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Unsolvable? Assessing the Accuracy of Missing Person Case Data

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Unsolvable? Assessing the Accuracy of
Missing Person Case Data

by
Scott Duncan

An Applied Dissertation Submitted to the
Abraham S. Fischler College of Education
and School of Criminal Justice in Partial
Fulfillment of the Requirements for the
Degree of Doctor of Philosophy

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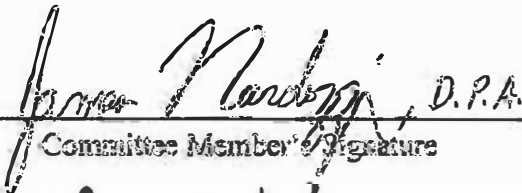
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Approval Page

This dissertation was submitted by, Scott Duncan
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Justice and Human Services and approved in partial fulfillment of the requirements for
the degree of Doctor of Philosophy at Nova Southeastern University.

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Statement of Original Work

I declare the following:

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January 20, 2020
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Abstract

Unsolvable? Assessing the Accuracy of Missing Person Case Data. Scott Duncan, 2019: Applied Dissertation, Nova Southeastern University, Abraham S. Fischler College of Education and School of Criminal Justice. Keywords: data quality, investigation, missing persons, policing

Annually, about 100,000 individuals are reported missing to authorities in the US. Fortunately, the majority of these investigations are resolved quickly with the persons being accounted for and reunited with loved ones. Conversely, the number of cases that remain open represent dilemmas for police as the incidents could be connected to unsolved homicides, other violent crimes, or endangered persons. Despite the commonality of missing persons, research on the topic is scant. Predominantly, published studies on missing persons focus on investigations from European countries. In 2008, the US Department of Justice launched the National Missing and Unidentified Person System (NamUs), a publicly accessible repository, to promote sharing of information in these investigations between law enforcement, medical authorities, and the public.

The purpose of this study was to examine the accuracy of missing person records from the NamUs database by comparing characteristics to those compiled in arrest reports. The researcher hypothesized that NamUs records contained inaccuracies, and that these mistakes would be more prevalent for incidents involving persons considered as having low socioeconomic status. Theoretically grounded in Black's Behavior of Law and social exclusion theory, a non-experimental research design was employed using purposive sampling to collect 161 records of missing persons listed in NamUs who had also been previously arrested. From the two sets of data, the heights, ages, hair and eye colors were compared, and an accuracy score was assigned for each case. These scores were then statistically assessed using the variables of SES and the difference in days between date missing and date reported as missing to authorities.

Consistent with previous research that found inconsistencies contained in other large criminal justice data, discrepancies in NamUs case listings were noted as well. Specifically, 23.0% of the total cases ($n = 37$) contained a least one discrepancy. Of these 37 records, 17 (46.0%) contained a very minor conflict between arrest and missing person reports (e.g. a difference of 2+ inches in recorded height). Further, only one record contained conflicts in two of the assessed categories, and no record contained discrepancies in more than two characteristics. Despite these record peculiarities, 6 statistical tests (e.g., t-test, Chi-Square, ANOVA, and regression) determined that the noted discrepancies were not statistically significant. Further, the results of a factor analysis using variables strengthened by linear interpolation to account for missing values produced low Eigenvalues and was unable to explain the variability in the noted discrepancies.

This research represents a first empirical look at the NamUs system's data, as well as one of the few studies to examine missing persons in the US. In addition, this work employed an obscure federal government tool to assign SES based on residential address. Weaknesses of the study included that cases from Southern states were overrepresented, there was a lack of publicly available arrest records, and an unintended recency bias was present in that the cases sampled consisted primarily of missing person records from the past 7 years. Limitations of this research were that the sample consisted exclusively of adults, examined cases involving those with criminal histories only, and the study was hindered by the lack of availability of arrest records to review. Recommendations for future academic research and practitioners were also discussed.

