in those databases would enrich these kinds of analyses, but there might be at least departments who have really worked out how you record crime series. I know that they at least tag them, give them a serial number, and then focus on those crime series. So if we can find them, they might get a girlfriend, they might get work. Location.

Derek Paulson: It may take doing a case file rather than just getting it out of a database but going – doing an actual case file and finding what they found.

Wil Gorr: It turns out to be another very interesting question the way that this whole, you know, front end to this. Identifying the crime series. What should police departments be recording them by crime series? For those who are - crime series, those who are doing it. So that you can properly evaluate – and then get the most value out of those databases. Like, it wouldn't take much more effort, excuse me, once you focused on a crime series to record these additional anchor points. Just, you know, if you could get out that message and _____ to them.

Pat Brantingham: That's what the Flint system does. It's just incredible.

Wil Gorr: Which one?

Pat Brantingham: Flint.

Tom Rich: Yeah, that was one that you mentioned yesterday as another geographic profiling?

Pat Brantingham: Well, it's done by West Midlands and it's got a lot of AI and it's just a beautiful system. A few people got their PhDs out of it. And I'm sure they'd be willing to go along with it, but theirs is very much going way beyond all of this and what they're doing is networking of people who know each other, so they find out where all of their suspects – or all of the individuals who are in their list of potential suspects, they've got all of their family members. They've got as many friends. They've got the home address locations for all of them. They have all of their prior address locations.

So what they end up doing when they look at the networking of these people, is finding out how one relates to the other, and then try to find center points. So like if you talk about geographic profiling, yes, they do geographic profiling with it, but in the retrospective look at it, like the highest proportion of people who are burgled over there are ones who have a record of burglary. And when they use their system looking at it, what they're able to find was that they weren't the first order of friends. They were second order friends. So it's more like, you know, picture is where you decide where you're going to break into is you go to a party at a place. You see lots of great stuff. It's not your friend. It's your friend's friend. And they go back there. And they've used it to show how someone's committing their B&E's here. They get sent off to a youth facility. Develop new friendship networks. After that, with this new friendship

network. Boom. They start committing them over there. The Flint system is beautiful. But it's not for sale.

Keith Harries: It's just a--

Pat Brantingham: It's run by the police department.

Keith Harries: Oh. From what city?

Pat Brantingham: It's West Midlands.

Keith Harries: West Midlands?

Pat Brantingham: In England.

Keith Harries: Oh. England.

Pat Brantingham: It's a beautiful city. Yeah. A couple of them were there. One who's just getting his PhD in AI doing other types of neural network stuff with the data, and another one who got his pass, and another guy who didn't come who was – I think they just used _____ add the geographic side to it. But it's a whole other class. It's not like these. But it's a database requirement that we can't meet. I mean, you only can meet it in a place like England where they go out and they do DNA samples at every single burglary. So some of their linkages come from DNA. So it's set up, you know. You met them. It's like they're set up at a different level. So could you say utility over here? Zero. There's no way we have data systems that can work with the sort of stuff they have.

Keith Harries: They also don't have the fragmentation of the agencies that we have.

Pat Brantingham: That's right. So it's not functional here. It's functional there. But wow, you know, you ought to have them over. Their thing is just overwhelming to see it.

Keith Harries: Is it used in other districts in the UK?

Pat Brantingham: They've got internal wars about which one, but it's available in other districts. And I've worked a lot with them over there, and it's based on the same theory. They just have different data. So they went about it in a different way. But that probably doesn't help you at all on these. Because I mean, no police department here could ever get – or ever use it I should say. They could get

it. You know, they'd give it to you. They'd give it to the police department but you couldn't use it.

Tom Rich: So I guess it's fair to say then that the output accuracy and utility are the top two. It's just that there's a disagreement among the panel members as to--

Derek Paulson: I'm not disagreeing with you. I'm just talking in terms of practical sense. I mean, I understand the point completely. And that there are going to be multiplying point. But I also say that in terms of practicality, as a measure of accuracy, as a measure of some accuracy, we can't – just like _____ said, that is a measure of accuracy that can be used. Again, you can't just say it was accurate, you know, it always found the anchor point.

Robin Wilfong: I think if you're looking at it from a law enforcement perspective and on what a law enforcement agency would be looking for, that you've got it set up pretty good here. They're going to want to know right from the beginning what the output – what's the accuracy? And it looks--

Tom Rich: Yeah, and if it's accurate, it doesn't matter so much as does the underlying theory is the cutting edge. As opposed to horse and buggy. As long as it's accurate, right? Is that a reasonable?

Wil Gorr: And look at it this way, too. If it does identify the residence, then the utility of it diminishes as it doesn't find that area. But if it comes up with an area that it's alright I'm going to search this and he doesn't live there, alright, well now I've just exhausted resources looking in that area and I keep having to go in these different areas that it has identified for me as being, you know, relevant, and each time I have to do that, my, you know, utility of it is diminished because it's just expanding my search of the area. Expanding my search of the database and stuff like that. So I think, you know, the argument could be made that well, there are other anchor points. Yes, but to get to those other anchor points, the utility is diminished.

Pat Brantingham: But I think with the investigator, if you gave them that or when you know a city, you'd say drop that, drop that, and you're just down – what you're looking for is residence. You drop three of the anchor points and you're only focusing in on the one that's a residential area. So in that, then what's the measure of accuracy? Do you take the proportion of the total space that's identified? You know, at whatever level you want in every surface, or do you take the proportion that's identified in residential areas?

