SURVEY AND EVALUATION OF ONLINE CRIME MAPPING COMPANIES

Version 1.2

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Abstract

The purpose of this research is to provide a baseline assessment of the state of the online crime mapping field. Specifically, this report is designed to determine how many online crime mapping companies there are, the basic functions and services they provide, and the accuracy with which they re-produce the local crime data of a police agency. Seven different online mapping companies were identified and canvassed on a number of topics relating to their businesses. In addition to basic information about customer base, questions were asked concerning data acquisition, data integrity, and data archiving. Results indicate that there is a range of online mapping company types, each with a slightly different focus or market. These online mapping companies are effective in handling data uploading, data validation, secure data storage, and how they handle complaints and service issues. Finally, the various online mapping companies analyzed are providing accurate data, with over 80% of all errors being within 300 feet of incident locations. In addition to these findings, recommendations are made for areas of future study and research.

1. Introduction

While computerized crime mapping has only been around for 30-40 years, the use of maps to visualize and analyze crime patterns dates back to the early 1800's (Paulsen and Robinson, 2009). As with many new techniques, mapping of crime patterns was first conducted by researchers and was only later adapted by practitioners. However, by the early 1900's police agencies such as the New York City Police department were starting to use basic mapping techniques to track crime patterns (Harries, 1999). These rudimentary pin maps were the norm for large police agencies into the 1970's when computerized mapping began to start taking form. Computerized crime mapping continued to struggle for legitimacy until the 1980's when the advent of faster, cheaper personal computers helped to usher in the start of crime mapping as we know it today (Paulsen and Robinson, 2009). Since the 1980s, crime mapping has continued to evolve, developing more advanced techniques and spatial analysis tools. These tools have allowed analysts to analyze crime patterns in previously unthought-of manners with increasing ease and speed. The result has been an improvement in analytical abilities that has given rise to the burgeoning predictive policing movement.

As can be seen from the brief history of crime mapping, the field has evolved over the last 100 years with a series of breakthroughs (computers, personal computers, availability of advanced analysis tools) followed by years of steady but slow improvements. Currently, we appear to be entering the next stage in the evolution of crime mapping. In particular, we are entering the age of cloud and mobile computing, where crime mapping is evolving from the desktop towards online and mobile platforms. This new stage of development promises to transform crime mapping and analysis by liberating analysts from their computers and making data more accessible to all. Using mobile platforms such as iOS and Android, officers will be able to gather crime data in real time, avoiding the cost and delay of geo-coding. Moreover, agencies will be able to easily share data between officers, other agencies, and civilians through cloud services. Although we are only in the beginning stages of this latest transformation, it already holds the promise of truly changing the way we acquire, analyze and share crime data.

While this transformation is important to practitioners, it is equally important for citizens. This technological advancement is allowing for-profit online mapping companies to make available crime data to the general population. These companies offer the potential to allow citizens access to data and tools that were once only the purview of those within law enforcement. Already these changes are felt in the research world, where the research institution, RAND Corporation, has used crime data from an online mapping company as the basis for an evaluative study on crime and public policy (Hoeffel, 2011).

As these online mapping companies continue to proliferate and citizens and police agencies increasingly rely on them for informational and analytical purposes, questions begin to arise about the nature and extent of these services. Specifically, as these companies proliferate, there is a need for a baseline assessment that allows for a comparison of the basic features and products of each company. Because of these very reasons, in 2009 NIJ proposed an assessment of the current state of online mapping companies, covering such factors as the number of companies, basic functions and accuracy. Importantly, rather than an evaluation of the different

companies and which is “best”, this report is meant to provide a baseline assessment of what companies exist, what features they provide, data uses, data quality and analytical functions.

2. Methodology

In conducting this assessment, there were three main areas of focus for the analysis. The first area focused on determining the extent of online mapping companies and the basic functions and features of the services they provide. This includes identifying a comprehensive set of commercial online mapping companies and conducting an inventory of the basic features each company offers. The second area focused on internal data management such as data acquisition methods, data integrity, and validation. The third focus area was data accuracy, specifically, the differences, if any, between location data from the police agency and the online mapping company. This last area assesses the degree of error that may occur when an online company maps data provided by a police agency. Overall, these three areas provide an assessment of the state of online mapping companies and the services they provide.

To find online mapping companies and services for the study, a two-stage search was conducted. In determining the extent of online mapping companies, the researchers used both a web search as well as posting a query on the International Association of Crime Analysts (IACA) discussion list. The latter provided responses from crime analysts on their experience with the online crime mapping services used within their law enforcement agencies. From these two searches, a list of eight online mapping companies and nine online mapping products was originally created. This list was later reduced to seven online mapping companies after closer inspection of the services being provided. Specifically, a decision was made that to be considered an "online mapping company", a company needed to be providing a single site solution where crime data could be viewed for multiple geographic locations. This is in contrast to a service provided by a software vendor where crime data from a single local agency is hosted on a server with assistance from a company. In this "service" model, the company is more providing software assistance than hosting an online mapping product. These seven online mapping services and corresponding companies are listed in Table 1, and the survey questions asked of each company are listed in Appendix B.