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Chapter 1: Introduction

Background

Annually in the United States, police investigate approximately 100,000 missing persons (Ritter, 2007). The precise number is unknown due to the varied and voluntary reporting practices of the thousands of law enforcement agencies that contribute to missing person investigations. Though the majority of these incidents are resolved and individuals reunited with loved ones, others present formidable problems for law enforcement in terms of cold case homicides or as unresolved cases (Smith & Shalev Greene, 2015; Quinet, 2007). Despite the extensive resources invested by authorities in investigating these incidents, few studies exist that examine missing persons (Shalev Greene & Alys, 2017).

Within the last five decades, technology has revolutionized the ability of law enforcement to conduct missing person investigations. Absent modern innovations, the search for those who had disappeared was limited and labor intensive. Pettem (2013) described investigators 60 years ago manually searching city telephone directories in hopes of finding that a missing woman had simply relocated to another city without telling loved ones. In the 1960s, a local US police department investigating a missing adult likely followed the lead investigator's experience and intuition – contacting relatives, friends, co-workers, and persons of interest in an attempt to locate the individual. Photographs were shown when available, and then clipped manually to paper case files. An investigator could even have a local newspaper help publicize a case. Otherwise, little media coverage or coordination was available for law enforcement.

In 1984, the US Congress funded the establishment of the private non-profit, the National Center for Missing and Exploited Children (NCMEC). This agency was in part a response to two high profile child abductions and murders (Etan Patz from New York and Adam Walsh from

Florida), and the recognized need to provide local law enforcement with improved resources and support at the national level to aid in missing children investigations (Dube, 1999). In 1990, a federal law passed requiring that missing children be reported by local agencies through national channels (Butterfield, 2001). Public interest and support programs continued growing during the late 20th century, with one of the most popular initiatives featuring the images of missing children on milk cartons. National retailers like Walmart posted pictures and descriptions of missing children in highly visible parts of their stores. Popular television programs of the latter part of this past century, including Dateline NBC, America's Most Wanted, and Unsolved Mysteries, detailed some missing persons, and captured national audiences.

Resources to locate missing children continue to be trumpeted through NCMEC — which was refunded in 2013 and remains highly visible in supporting investigations, as well as offering public awareness programs on topics ranging from preventing human trafficking and child pornography. First initiated in 1996 to aid in finding endangered missing children, the AMBER Alert program has become one of the most recognizable practices in the US (Griffin & Miller, 2008). Similarly, authorities also use Silver Alert to notify the public of an endangered older adult (Yamashita, Carr, & Brown, 2013). Fax machine notifications for missing persons have been replaced by social media and texts, and now can provide blanket coverage to an area when a disappearance occurs. Finally, for families searching for missing adults, the National Institute of Justice introduced the National System for Missing and Unidentified Persons (NamUs) in 2008 as an online tool accessible by the public and authorities.

From practical experience, collected characteristics about a missing person may contain ambiguities that are entered into law enforcement and non-law enforcement systems and then treated as veracious. Subsequent investigations using this inaccurate data create difficulties in

finding case matches. The most reliable methods for case matches are with DNA and dental records, but for some individuals that information is not immediately available. For instance, if a transient or individual otherwise disconnected to society disappears, law enforcement will likely be unable to collect a DNA sample. Further, the reporting party being interviewed by police may be uncertain about the missing person's height, weight, presences of scars, tattoos, eye color, etc. Unless an investigator verifies the missing person's information through other means, the unsubstantiated attributes propagate and, over time, are misconstrued as facts. Specifically, this represents a significant problem for investigators: a missing person with no DNA sample or dental records for comparison, and potentially inaccurate personal attributes.

Addressing this issue, Kiepal, Carrington, and Dawson (2012) discussed the complexities of cases involving transient missing persons. The authors asserted that individuals who suffer from social exclusion or disconnectedness to society represent a higher percentage of missing persons, and police investigators are more apt to be dismissive of violent crime explanations to explain their disappearance. For instance, socially excluded individuals are exposed to high risks (e.g., homelessness, mental illness, substance abuse, etc.) that can increase the delay in reporting to authorities, as well as contribute to incomplete and inaccurate attributes being recorded.