Sean Bair: That's going to be too difficult. I say we take all of them.

Pat Brantingham: But since there's no assertion that it is more than information going to the – to the investigator, then – I feel like I'm playing the devil's advocate. But you know, it's best to hear it--

Derek Paulson: Well, even _____ when you talk about taking residential first if there's commercial areas as well. You should focus on those equally as well, too, because we're looking for an anchor point. It may be where his job – it may be something else that's an anchor point.

Pat Brantingham: But they can't test that with the – if you're only using the home residence, then you can't – you have to drop all the rest of them out in your test. And the fact that it's identifying the work location you can't test that. So I mean it's like you're not testing – does the system work you're testing? Does it tell you the home residence? Which is just a tiny test.

Sean Bair: Well, whether the home residence falls in any of these anchor points--

Pat Brantingham: Any of them.

Sean Bair: Right. Then that's fine.

Pat Brantingham: But if you say any of them, then I mean to be – I don't. I'm the devil's advocate. Right? I do apologize. But hey, better me than – but you'd have to drop some of the others out and what are you comparing them to?

Sean Bair: Why do we have to drop them out?

Pat Brantingham: Because the investigator would. If you're saying I'm looking for home--

Sean Bair: But it's not – again, we're not evaluating that portion of the software. We're evaluating up to the point where we make that interactive decision of what to drop. We're going to stop right there and say okay, here are the areas it has designated as priorities or jeopardy surfaces. Did the residence fall in any of these?

Pat Brantingham: But if you start using like did it fall in any of these? Yes, no. That's fine. It's – if you get into measuring the area, then it's a

	different issue because some of those areas and the way when you pass it to the investigators, it'd be dropped out. But on the other hand, if you say does it fall in the area? Yes, no. Then on CrimeStat, just change your parameters and you've got more--
Sean Bair:	Exactly. But that's a ratio. The fact that it fell in or out. Okay. But yeah, but it predicted the entire northern hemisphere. Okay. Well, that search area is too large, so that's a negative or a, you know, a hash against it. So no, I think those are measurable. We can compare across those. Yes, CrimeStat did a better job of predicting where the residence fell in the area it predicted, but it was so large, it was not useful--
Derek Paulson:	That's why the total, the area, square mile area, or square block.
Sean Bair:	It doesn't _____.
Derek Paulson:	It's good.
Sean Bair:	Yes.
Derek Paulson:	_____ and a half. _____ utility. I mean, how much is this actually reducing? How much are you helping?
Pat Brantingham:	But with CrimeStat, you just change one of those coefficients, you're going to get the whole area. Or you're going to get a tiny point. I mean, that's the thing with it. It doesn't tell you which to use. Unless you go the route of saying we're going to calibrate it. And then I won't say another word. To be fair to CrimeStat, you'd have to have all the data and you'd have to calibrate it and use the function that comes out of that.
Sean Bair:	And that's where I think that with these amorphic areas, if we take the centroid of them, and compare the centroid of that area that it identified as a jeopardy surface, compare that to the distance that the actual residence was found, that's another measure we can use. It doesn't matter the size or shape and we can actually use, okay, the fact that it was in the centroid of this, that's another, I think, measurable measurement we can use.
Pat Brantingham:	And then that's one that doesn't fit the series. But that's okay.
Derek Paulson:	You could measure the distance from the profile to the home location. The nearest point in the profile region to the home.

Sean Bair: To get _____ or something? Yeah. There's a lot of different types of things we can do.

Derek Paulson: Which would be fitting _____ profile. That just means you're measuring to a polygon area to record the area, the square mile area, so if you've got one that's twenty-eight square miles is the top profile area from a 200-square mile search area, it may not be in that top profile area, but you can say we've got a twenty-eight square mile profile area, and it was two miles away from it or half mile outside of it.

Pat Brantingham: That's one where you come to which type of data – which type of city are you going to do it on. It's like we'll go back to Chris Stall or, you know, which type of, what are you going to use it on? Say, you know, it's someone who's going after banks and your nearest banks are fifty miles away. Well, that's going to be wrong, because none of these take in opportunity surfaces. So it's identifying a location choice. It might be, I like this city, that's one point. I go to that city. I live out in the country. So I don't know.

Sean Bair: I don't think they identify any type of victim or target information at all--

Pat Brantingham: None of them do.

Tom Rich: They're not. _____

Pat Brantingham: That's the limitation on all of them. Except that by inference you could say that all of them by identifying their activity node to an investigator, he'll tell you the opportunity. But that's giving CrimeStat that it's information given to an investigator. That's how you tell if it's an opportunity surface. So I won't say another word.

Tom Rich: In terms of measuring output accuracy, are we, you know, there seem to be two ways of going about that we talked about yesterday. It's going to be automated testing and the – getting the team of analysts in here. Is that – is there a role for the analyst testing in output accuracy or?

Wil Gorr: The third one is talking to people in the field. That's not a group of analysts coming in.

Tom Rich: Okay. Okay.