Table 1. List of Online Crime Mapping Companies and Services

Online Service (Company)	Website
Crime Mapping (The Omega Group)	www.crimemapping.com
Crime Reports (Public Engines Inc.)	www.crimereports.com
Everyblock (MSNBC)	www.everyblock.com
Mapnimbus (Geographic Technologies Group)	www.mapnimbus.com
My Neighborhood Update (Corona Solutions)	www.myneighborhoodupdate.net
RAIDS Online (BAIR Analytics)	www.raidsonline.com
Spotcrime (Spot Crime)	www.spotcrime.com

3. Results

The results of the assessment are discussed in the following three subsections. The first discusses the basic services and analysis capabilities provided by the different online mapping companies. The second takes a closer look at the data services and infrastructure aspects of the online companies, such as associated fees, data acquisition, data storage, data validation and complaint handling. The third subsection is an assessment of the accuracy of the location of crime data on the company sites.

3.1 Functions and Analysis Capabilities

Table 2 provides a summary of the basic services and analysis capabilities offered by each company. Overall there is a wide variety of functions and analysis capabilities across the different online mapping companies.

The range of police agencies served by online mapping companies varied from a low of 16 cities for Everyblock.com to over 1,700 cities for Crimereports.com. While services and analysis capabilities are provided for police agencies, they are generally displayed and reported at the city level in order to make civilian interpretation easier. Thus, when people want to view data for a police department, they are presented with a map of the geographic area overlaid with crime data.

Despite the wide range in cities/agencies served, almost all of the companies provided coverage of the same types of crimes, with the major determiner appearing to be the type of data they receive from the corresponding agency. Most companies appear to be providing the crime types that they are provided by the agency, with no special requirement that an agency provide a specific set of crimes. Thus, if a city only wants to make available burglary, robbery and homicide data, online mapping companies are more than willing to comply.

The greatest amount of variation between the companies is in the mapping functions available to visitors of the sites. While all provide the capability to view pin maps of crime data, the types of analysis functions vary among the different companies. In terms of temporal analysis, the majority of companies allowed users to select their own date range, with some providing date ranges of over six months. In addition, a key function for all but one company was the ability for users to set location based alerts, so that they can be alerted if crimes occur near them. This is perhaps one of the most useful services provided by online mapping companies, as it helps to keep citizens informed without placing extra burdens on local police.

Table 2. Basic Functions and Analysis Capabilities

Service	Cities/ Agencies	Individual Crimes	Temporal Analysis	Map display	Non-crime data	User Alerts	Buffer analysis	Advanced Analysis	Mobile App	Other
Everyblock	16	All major crimes	No	Pin	Yes	No	No	No	Yes	
Crimereports	1700	All major crimes	Yes, variable	Pin	No	Yes	No	No	Yes	Provide tips online
Spotcrime	Not provided	8 basic crimes	No	Pin	No	Yes	No	No	Yes	Report a crime
Myneighborhoodupdate	26	7 basic crimes	Yes	Pin	No	Yes	No	Trend, Charts	No	
Mapnimbus	25	All major crimes	Yes	Pin	Yes	Yes	No	Reports	No	
Crimemapping	144	All major crimes	Yes, variable	Pin	No	Yes	No	Trend, Reports	Yes	Detailed reports
RAIDS Online	100+	All major crimes	Yes, variable	Multiple	No	Yes	Yes	Density, trends	No	Multiple advanced tools

As previously mentioned, the greatest variation between the companies appears to be in the analytical functions that are available from the different companies. Some sites such as Everyblock provided rather minimal analysis functions, whereas Crimemapping, Myneighborhoodupdate, and RAIDS Online all provided rather advanced capabilities, including trend analysis and chart creation of crime data. In looking more closely at the analysis functions provided, temporal analysis is provided by all but two of the companies, and all but one company allow for user created alerts. In contrast, only one company provides the ability to perform buffer analysis around specific locations. RAIDS Online appears to be the most analysis focused of the companies, providing users with the capability to create density analysis, buffers, trends, temporal topographies and several other features usually only seen in advanced desktop applications. Finally, to the increased importance of mobile platforms, four of the companies have free applications that allow users to look at crime data on their mobile phones. These mobile applications were rather robust, closely mimicking, and sometimes surpassing, the services available on the normal websites accessed via traditional computers.

Overall, looking at the different analysis functions provided by online mapping companies reveals that there is some diversity in the functions provided. Whether it is a focus on providing non-crime data (Everyblock, Mapnimbus) or advanced analysis (RAIDS Online), it is incorrect to describe online mapping companies as simple clones of each other. This variation in basic functions and analytical capabilities provides both cities/agencies and citizens with a variety of services to choose from in looking at crime mapping companies.