Similarly, but in the context of serial killers, Quinet (2007) asserted that missing persons from marginal populations were less likely to be investigated as thoroughly as other cases. Anecdotally, the author described Indiana investigators in the 1990s as reluctant to cooperate in regional task forces involving missing persons who were portrayed as homeless, deviant, or criminal. As such, the relationship between missing persons characterized as marginalized or socially excluded due to economic disadvantage and the accuracy of associated missing person records will also be explored in this study. The following discussion expands upon the lack of

knowledge about missing persons, and the purpose of the conducted research as a contributing to the academic literature, as well as to practitioner knowledge.

Problem Statement

In the United States, criminal justice agencies enter reports of missing adults and children into the National Crime Information Center (NCIC). The disadvantage with NCIC is that the system is restricted to law enforcement practitioners and medical examiners, and not frequently accessed by the latter. A federal government study found that 4 out of 5 medical examiners reported “rarely” or “never” utilizing that system for cases (Hickman, Hughes, Strom, & Roper-Miller, 2007, p. 6). Since missing person investigations promote the need for atypical cooperation via information exchanges and publicity of cases between police, medical professionals, and the public, the US Department of Justice created the National Missing and Unidentified Person System (NamUs), a publicly accessible missing person repository.

This research examined the possibility that publicly available missing person records contain errors and incomplete details that hinder efforts for case closure. Currently, NamUs lists over 16,000 active missing person cases. Law enforcement personnel voluntarily submit case characteristics to NamUs so totals are not as complete as with NCIC--representing only about 14% of the annual average number of missing adults and children in the United States. The NamUs database includes a variety of descriptive and contextual characteristics involving the featured missing individuals, but the accuracy of this information has not been examined in the peer-reviewed literature.

Purpose of Study

The purpose of this study was two-fold. First, statistical methods were used to evaluate the accuracy of NamUs missing adult records in comparison to the individual characteristics

comprised in local arrest reports. For comparisons between the two databases, a sample of missing person heights (absolute value in inches), year of birth (to determine age), hair color, and eye color was used to assess the accuracy of these same attributes as contained in the NamUs database. Also, socioeconomic status (as discerned by listed home address) and length of time between reported missing and actually missing were explored. Second, statistical methods were also used to examine the accuracy and completeness of NamUs records for those identified as socioeconomically disadvantaged versus others missing.

In addition to comparing the accuracy of individual characteristics between the two databases, it was beneficial to create an overall accuracy scoring system to assess how well each arrest record characteristic (e.g., height, hair color, eye color, tattoos, scars, etc.) was reflected in the corresponding NamUs entry. This was intended to provide a more robust assessment of potential differences in the preciseness of records for marginalized versus non-marginalized missing persons. In a psychological study to assess the accuracy of descriptions provided by eyewitnesses to crime, Fahsing, Ask, and Granhag (2004) used such an assessment instrument that was considered reliable and valid.

The scope of this study was to evaluate the accuracy of NamUs missing person records in comparison with other existing databases. Specifically, some missing persons have previous arrest records that detail individual characteristics including height, weight, tattoos, scars, age, and eye color, but no published research was identified that compared the validity of NamUs records to existing arrest records or any other independent database. For this study and since some attributes may change naturally over time, adult height, year of birth (to determine age), hair color, and eye color were examined in terms of accuracy between NamUs and arrest report entries. These characteristics represent the standard information recorded by law enforcement for

a missing person investigation, as well as when persons are arrested. As such, obtaining missing person and arrest records for comparison was a feasible exercise for research.

Rationale, Relevance, and Significance

Since missing persons are predominantly investigated locally, policies vary widely. Recognizing the need to better publicize active missing person and unidentified decedent cases, the US Department of Justice, in partnership with the University of North Texas Health Science Center, launched NamUs in 2008. Available to the general public, NamUs offers a searchable online database that contains a wealth of characteristics about missing persons, including date last seen, location, circumstances (if known), and a wealth of personal characteristics ranging from age, hair color, eye color, height, weight, scars, tattoos, and medical conditions. To be listed in the system, a missing person report is filed with the appropriate agency, and then voluntarily, the assigned investigator works with a NamUs representative to create an online record for the individual case.