Wil Gorr:	And that's how it's a lower cost.
Tom Rich:	Okay. So there are those three techniques. Does anybody have any strong feelings about, you know, the automated testing, which we talked about. Bringing in a team of analysts in a big room like this, or talking to users. Does anybody have any feelings about which of those methods is a higher priority in terms of getting at this output accuracy issue?
Keith Harries:	Would it be unfeasible to have analysts evaluate the ultimate output – to evaluate relative accuracy? In the sense that it might not have the absolute accuracy, and a discussion that it just doesn't have it, but then that may be useful information in the output. Perhaps it could be subject to be evaluated by analysts. You know, was the product of the automated process, was it useful? That kind of decision.
Tom Rich:	So, there are clearly costs setting up the automated test bed, and like that, but that is – is that – do people still feel that's a good way to go. That that's money well spent?
Wil Gorr:	I sure do.
Tom Rich:	You do? Okay. *[Laughing]*
Shari Pfleeger:	And some of that addresses utility, not accuracy. There's things like doing the sensitivity analysis tell you about the utility of a package more than the accuracy.
Tom Rich:	That's true.
Wil Gorr:	I think the field – talking to people in the field is low cost, and may be pretty informative.
Tom Rich:	Right. We talked about a future analysis. Coming up with a list of features that are either in there or that we would like to have. That seems like something that, you know, once we come up with this list, then we could just check off. But that's something that seemed – could be fairly straight-forward I would think.
Shari Pfleeger:	And if you do the survey of the analysts, right, it could go beyond this particular theory. It could be generalized to software that assists the analysts in doing this kind of work. It doesn't have to be just the distance theory. It could be any theory about profiling that could be embedded in the software to assist the analyst. The features would have to do with what the end stages

	for the analysts. What kinds of things would they like to know about? Some of the things you mentioned today, like the things that are in Flints. Flints has a different underlying theory, but those things could still be useful to analyze.
Tom Rich:	Okay, well, it seems like people are somewhat comfortable with this ranking. That's what I'm hearing.
Mike Shively:	Some of us.
Tom Rich:	Some of us. That's okay. Maybe we should spend some time trying to flush out, particularly in terms of output accuracy, what are the key design elements of how you would do that? And we talked a little bit about that, you know. How you would need to get a data sense from different jurisdictions. You know, which ones. How many. How many points do you need? How many crime series do you need. There are a lot of issues that need to be resolved there.
Mike Shively:	Maybe we should make a list of what are the key design elements to any type of automated testing? Which data sets? How many? How many points are, you know, how many crime series?
Sean Bair:	It only takes two crimes to make a series. But most analysts won't state that they have a crime series until maybe about three crimes. To be absolutely certain that okay, these three are related. Now let's go ahead and analyze it. Thus brings up the geographic, you know, analysis. You're going to want at least three points to get some good stuff going there.
Pat Brantingham:	_____ just fine.
Sean Bair:	We've got a graduate assistant right now who's thesis is going to be – I think I talked to a few of you about this yesterday, studying predictive techniques. Not where the offender lives, but where the offender's going to strike next based on their past movements and behaviors. And he's set the bar at ten crime series. Or ten crimes in a series I should say. We could get, I mentioned yesterday, that we're already gathering crime series from across the country so he can do his thesis work. Well, better than, you know, just to turn those over and use those same crime series for this purpose as well. We also already have – and I don't know how NIJ works with this kind of stuff, but from the university, which is who employs me, for us to conduct studies on humans, we have to get a whole bunch of disclaimers and

everything. But we've got that already taken care of. So that we're going to use humans and actually do the whole visual approximation study for where they're going to strike next. Again, that's just as easy for them to say put an X where you think he's going to strike next. But also put an X where you think, you know, he's going to live. So we've already got this – that maybe we can kind of piggyback on and make the cost N.I.J. and the amount of effort we put forward a little bit less. So for what that's worth. Is Ross wants those five, I kind of like five, too – five's good. I would say that would be--

Derek Paulson: I would say three for one reason. See if it works. Well, no one's really looked to see if it would be interesting to see if – because I've got a feeling it's not the number of points, it's the distribution of them. If you've got three points that are fairly close together, that there should tell you that they live fairly close to that point, or they're a commuter. Two more points in that same location might not really improve the profile. Two more points in totally opposite districts, you know, ten miles away would screw up a profile in a totally different way. I think it would be interesting just to see. I mean, I don't know. It'd be interesting to see if three points works.   If five is the magic number or what it is. You know, it'd just be something to see where it – where it does hit. Who knows? Or like I said, distribution maybe has more of an impact than number of crimes.

Sean Bair: That's great, but it just becomes that exponentially harder because it's now each time you've got to stay to change from one event to the next event. One event to the--

Shari Pfleeger: That gets back to something I think Wil said yesterday about knowing the time series. So you could artificially do that. If you know the sequence that the crimes were committed in, you could do it with the first three crimes, and then with the first four crimes, and the first five crimes, and see what happens over time. See if it gets worse or better.

Tom Rich: How many jurisdictions would you need to get data from in order to make this a, you know, a reasonable test? You know, we're saying the more the merrier. Right?

Sean Bair: For our purposes, for the thesis work this guy's doing, it really doesn't matter from what area it came from because the layout of the land doesn't really – didn't really have that much impact. However, there are two fundamental differences between Rigel and Dragnet. Rigel uses the Manhattan distances which they

claim works better on west coast type cities that have more grid patterns versus like David Canter's program that is, you know, as the crow flies that may do better in like Boston or more of the, you know, London type cities so I say we should get samples from kind of different make-ups or different city make-ups.