3.2 Data Services Information

While there is variation in the analytical functions of online mapping companies, there is less variation in data services information. Perhaps the greatest variation lies in the fees charged by the different online companies. As Table 3 indicates, online companies have different pricing options for their services. In general, companies seem to rely on one of three pricing schemes: free; fixed-fee based on agency size; a combination of free and fixed prices for upgraded service. This variation in costs provides all agencies with the ability to use online mapping companies regardless of budget constraints.

Table 3. Online Mapping Service Fees

Service	Fees
Everyblock	Free
Crimereports	Fixed monthly fee based on agency size
Spotcrime	Not provided
Myneighborhoodupdate	Free. Updates are priced based on agency size
Mapnimbus	Based on agency size
Crimemapping	Fixed monthly fee based on agency size
RAIDS Online	Free (Monthly fee for law-enforcement-only tool ATACRAIDS, based on agency size)

Table 4 shows the different methods for data acquisition used by the various online mapping companies. The various methods range from scraping data from public websites to data uploads and direct connections with customer Record Management Systems (RMS). With the exception of those online mapping companies that are scraping public data, all companies provide a convenient method for getting their data. While some of the free services provide for automatic uploading of data, in general, companies that charge a fee have more integrated data acquisition methods than free services.

Table 4. Data Acquisition Methods

Service	Data Acquisition Method*
Everyblock	Scraping data from public websites; consuming public feeds
Crimereports	Direct feeds or uploads
Spotcrime	Scraping data from public websites; consuming public feeds
Myneighborhoodupdate	Direct connection; automated feed
Mapnimbus	Agency upload
Crimemapping	Direct connection to agency RMS
RAIDS Online	Agency upload

* The different data acquisition methods include the following: (1) Scraping Data: The online company receives the data from other websites such as a police website rather than through official sources; (2) Direct Feeds/Uploads: Data is sent directly or uploaded directly by the company from the police agency; (3) Agency Upload: Data is uploaded by the agency to the company. This differs from direct feeds in that the agency has to initiate the upload to the company; (4) Direct Connection to RMS: Company has a direct connection to the agency RMS and downloads the data as needed.

Closely related to data acquisition is how often the online mapping companies receive data from agencies, which is summarized in Table 5. In general, most online mapping companies allow agencies to determine the upload schedule, with most uploading data at least daily. Given the automation involved in most of the companies' products, a customized upload schedule is highly flexible and allows for agencies to be served in the manner they most desire. This flexibility, combined with the capabilities of the different online mapping companies, allows agencies to make crime data available as quickly as an agency can record the data. This potential for an almost real-time public release of data is an interesting development created by online mapping, and may be highly attractive for some agencies.

Table 5. Data Receipt Schedule

Service	Data Acquisition Method
Everyblock	Depends on agency; daily, hourly, near real time
Crimereports	Daily
Spotcrime	Not provided
Myneighborhoodupdate	Depends on agency, up to every minute

Service	Data Acquisition Method
Mapnimbus	Daily
Crimemapping	Depends on agency, usually every 12 hours
RAIDS Online	Depends on agency

In this era of increasing cyber-attacks, the question of data storage and data protection is of the upmost importance to an agency. A police agency does not want to have sensitive victim or location data exposed because of insecure company procedures. With this in mind, it was important to survey both the method of data storage and the length of time that data is stored. Table 6 provides a summary of the responses to data storage questions. All companies that responded to this question replied that they stored the data in a secure manner, either behind a secure firewall, off site at a secure data center, or a combination of secure procedures. In terms of how long the companies stored the data, answers varied from 90 days to indefinitely. One online mapping company replied that they had almost 10 years of data from one agency, allowing for historical trend analysis. Importantly, most online mapping companies stated that the length of data storage was determined largely by the desires of the agency. As with data uploads, the various online mapping companies are focusing on the needs and desires of their customer agencies. The combination of secure facilities and user-determined storage durations makes data security a strength for the various online mapping companies.

Table 6. Data Storage

Service	Data Storage	Data Storage Time
Everyblock	Secure	Indefinitely
Crimereports	Locally stored	Indefinite, or until agency requests removal.
Spotcrime	Not provided	Not provided
Myneighborhoodupdate	Off-site secure facility	1 year
Mapnimbus	Secure hosting facility	In perpetuity
Crimemapping	Secure hosting facility	Rolling 90 days
RAIDS Online	Secure hosting facility	Indefinite based on agency preference.