NamUs case representatives, known as regional program specialists, hold US Department of Justice clearances and are experienced professionals in the criminal justice and/or forensic science communities (NamUs Overview Booklet, 2018). These specialists are charged with screening all professional users and case data to ensure validity prior to and after the information becomes searchable through the online system. In 2019, the NamUs website indicated that the agency employed seven regional program specialists to assist law enforcement, medical professionals, and the public with missing persons and unidentified bodies. NamUs' nine state regions range in mostly similar geographic areas. For example, Region 6 is comprised of Connecticut, Maine, Massachusetts, Michigan, New Hampshire, New York, Rhode Island, and Vermont while Region 9 solely covers California.

Since NamUs listings are comprised of cases voluntarily listed by the investigating agency, the dataset is not a comprehensive compilation of all missing persons in the US. Interestingly, this voluntary reporting component is slowly expanding as authorities and public officials recognize the value of an accessible repository for these investigations. As of March of 2019, Oklahoma, New York, Illinois, and Tennessee had passed legislation that mandated state and local law enforcement to utilize the NamUs system for missing persons (Jaglors, 2018; Oxendine, 2018; Bowles, 2018; Augenstein, 2017). Similarly, California, New Jersey, and Connecticut have legislation that indirectly supports the use of NamUs by investigators. In addition, Michigan, Pennsylvania and Kentucky have considered NamUs legislation (2017).

The growth of NamUs is not without problems. In Tennessee, the mandated use of NamUs created a significant backlog of cases, as more than a year after the state requirement's passage, only 26% of the 1,242 active cases from NCIC had corresponding entries in NamUs (Jaglois, 2018). Understandably, older cases may only exist in paper files with the investigating agency, and thus require more time to research and enter into NamUs. In addition, some missing persons have previous arrests and convictions, but it is unknown how frequently this information is used to vet characteristics contained in these official police reports. As NamUs use continues to increase, quality control of the entered information will be imperative.

The exigent literature on missing person investigations is scant. In peer-reviewed journals, no analytical research has been published using NamUs, and only two dialogues about the system were located. Pittman (2010) limited a discussion to describing how NamUs was utilized by coroners and law enforcement, while Reineke (2013) addressed limitations in the initiative for investigators working cases involving attempts at entry by non-residents on the Southern border of the US. This study contributed to the scholarly literature by examining the

accuracy of nationally publicized missing person records, assessing potential discrepancies involving records of marginalized missing persons, and providing a foundation for future quantitative research on this topic that is inadequate at present.

Several factors are relevant to understand the dearth in the literature on missing person investigations. First, these cases are not necessarily crimes, and are widely regarded as resource intensive and challenging for the police agencies involved (Smith & Shalev Greene, 2015). The authors detailed how risk assessment is prevalent for law enforcement in the initial stages of these cases. High-risk incidents involving children or those that indicate an abduction or violent crime are catalysts for significant response of personnel, supervisors, and resources by the investigating agency. Unfortunately, this assessment is subjective, and can result in a low-priority response to a missing person that is later deemed a homicide. Related, LePard, Demers, Lanagan, and Rossmo (2015) examined the investigative barriers when missing persons were later discovered to be homicide victims. The authors discussed multiple instances of delays in reporting marginalized individuals as missing to authorities, as well as officers not considering cases to be serious that eventually hindered closure.

Second, Smith and Shalev Greene (2015) surveyed more than 300 police supervisors in the United Kingdom and determined that supervisory limitations contributed to underestimating the need for action in certain missing person cases. Despite organizational policies directing supervisors to take an active role in assessing missing persons, respondents indicated that sometimes the presence of other more pressing responsibilities limited their involvement. Further, best practices research on missing persons provided to agencies by regional partners was not being fully utilized. In essence, missing persons are generally considered low priority, which contributes to incomplete investigations and records.