Tom Rich: Grid lay-out versus non-grid.

Sean Bair: Exactly. Because they may have different results. You know, Canter's model might not work good in Arizona where everything's just a big grid. But it may work really well in Boston. And vice versa for Rigel.

Wil Gorr: So representation of different regions. Types of regions.

Derek Paulson: Is it regions as much as types of cities?

Sean Bair: Types of city.

Tom Rich: Or size of the city.

Sean Bair: Or road networks?

Derek Paulson: Road networks.

Sean Bair: It's not so much, you know. New England has no really – just the way Boston's cities are laid out, rather than the climate – region they're in. Same as it would be good to get a sprawl city. Atlanta covers like twenty-eight _____ some Godforsaken thing.

Shari Pfleeger: Yeah, but by contrast L.A. also has a lot of sprawl. It has a lot of geographic obstacles to just going straight across.

Sean Bair: I mean, these things would be interesting to see.

Derek Paulson: And we could get – Houston is a strange city. It's one of the lowest population densities, but it's one of the largest cities, square miles in the nation. I think it's the second largest in the nation. So I mean again, that's one of the – what do you want to key on? You know, there's a wealth of different things.

Tom Rich: What about small cities?

Derek Paulson: I'd love to suburban and rural area. If you can find the crime series.

Wil Gorr:	Robin, you do small cities, don't you?
Robin Wilfong:	Yeah. Yeah. _____ probably.
Derek Paulson:	Are they – are the cities separate from – I mean, like Los Angeles has a lot of small little cities within the LA _____.
Robin Wilfong:	Well, like they're all incorporated into one county, so.
Derek Paulson:	But as long as – the difference between – Houston has a little town right in the middle of it. I wouldn't really call that a small town. It is – because it's – but it's right in the middle of _____.
Keith Harries:	But it's like Falls Church here.
Sean Bair:	Yeah. Two--
Keith Harries:	_____ square miles better than the metropolitan.
Derek Paulson:	Right. So I mean, we have to make a distinction of a small town embedded within a city versus a small town that's--
Sean Bair:	Right. The difference between like Las Vegas is a big town, but nothing is around it. And also like Maui. A small city, but there's really no – there's nothing at the end of Maui other than ocean, so you know, they have their natural boundaries.
Pat Brantingham:	Which is – I agree with the street networks. I mean, we know which one will work better and which type. We ought to make sure we have both types in there. We also ought to make sure we have the ones where neither distance measure works well. Because are those. Like you know, river grids. I mean, that's only fair because there are those towns.
Derek Paulson:	I mean, I'd honestly – if you could get it, I'd love to get data from England. I mean, maybe, you know, the way the cities are laid out there, maybe different street networks than what we have.
Wil Gorr:	I think academically that's pretty interesting, but NIJ's mission….
Derek Paulson:	I'm not talking about – but I'm not talking about. It doesn't matter so much as the street layouts. You know, London is different than Boston. You know, it's a difference. It's a _____.

	It's got different road networks than this city over here may have. Now, that's all I care about. I don't care where the cities are. I'm just talking about variety. Network types. I think Las Vegas is very interesting. Again, it's like an island.
Sean Bair:	My partner came from Las Vegas metro. We got just tons of _____. We've got plenty of data.
Keith Harries:	If one approach is to try to represent many different kinds of urban environment, perhaps an alternative approach that might simplify things would be to essentially try to control for urban environment by picking only a gridded, flat, featureless city. Or cities of that type. You know, Phoenix, or some of the other relatively featureless gridded major cities.
Tom Rich:	Salt Lake.
[group conversation]	
Tom Rich:	So are there other things besides type of road network that?
Derek Paulson:	Type of crime.
Tom Rich:	Type of crime, yeah.
Wil Gorr:	Type of property crime?
Derek Paulson:	I think the list of crimes that Rigel Analyst has in it is a good breakdown. Commercial burglary versus residential burglary. Different – street robbery versus commercial robbery or auto theft, arson. Whatever else. I mean, I think it'd be interesting to see. I mean, street robbery again, I think it's – I think it'd be different than a commercial robbery. Just because of the opportunity structure and whether or not that may get into commuter marauder issue.
Mike Shively:	Right. We probably need to have a certain number of these in order to make the tests somewhat – I mean, there's probably some answer to the question, how many series do you have to have in order to speak with confidence? You know, things like that.
Tom Rich:	And part of it's going to be an almost sort of breakdowns you want. You know.

Tom Rich: Right. Other issues here that, you know, I mean, I feel like we're
getting the sketch of an overall evaluation here, you know. And
if we could add some meat to the bones.

Sean Bair: I may have missed it. How are we going to evaluate whether or
not this works? I mean, again— *[Laughing]* The crimes are on
the map now and you know, it's going to put little jeopardy
surfaces. What technique are we going to use to measure –
measure how accurate that prediction was? Have we really
decided upon what – we're kind of throwing it around?

Tom Rich: Well, we've talked about different approaches.

Sean Bair: Have we agreed upon one? Are we going to put that down? Do
we understand each other? Do we understand my idea here?

Derek Paulson: Are we supposed to spit up something and you write up a
summary--

Sean Bair: Can I diagram mine?

Tom Rich: Well. I mean, ultimately you know, I mean – whoever's going to
respond – I mean if there is a solicitation, whoever's going to
respond they're going to need to say, this is how we're going to
measure it. You know. Distance from peaks. Peak point in the
surface to the home address. Or something like that. I don't
know.