The final area of focus for the data services information is validation of data and handling of complaints. In particular, this area is concerned with both how online mapping companies ensure that the data they are displaying is accurate and how they handle complaints about data and other issues relating to their services. Table 7 provides a summary of the company responses to both issues. While all companies that responded to the question stated that they validated the crime data, most were not specific about the methods used for validation. None of the respondents provided more than simple responses that they had a process for validating data and that all data was validated before being uploaded to the website. Although it doesn't provide detailed insight into the methods of validation, RAIDS Online provides metadata on their site with information on geo-coding accuracy, the percent of data geo-coded by the agency, and

percent of data geo-coded by Google. This was the only online mapping company that appeared to provide validation information that could be used by both citizens and agencies when reviewing data.

Table 7. Data Validation and Complaint Handling

Service	Validation	Complaint Handling
Everyblock	Yes	Internal investigation
Crimereports	Multiple methods	Investigation working with agency
Spotcrime	Not provided	Not provided
Myneighborhoodupdate	Automated data check	Internal investigation
Mapnimbus	Yes	Internal investigation
Crimemapping	Tested for accuracy before going live.	Internal investigation
RAIDS Online	Thoroughly tested	Internal investigation

As with validating data, all companies that responded to the questions stated that they handle all complaints with seriousness, but several did not provide details. The responses listed in Table 7 were fairly standard, with almost all conducting an internal investigation, including one working with a designee within the Police agency. Overall, all companies state that they take both data validity and user complaints very seriously.

In conducting the data services assessment it was apparent that there is a moderate degree of variation across the different areas. Whether it is cost issues, data acquisition, data storage, or data validation, there is a variety of choices available to police agencies. This information, when combined with the review of analytical functionality, can be helpful to police agencies looking to move data online. Knowing the exact functions to be provided as well as how the data will be handled and secured is important for making an informed decision.

3.3 Accuracy

The final aspect of the assessment is the determination of the accuracy of the online mapping company data. The accuracy analysis is meant only to provide general comments on the overall accuracy of these different online mapping companies. Accuracy of mapping is one of many aspects that agencies are concerned with when choosing an online mapping company to host their data. Moreover, accuracy of data is affected by numerous factors, several of which are out of the control of the online mapping companies. These factors include agency geo-coding results and format of data provided to online companies, both of which can have negative impacts on the accuracy of online company data. Finally, given that crime data is generally reported at the block level and not the exact address, questions remain about how accurate data actually can be reported and whether they should be at exact addresses.

In order to assess the accuracy of the online mapping company data, the following process was used to match agency data with online data. An email was sent out on the IACA listserv seeking agencies that currently used online mapping companies that would be willing to share their data for research purposes. The goal was to obtain data from two different agencies for each of the three online mapping companies who participated in the assessment of accuracy. The data was provided for a two-month period in order to allow for a large, but manageable sample of the accuracy of the companies. In order to minimize accuracy issues associated with geo-coding, the data provided from both the agencies and companies for the analysis already contained coordinates. The three companies were Crimemapping, RAIDS Online, and Myneighborhoodupdate. Finally, in terms of the accuracy analysis, a Geographic Information System (GIS) was used to provide a straight-line distance error measure between matched pairs of company and agency crime points. Specifically, layers for both agency and company data were matched based on incident numbers and the distance between these points was measured and recorded (see Appendix A). This analysis was conducted twice, once by each principle author in order to ensure the reliability and validity of the analysis. Once the error measures were determined, basic summary descriptive statistics were calculated for four cities, and is summarized in Table 8.

Table 8. Summary Statistics of Error Distances *

Agency	Service	N	Mean Distance	Median Distance	Mode Distance	Std. Dev.
Cincinnati (OH) Police	RAIDS Online	1925	1198	130	250	7627
Ft.Worth (TX) Police	Crimemapping	10546	<1	<1	<1	<1
Glendale (AZ) Police	Myneighborhoodupdate	16889	991	102	<1	7568
Lincoln (NE) Police	Crimemapping	1436	<1	<1	<1	<1

* Distances are reported in feet.

The first thing to note in the analysis is that both of the cities that crimemapping.com hosts had no differences in accuracy. While in actuality there was a slight difference in the two sets of data, the error distances were so small as to be classified as no difference. In particular, in some cases the differences between company and agency data were only a matter of inches. In contrast, both RAIDS Online and Myneighborhoodupdate showed slight distance errors in comparison to the agency-provided data. The results for both RAIDS Online and Myneighborhoodupdate are very similar across all measures. In particular, both have an average error distance of about 1000 feet, with median and modes being much lower and a standard deviation around 7600 feet. In taking a closer look at the error distance from both RAIDS Online (Cincinnati, OH) and Myneighborhoodupdate (Glendale, AZ), the majority of errors are small, with distances being less than 150 feet. Figure 1 shows the cumulative percent of

coordinate pairs by distance difference group for Cincinnati, indicating that over 80% of all errors are less than 350 feet in distance, with only 5% being greater than 1000 feet. Similar results were found for Glendale in Figure 2, with over 80% of all errors being concentrated below 2000 feet in distance and only around 3.5% being over 1000 feet.

In both cases, these results indicate that while errors are present, the majority are relatively small in distance, with only a small percentage being over 1000 feet. In these cases where the errors are over 1000 feet, it is likely caused by a geo-coding error either by the agency or the company. With the majority of error distances being small, it is quite likely that what we are seeing is not actually an error, but the obfuscation of data at the block level. These may not be errors in geo-coding as much as they could be representations of data that is being shown as somewhere along a block rather than the actual address. All of the online mapping companies surveyed for this assessment reported that they represent data at the block level and not the actual address. In fact, when one clicks on any crime location for information, all that is reported is the block level information, not an actual address.

Another potential cause of the errors is the quality of the data provided by the agency, i.e. improper geo-coding of the data that are provided by the agency, resulting inaccuracy problems by the company. RAIDS Online reports metadata for all associated agency data, and in reviewing the metadata for Cincinnati, 3% of the data was flagged by RAIDS Online as potentially problematic. This 3% is close to the amount of records where there were errors over 1000 feet. Although there is no reason given for flagging the data, geo-coding of data is inherently difficult given the wide number of crimes that do not occur at a specific address, but at an intersection, along a road, in parks, parking lots and other locations without a fixed address. Unfortunately, information on the data being analyzed does not allow a closer look into potential sources of geo-coding error such as crime type errors (e.g. some crimes producing a majority of errors) or errors by geo-coding type (intersection, street, address). In a visual inspection of the data provided by the agency, several of the crime points were located well outside the jurisdictional limits. While this is in no way definitive proof of any accuracy problems, it does provide an interesting side note about problems inherent in these types of operations.