Sean Bair: That's not for us to do then. We--

Tom Rich: Well, I think we should provide guidance on what we believe is
the most valid….

Sean Bair: Okay.

Tom Rich: …measure. And to extend that there are multiple measures.
That's good.

Sean Bair: Should I do that now?

Tom Rich: Yeah. That's a probably a good idea.

Wil Gorr: _____ my earlier point, multiple measures and maybe the
virtues of each? I have a favorite one, but--

Tom Rich: Okay. What's your favorite one?

Wil Gorr:	It's a ratio of optimal search area over total search area. And I would make the total search area the minimum bounding rectangle for all the crime series points. And then when you compute that, the optimal search area for commuters is the uniform extension to that minimum rectangle, but this touches the residence of the commuter. And that gets you to measures that are over 100%. The optimal search area would be larger than the minimum bounding rectangle of all the crime series. The other consistent measurement – I mean I can write it down, and I can go to the board and give you examples if this is unclear.
Tom Rich:	Derek, what – what's your favorite?
Derek Paulson:	I've got – well, I like that. I also like just giving the – well, we've already got the area of the _____ --
Wil Gorr:	_____ keep those, too.
Derek Paulson:	Yeah, you've got that. Whether or not it was just in the profile for example. In the top profile area.
Tom Rich:	You mean the top 10% of the – or the top 10% of the profile?
Wil Gorr:	With over 100%? No.
Derek Paulson:	Was it in the top profile area? Like when Rigel gives you that 7.9% as the home residence, if we use that, did it fall within that? Yes or no. That's it.
Wil Gorr:	Oh, no, no. That's an implementation issue. On the validation study, that measured – you focus on the location, the anchor point. And you work back to the peak of the surface for the optimal search area. That may be 20% of the total search area, which is a bounding rectangle.
Derek Paulson:	Well, they all give us a optical search area already. And what – the difference between – the hit score is not the optimal search area. The hit score is where it actually came within that search area. The optimal search area, the profiling, actually it's nothing different.
Wil Gorr:	Terminology issue.

Tom Rich:	Maybe we need to make some pictures here. I think that probably would help.
Derek Paulson:	Rigel--
Tom Rich:	We're back to square one here.
Wil Gorr:	Rigel is not going to address the validation study where you know the serial offender's location _____ point. Rigel is not going to – what they do is not going to address our validation – our automated testing issue where you know the serial criminal's location.
Derek Paulson:	Now this is what – let me tell you what – well, here's the search area. Rigel gives you a – get a version of its top area, which in the statistic says 70% hit score or 7.9 of the search area. And it'll be maybe that. This is the area I think we should measure in relation to the search area. So that we know what – this shrinks down to. Because it is what it's going to give you. This is what they're going to see. If you have Rigel Analyst. But it's different – it's a different measure than the one you're talking about. I still like yours. But this is still what they're going to get off the software.
Wil Gorr:	This is a recommendation of how to use the output of the automated testing. What Rigel does. And Kim has 70% or something decision that he's made about how to use his historical results.
Derek Paulson:	Right.
Wil Gorr:	Alright.
Derek Paulson:	That's his top profile area.
Wil Gorr:	Yeah. That--
Derek Paulson:	But here's the thing. Here's what I think we can get to it. If that's what it says at the top row, that's what – when you get a profile, is that what you consider the top profile area? That's what we're taught to think of the top profile area. Irrespective of where it is actually. Okay. What it tells you is what the top profile area is. If the actual home location is up there, it's a simple measure. Was it within that? We're not – does that provide you any measure of accuracy? I say that it does. As well as I say--

Wil Gorr:	Oh. Okay. Alright. I'm with you--
Derek Paulson:	It's irrespective – it's not the actual _____. That's why I say Rigel gives you a theoretical history.
Wil Gorr:	Yes, sir. I'm with you. This is the holdout sample report. Because in the holdout sample, you make that prediction. That polygon that you've drawn there, and sometimes it'll be inside the polygon and sometimes it'll be out. Or that optimum search area as you're calling it. When you're fitting the data, there's a previous stage before you get to this point. And I'm talking about that previous stage. In terms of a measure.
Tom Rich:	Well, maybe I don't understand your concept of the optimal search area relative to this diagram.
Wil Gorr:	They're different _____. Hopefully they're a different color. Yeah, I think they are. _____ orange is suppose to make you angry.
Tom Rich:	Make us worried, right? *[Laughing]* High alert. Right?
Wil Gorr:	So suppose in terms of this diagram, we've already got this sort of--
Tom Rich:	By the way, that little switch thing in the middle, is that like the top ten percent? That's what we were talking earlier.
Derek Paulson:	That's what I'm talking about.
Tom Rich:	Or whatever that is.
Derek Paulson:	All of the systems will give you, you know, Dragnet gives you the top red color and it says--
Tom Rich:	And that's some percent of the total.
Derek Paulson:	Rigel gives you a 7.9% which is its top profile area. That's what that would be there.
Tom Rich:	Yeah. Okay.
Derek Paulson:	And CrimeStat, you know, will also give you a top area, and that's what I think – again, that's an important, in my estimation that's an important thing to know. How large that area is in

	relation to how much the search area was. That's giving you an area of how much it reduced it. Now, whether or not it was actually right--
Jay Lee:	Now that's requiring the data set to be solved cases, you know.
Derek Paulson:	If we don't have solved cases, I don't know how we'd _____ --
Robin Wilfong:	You'll need to focus your investigation in that top --
Derek Paulson:	Right. Where the software suggests.
Robin Wilfong:	But where from there? Okay.
Wil Gorr:	This orange dot is the peak of the jeopardy surface. This being X is where the person actually lives. And it's a simplified diagram. It doesn't have other we'll call optimum, which are possible. Possible, yeah. And so what this – what this does is the black line here is – all it shows is it's the same level of jeopardy as the residence of the serial criminal. There's the peak. And then so inside of this polygon you've got jeopardy surfaces that are equal to or higher than the jeopardy at the root cell of the residence. That is what I'm calling the optimum search area. And so maybe that's--
Tom Rich:	I don't understand the difference in that just the – what we were talking about earlier.
Derek Paulson:	It's the same thing.
Wil Gorr:	Not quite. Not quite. So here we learned it was – it's 10%. Now I would also add another – no, I don't know. I was going to say I'd like to measure things relative to there being a point if this rectangle fits. You know, has points in its boundary. So we could nail it down. Because there's an extension. Most people would say well, what's, you know, the perpetrator could live on the other side of those points, and we've got to figure this out. But not to use that distance in the denominator. The denominator area would be this. Numerator is this thing I've justified here. Now when you're done. Historically, you have a distribution of percentages – 10%, 15%, 25%. And you've got pick a sufficiently high number that you include say 90% of historic residences. That's what Rigel does – 70% let's say jeopardy surface so when you actually then – this is fitting data. We actually go to do a simulated prediction where you don't know – you never used that location in your calibration set.

	You're going to have to make some decision like Rigel does. Let's pick the horizontal slice through here at 25% instead of 10%. So I get 9% of historical of locations of the residences. Clear?
Tom Rich:	I guess I'm confused on how your incorporating historical information here rather than just sort of the--
Wil Gorr:	Which kind of information?
Tom Rich:	Historical.
Wil Gorr:	Historical.
Tom Rich:	Yeah. I mean, I don't understand – I mean Derek was talking about just – here's this --
[*multiple voices*]	
Derek Paulson:	What it did say was the top profile area, the top – the optimal search area, and just made that. Was it within that or without it? And then also do the hit score, which is a different measure which is how far do you actually have to go before you find the residence in relation to the search area. Two different measures. One gives you the area of it.
Wil Gorr:	Just different ways to look at it.
Robin Wilfong:	That's good.
Wil Gorr:	_____ and this is the total search area. And then the ratio we're looking for is A0 over AT. Now I claim all the controversy in the future is over how you do AT.
Wil Gorr:	Right. Because that's--
Derek Paulson:	I totally agree. I think that's how much you do.
Tom Rich:	Because that's the user – the user can pick whatever they want for the search area.
Derek Paulson:	I agree. The search area is the key to unlock it.

Wil Gorr:	And the regular search area – you have to have the subjective. Now people can include a wild data point that's way out here. I mean, _____ or huge, and make the ratios small. And that would be fudging the numbers. So there's the way you protect against it. Because that becomes the crux of it later on.
Tom Rich:	How about you, Sean?
Sean Bair:	Show an analyst _____.
Pat Brantingham:	We have a problem. We don't have the _____ to Rigel. I don't think Rigel has--
Derek Paulson:	Unless there's some way you can crack into your stuff with Rigel, then you need to make Rigel's bid for the other four doing something--
Pat Brantingham:	I think Rigel – actually the way that it works is that there is no boundary. It's what visually displayed.
Derek Paulson:	He does – he does it and it's in here if you want _____ find it show you the calculations. But there is a calculation of how he comes up with it.
Pat Brantingham:	And he says 20% of the area?
Derek Paulson:	I'll find it. No, it's – there's a formula to it.
Pat Brantingham:	It's just basic function doesn't have--
Sean Bair:	Alright, so here are my crime series right? This is what the analyst knows. This is all they have to work with. For our purposes, I think Rigel does this. Doesn't it define the search area and the bounding – rectangle bounding all the points, right?
Derek Paulson:	And then it takes those out beyond that.
Sean Bair:	The bottom line is they all return in some type of _____ base jeopardy search. Right? They all return something that had – these things are made up of little boxes that contains values in them. Nevertheless, that was my idea, too. Whether or not the home fell in the jeopardy surface. Is it in or is it out? That's a good measure. We can do that. Okay. Well, let's say if it did, that's great. That's that measure. But now what if it didn't? What if the home fell outside the jeopardy? Well, okay, that didn't work. That didn't, you know, satisfy that measurement, but