Figure 1. Cumulative Percent for Cincinnati, OH

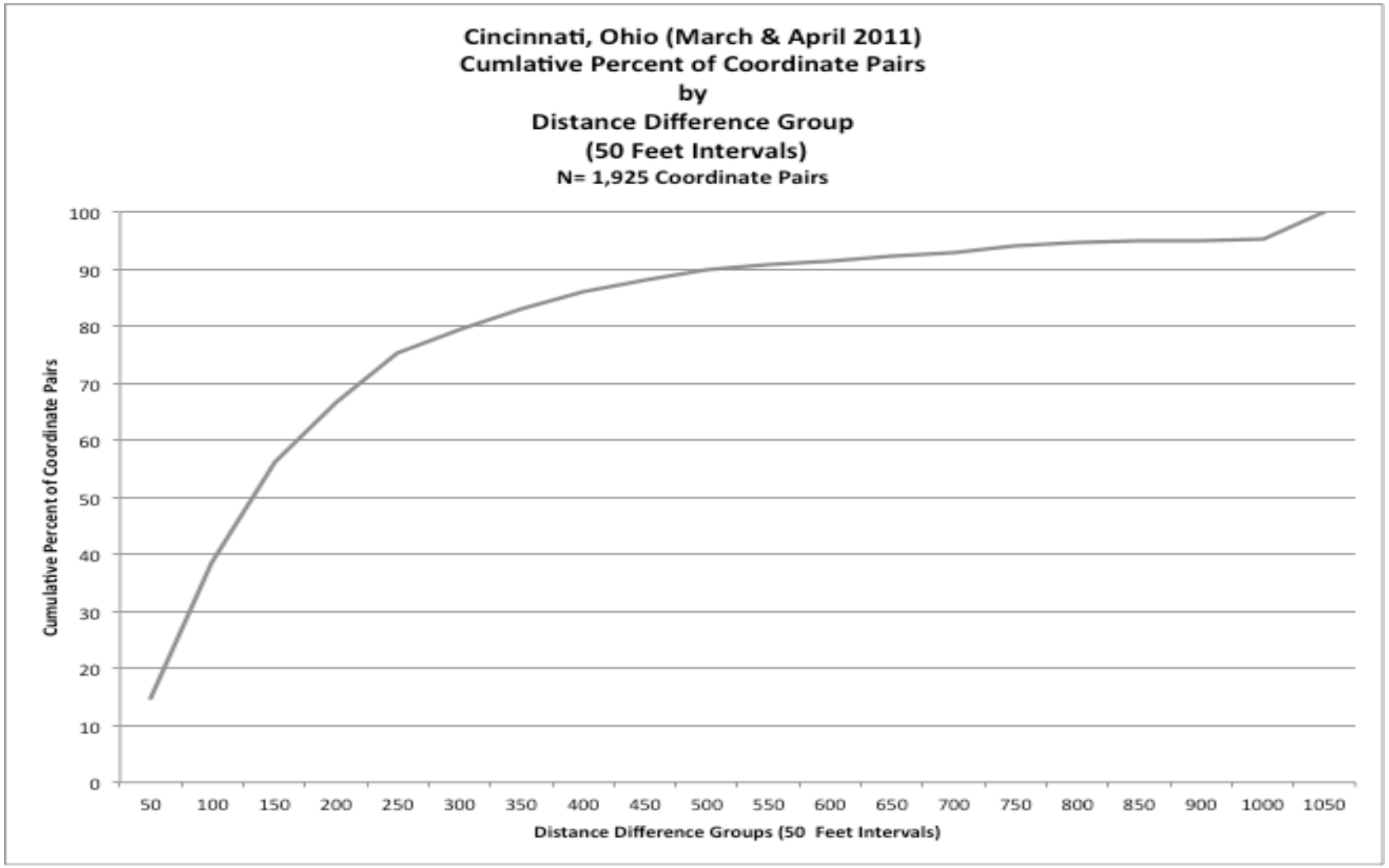
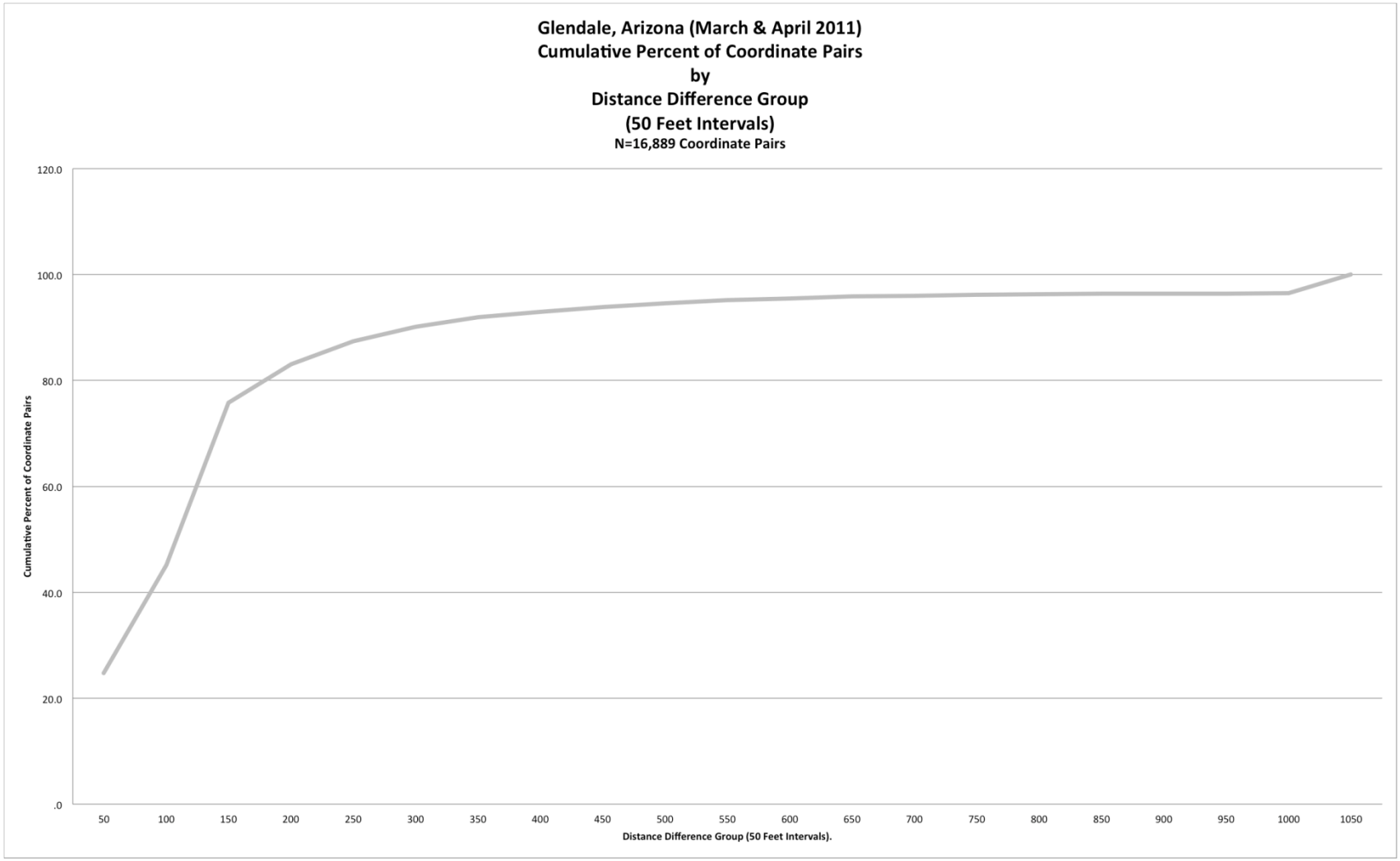


Figure 2. Cumulative Percent for Glendale, AZ



Overall, the accuracy of the three companies that provided data for analysis is high, with one reporting no errors and the other two indicating minor distance errors. While these results are in no way indicative of the accuracy of all online mapping companies, they do provide a baseline assessment of the current state of online mapping accuracy. Moreover, they provide strong support for more detailed research in the future by pointing out the limitations of the current study. In particular, in looking only at limited samples, it is not possible to determine if the errors in the data are a function of the company, the agency data, a combination of both, or some other cause altogether (such as the required block offset).