	now what we're going to do is take the centroid of this area, which may be the same X area, and then measure the distances between those two. Say, well, how close was it then? Right? The other measure we could do is awesome. Because these are now rastors, we could take the highest value of your entire jeopardy and say okay, well the highest value actually occurred way up here – and wherever the heck it was doesn't matter, it's irrelevant. But it is the highest value. It's the most optimal place this person's suppose to live based on its mathematics. How far was that from the actual home location of the offenders?
Wil Gorr:	How about distance from the boundary?
Derek Paulson:	_____ we just call the _____ where we just measure the boundary, the optimal search area just like the--
Sean Bair:	There are number of measurements. There are number of measurements.
Wil Gorr:	Your boundary that you have inside is – if there's a decision to make – 70%, 90%. It's in there. So – and the higher that number is, the less area we're going to have. The more work volume for investigators.
Sean Bair:	Right, and this is what I think accounts for the fact that you have one program that's going to find it in, and one program's going to find it out. But actually the program that didn't get it in its box, or in the jeopardy surface, it'd actually be more accurate than the one that didn't. For instance, if this is my jeopardy, very small in Rigel. Okay? And the home offender's location is actually here. And then here's CrimeStat's jeopardy surface. Right? And low and behold it did find the home offender's, you know, box in it. Well, so what? I mean, first of all, we're going to take this _____ area and measure those two and _____ but also what's the highest value in this rastor here? Maybe the highest value occurs down here, whereas the highest value for Rossmo is right up there. They give me measures of distance between its most optimal value there.
Shari Pfleeger:	I think you need to be careful using it centrally, because of an example Pat did yesterday was U-shaped, then the central would be outside of--
Sean Bair:	It all depends on how you calculate centroid. Now if you ArcView. So we can get around that. But that's where, not using the central. And actually using the highest value in a

	rastor. Remember, these are just – they look like _____ but they're not. They're all just, you know, made up of squares. Each square has a value in there. Now all we have to do is derive the highest value of the box and use that as the point to measure from. Does that make sense?
Tom Rich:	No, that's perfectly. I mean, you know, so basically one question is, you could say is it in or out? And the other is, okay, is it, well, how far? And that's perfectly reasonable.
Derek Paulson:	Right. But when you do the how far away, I think you need to – and we've already calculated this. You need to know the area of that optimal search area. Like you may be 68 square miles, but you're only a tenth of a mile out of it. Whereas another profile will give you a--
Tom Rich:	Or if you do the distance from the peak point. That's _____.
Derek Paulson:	I've got like four or five measurements, of which all of them we've talked about. Basically this is the second one I've called.
Sean Bair:	Oh, yeah. Sure.
Derek Paulson:	I've got it typed up. You want to see?
Tom Rich:	_____ to us tomorrow.
Derek Paulson:	I'll give it to you.
Wil Gorr:	So those are the ones that I think you can – by the way the measure that I drew isn't _____. It's his optimal search area. I can get that in the book here, or I can get it out and look it up if you want the page number. But it's not my idea. And again, that's where the validation fitting sets. Where you know the location of the criminal and you're trying to get a rule of what percentage level do you cut through the surface. Do you take the top 10%? Top 15%? Top 20%? And that gives you bigger and bigger areas.
Tom Rich:	Well, yeah, and that'll give you different results.
Wil Gorr:	Before you get 90% of the – or 70% of the historic cases included.
Tom Rich:	Well, yeah, actually that's an issue that we haven't talked about here. Is what is that cut? What is the cut that we're making

	here? Those – those squiggles. Does that cut it at the 90 or the 10?
Derek Paulson:	Rigel will tell you that. Rigel gives you what you cut it at.
Tom Rich:	Okay.
Derek Paulson:	In statistics. CrimeStat. And Dragnet gives it to you as well.
Jay Lee:	But that's Rigel allow users to expand that area?
Derek Paulson:	You can do – you can make it whatever you want. But what Rigel tells you in the training is that you should use the 70% expected hit score as your optimal search area.
Pat Brantingham:	But you can change it?
Derek Paulson:	You can create it to be, you know, 90 – I mean you can make it whatever percent you want of that 100 – of that search area.
Jay Lee:	Then wouldn't it make more sense by seeing or comparing the probability of that optimal search area including the actual location? In other words if we expand the area big enough to include that, then check what percentage that is.
Derek Paulson:	I think that's one of the – that's what Wil was talking about is another – that's the actual – that is the search cost. That's what the search cost--
Tom Rich:	That's the ratio of the areas. I mean, or is that the probability?
Derek Paulson:	What Rigel gives you is the logistics--
Jay Lee:	Not the _____. What percentage does that area hit there?
Wil Gorr:	On page 201 in Rossmo's book.
Pat Brantingham:	I've never read his book.
Wil Gorr:	I recommend this book very highly.
Pat Brantingham:	I haven't read it yet.
Tom Rich:	Not that you're indicating his package is much better.
Wil Gorr:	No. *[Laughing]*

Wil Gorr: I would be glad to quote people _____ --

Derek Paulson: But that was the theoretical hit score that Rigel gives you the statistics. Rigel Analyst gives you the theoretical hit score. Okay, so it's not – it doesn't take into account where the – where this pint actually is. Okay. So that would be – and then you use that theoretical hit score to determine what the optimal search area is. That's the methodology behind Rigel. They give you a 7.9% theoretical hit score. You then type in seven, or 8%. You're suppose to round up. You type in 8% and that gives you the squiggly. Okay. That will be a measure of what this square mile area is that it gives you. Because that's what it is telling you is the optimal search area. Irrespective of where--

Tom Rich: Optimal meaning what – that's above the--

Derek Paulson: It feels is the optimal search area. 70% of the time you should find – again, that's Rigel's determination. This is the area you should be focusing on.

Sean Bair: Well, that's why I came up with that approach of where you – we break down the area. There is no matter that they're relevant. What matters is the highest value that it has – that it assigns a probability to. That's where we measure from. Again, breaking down the different percentiles and stuff I think it's going to get very tricky to do that.

Derek Paulson: That's different measures.

Tom Rich: Can we get the peak value from Rigel?

Derek Paulson: What you can do is type in 1% --

Tom Rich: Oh. Okay.

Derek Paulson: And it'll give you an – it will not give you one specific point. And then you have to go and do a, you know, it'll give you 1%. This squiggly may go down to that. And if the point's still right there then you may have to _____ how are you going to measure it?

Sean Bair: So we can't derive the actual cell values?

Derek Paulson: You do not get _____...

Tom Rich:	You can get pretty close, though.
Derek Paulson:	But you can get – and then it begins again – approximate. How close can you get it to that? Dragnet is the same way. Dragnet only gives you – you can't break down Dragnet. All you'll get is that red colored area. With CrimeStat you can.
Wil Gorr:	That's what I was trying to _____ with CrimeStat we can.
Derek Paulson:	But you don't get an optimal search area then. With CrimeStat it is determined by the natural breaks of a file. How many different--
Sean Bair:	Right.
Tom Rich:	Does anybody else want to offer another measure?
Mike Shively:	Well, someone was going to read from the good book here. *[Incidental Conversation, Off-point Remarks]*
Derek Paulson:	In conjunction _____ I mean I think – and again, you just want to look at how it has been used. Area distances that have been used. It's a measure.
Sean Bair:	The other thing I think we should do that'll just help add to the research is whether or not – certainly whether or not they're a commuter or a marauder after the fact. I think – that's an easy measure to do and I say we just go ahead and do that as well and say, you know, did they live inside the bounding polygon of--
Derek Paulson:	But we can take – Cantor's the only who really said – he's the only one who I think has actually researched it, because I think when Kim did his test, he threw out all the commuters. There wee no commuters in his data set. So he said you shouldn't use it, but he didn't test to see how well it works. Cantor did.
Wil Gorr:	Now Cantor didn't have anything _____.
Derek Paulson:	Because he's done research that's says it will not work on Rigel. So when he tested it, he also thrown them out. He's done a couple of other studies.
Sean Bair:	But what designates a commuter? Is it the great circle _____. Which one is it?

Derek Paulson:	The next question I was going to say how do you determine a commuter marauder. It's just someone who's outside the search area and then it comes to – how do you define search area _____?
Sean Bair:	I say we use the great circles, since that's kind of where all the research has already been, versus – I would prefer to use minimal _____ polygon I think would be a better one. But a grade circle will work.
Tom Rich:	Can you explain that?
Sean Bair:	The grade circle you just take two of the fartherest points. You draw a big circle connecting them such as those two points. There's your commuter versus marauder.
Pat Brantingham:	Well, with Kim it's a square.
Sean Bair:	Kim is you take the two fartherest points and you take – you take the Y--
Tom Rich:	Is it outside of the rectangle, is that what you're talking about?
Sean Bair:	If it's outside, they're a commuter. They go to the area to commit crimes. If it's within that area, a marauder. They maraud.
Tom Rich:	But that's totally depending on what the size of your search area.
Pat Brantingham:	Absolutely. Absolutely.
Tom Rich:	Well, I mean if you make your search area the entire country, well, everybody's a marauder.
Sean Bair:	No, no. The search area is designated by the crimes they've committed.
Tom Rich:	Oh, oh. I see.
Pat Brantingham:	Oh, the known crimes they've committed. This is something – you get into burglary. Really. What is the search area? Nobody knows.
Derek Paulson:	The circle hypothesis is one cancerous thing, and it is. It gives you – he says, I can't give you. It's been tested in a couple of--

Sean Bair: 90%.

Derek Paulson: Yeah, that you can find 90% of all--

Pat Brantingham: But these are MA thesis. But in the ones that the students – that my students have looked as is they found is prior residences for most of those that'd been booted out before.   You know. Call them commuter. Well, they used to live there.

Derek Paulson: Yeah, we _____ criminals are quite changing.

Keith Harries: We seem to be running out of time. Is there other urgent business.

Pat Brantingham: I think we can do that. Keep talking. That'd be great. I want to know if they really know what swarming modeling is.

[*unintelligible group conversation before lunch*]

Wil Gorr: It turns out we probably have something to say. That others haven't considered, so it might be in the software package yet, but it should be. And the ability to evaluate the software package if the right measures aren't output.

Shari Pfleeger: You know, that reminds me of something I did in a different life that had to do with the Klinger Cohen Act with the Department of Justice, for instance, has to come with measures to show how things like information technology contributed to their mission. And doing that after the fact is really hard, and so one of the things that NIJ might think about is well, in general, what kind of output measures are there?

Pat Brantingham: Tied with that, because we are going to look at property crime. This is the victimization service. That is the under-reported offense. So in looking at how these systems perform, particularly if you're going to be using this bounded area, which is defined by all of them based on, you know, extreme values or distant points, I think we have to run it leaving out different cases, and finding the stability of it with and without data. Because it is the under-reported area. That's one where you're least likely to have full data. And if they just bounce – if all of them bounce all over the place, and I think they will, I think that's something the public should know. And that's testable.   I

think. That is testable. I mean, hypothetically draw up a case or two.

Keith Harries: Any other issues? Questions? I'd like to thank all of you for being so considerate and hardly rowdy at all.

[Incidental Conversation, Off-point Remarks]

[End of Audio]