4. Conclusions and Recommendations

Although crime mapping has been used in policing for over 100 years and has become very well established within policing over the last 30 years, online crime mapping is still a relatively new field. However, this new mapping process of distributing crime information through new methods, such as cloud computing, offers potential benefits for both agencies and citizenry alike. This assessment was conducted to provide a baseline measure of the state of online crime mapping.

Overall, the results indicate several important findings as it relates to these stated goals. First, there is a range of online mapping companies, each with a slightly different focus or market. The companies range from those that are simple pin map providers of data, to those that incorporate other non-crime data and those that provide more analytical functions. In providing these different services, all appear to provide these functions effectively, with some providing a range of tools often found only in desktop GIS. This range of online mapping products is not only good for agencies, allowing them to choose from different options, but it also provides citizens a range of options for analysis. In cities such as Chicago, where multiple online mapping companies provide data, citizens have the option of looking simply at pins maps (Crimereports), crime with other neighborhood data (Everyblock) or performing detailed analysis of crime data (RAIDS Online). Moreover, with the move toward mobile devices citizens of Chicago can get crime data on their phones within an application (Crimereports). This will be beneficial to local citizens as well as the agency, which no longer needs to field as many citizen calls about the types of crime in a neighborhood. These services may even reduce the costs to the agency as the above online mapping companies all provide their services for free or at a low price, reducing the expense to an agency hosting their own data.

A second finding is that these online mapping companies are effective in the manner in which they handle data services operations. Functions such as uploading, data validation, secure data storage, and complaint handing are areas where online mapping companies are already providing effective service. While there are no minimum guidelines that online mapping companies need to meet in terms of these functions, currently all companies that responded are providing more than adequate service. The importance of this is that agencies can be secure in the knowledge that these companies have policies and practices in place to handle the major issues that arise from online crime data.

The third finding is that online mapping companies appear to be providing accurate data for viewing. The results indicate that the data provided is accurate, with over 80% of all errors being within 300 feet. However, this analysis raised the following questions: are the errors seen in the analysis a function of the required block geo-coding offset or are they a function of other systematic issues inherent in geo-coding crime data? Given the complexities of geo-coding crimes that often do not have fixed addresses, the results of this analysis are within the expected tolerances. Future research should attempt to make up for the inadequacies of the current study by using a larger sample size. This larger sample size should include more companies, as well as more cities for each company. Because of the difficulties in securing data for the assessment, the current accuracy assessment is more akin to a case study than it is to a true indicator of how

accurately an online mapping company provides data. Future research also needs to employ a wider range of variables in order to try to determine if the errors seen in this assessment are a product of block level geo-coding, agency data issues, problems inherent in geo-coding or some other issue altogether. However, before such an analysis is undertaken, questions need to be answered about the level of accuracy that should be in these products. Some authors have raised the question of how accurately these online mapping products should be and whether providing the public with address level accurate maps does more harm than good (Paulsen and Robinson, 2008). For many crime victims, victimization is a private and sometimes shameful thing that they don't want to share with the public. Does providing highly accurate maps add an aspect of re-victimization? In addition, should some crimes, such as rape, sexual assault, juvenile crime, and domestic violence not be mapped at all or at least be offset more than other crime types? These and other questions need to be addressed before further analysis of accuracy is undertaken in the future.

Finally, the results of this assessment also highlight the need for future research into how agencies actually use these online mapping companies. In particular, future research should look into questions such as:

- How many agencies currently use online mapping companies?
- How many agencies host their own crime data?
- What are the perceived benefits of using online mapping companies?
- What, if any, complaints or issues do agencies have with online mapping companies?
- Is this a nonessential service provided to citizens or is it something agencies feel they need to provide?
- What level of accuracy of data is appropriate and does this vary by crime type?
- Should some crimes not be publicly mapped?
- What kinds of policies should exist with regard to online mapping?
- Should there be any minimum standard that all online companies must meet with regard to data security, storage, accuracy, etc.?

Overall, the field of online crime mapping is growing and increasingly important to policing. Nested within the growing cloud services, mobile computing, and intelligent cities movements, its growth and usefulness will only increase over time. While numerous questions still exist as to how these services will evolve, there is little doubt that they will increasingly become an essential aspect of effective policing.

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6. Acronyms and Abbreviations

ATACRAIDS	Automated Tactical Analysis of Crime RAIDS
GIS	Geographic Information System
IACA	International Association of Crime Analysts
NIJ	National Institute of Justice
RAIDS	Regional Analysis and Information Data Sharing
RMS	Records Management System

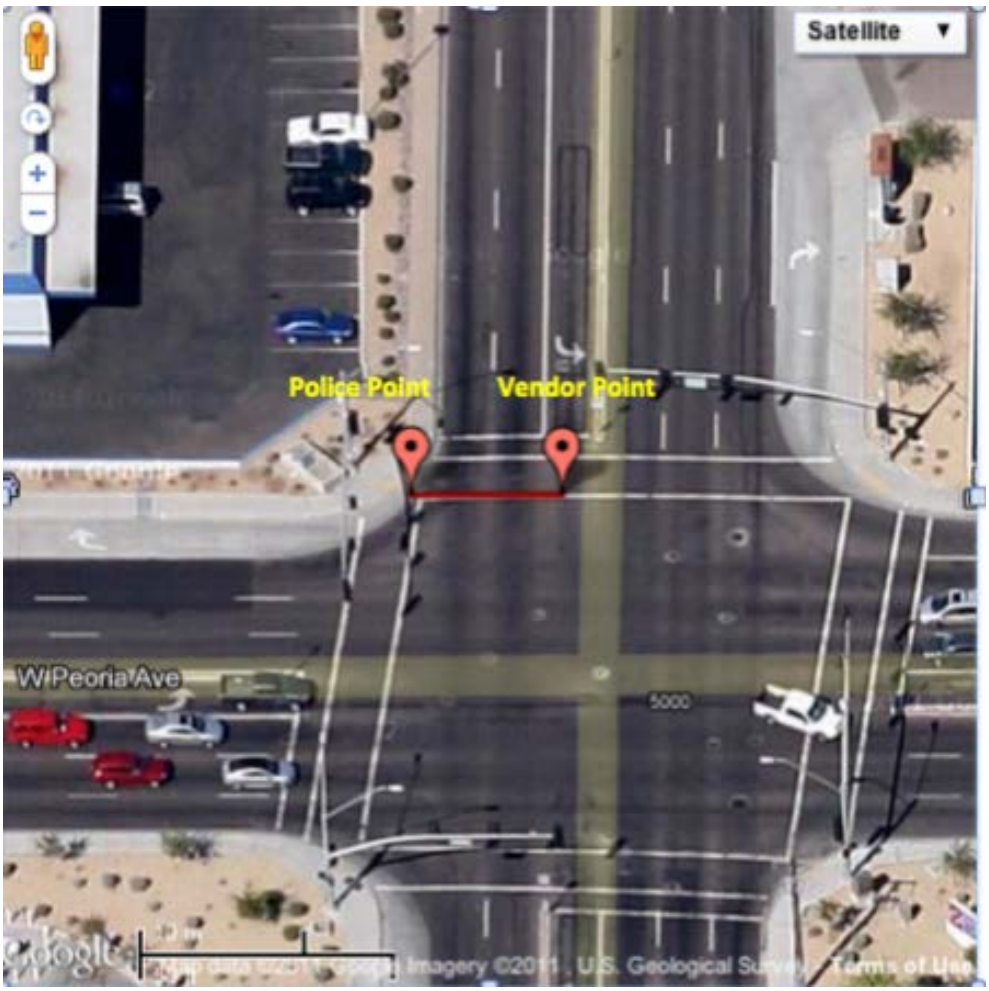
7. Appendix A – Distance Equation

Spherical Law of Cosines =ACOS(COS(RADIANS(90-NewY))*COS(RADIANS(90-LAT))+SIN(RADIANS(90-Newy))*SIN(RADIANS(90-LAT))*COS(RADIANS(NewX-LONG)))*3958.756

Source: http://www.movable-type.co.uk/scripts/latlong.html

Demo:

OBJECTID	NewX	NewY	LONG	LAT	DistanceMi	Feet	DisGroup
996448	-112.168970	33.582175	-112.168870	33.582066	0.009445	49.869832	50.00



8. Appendix B – Information Requested from Companies

To perform this survey and evaluation, the following information was requested from each online crime mapping company:

- Official name of your company

- Name of your online crime mapping program (if different)

- Point of Contact
  - Name
  - Phone Number
  - Emails

- Year you started this service

- Number of clients in the United States
  - Type of clients (federal,state, local, corrections, other)

- How you determine the charge (if any) for the service
  - Like "$99 a month" or "based on agency size", etc.

- How you receive agency data (email, direct connection, downloads, etc.)
  - In what format is the data?
  - Does the data contain XYs or Lat/Longs?

- How often you receive agency data?

- Is the data stored at your business?
  - If so, for how long?

- Is there any data validation occurring at the business?
  - If so, through what methods?

- How are complaints about data inaccuracy or issues handled (if any)?