Simply examining official missing person records can pose challenges for researchers. For instance, Shalev (2011) noted that in gathering a sample of missing children reports from the Oxford Police (UK), a significant number of cases displayed negative time entries between when the juvenile was actually missing versus when reported. The confusing negative numbers were the result of missing children being located prior to actually being reported missing to authorities.

Though a gap exists in the literature regarding the accuracy of missing person data, the validity of police reporting has been previously criticized. In a study of more than 31,000 police reports from 12 cities in the Southeastern US, Nolan, Haas, and Napier (2011) found 4.17% of the records contained classification and general errors. These inaccuracies led agencies to underreport the index crimes of robbery, burglary, and aggravated assault to the FBI through the Uniform Crime Reports. Similarly, Loftin, McDowall, Curtis, & Fetzer (2015) studied Supplementary Homicide Reports submitted to the FBI by local law enforcement agencies between 1988 and 2002. The authors observed that missing reporting fields were a source of systematic error that compromised the use of the data. More recently in the news, the sheriff of Ingham County (MI) announced that local prosecutors were dismissing 77 criminal cases due to over 1,000 haphazard and incomplete police records (Carmody, 2017).

Anecdotally, the authenticity of missing person records has been questioned. Pettem (2013) described three homicide investigations that were hindered by erroneous initial reports. In 1979, skeletal remains of an unidentified Navajo child were recovered near Tempe, AZ, and the description of the decedent was inadvertently listed as “Caucasian” on official reports. For decades, this error deterred investigators from ascertaining the child’s identity. Forty years later, the child’s body was exhumed to verify that she was Navajo, and that information was used to

help convict those responsible for her death. Also, authorities in Delaware amended the gender listed on reports from two separate official investigations involving the unidentified remains of an adult and a child more than a decade after each had been recovered in the 1990s.

Finally and in discussing complications involved in missing persons and unidentified bodies on the United States' Southern border, Reineke (2013) lamented the lack of agency participation in NamUs. In essence, case closures require a known missing person case and unidentified decedent report, and it is unfortunately common that the former or latter is absent. The author also cautioned that the usefulness of NamUs records in identifying skeletal remains without dental records or DNA is limited. This is a valid assertion, but it should be noted that NamUs records give investigators the initial comparison needed to confirm or eliminate a missing person report with an unidentified decedent. Consequently, having accurate data on the missing person's age, height, body deformities, etc. is essential for investigators to narrow the search to potential matches that DNA samples can be pursued. From a policy perspective, more published research on NamUs and missing persons could increase participation in the system.

Feasibility Statement

The publicly available nature of missing person characteristics (e.g., height, age, etc.) made comparisons between the NamUs database and arrest records possible. Since individual attributes are recorded both at time of arrest and when compiled for missing persons reports, the procedures for collecting such information aided in ensuring that data are valid no matter if the involved law enforcement agency is local, state, or federal. In using this secondary data to assess foundational quantitative research questions on missing persons, the feasibility of the project was achievable without the need for waivers, security clearances, or other special permissions.

Barriers and Issues

Three primary barriers impacted the implementation of this research. First, the NamUs database does not contain a specific field to indicate that a missing person has a criminal history. Periodically in the free-text descriptions about those missing, NamUs entries include descriptions of criminal activity, but it is otherwise up to a researcher to make this determination. To address this obstacle, some counties publicize arrest information online that can be accessed by the general public and used to create lists, but this led to the second barrier: obtaining law enforcement agency arrest records.

Specifically, the availability of arrest history information to the public varies. Local arrest histories are officially stored at the county level, and for even a sample of a hundred records, it is not feasible to work with a hundred or so individual counties to acquire this information. Fortunately, some cities and counties publish searchable arrest databases. For instance, in Florida more than a dozen urban and non-urban counties maintain arrest history databases online. State-level databases, including the North Carolina Department of Public Safety, publish criminal histories for individuals that have been imprisoned in a state facility. In addition, local, state, and federal agencies publish individual physical descriptors for those with outstanding criminal warrants. Subsequently, these sources offer criminal history information that are accessible to the public, and can be used to identify missing persons who also have been previously arrested.

The examination of large criminal justice databases represents a challenge for several reasons. First, the volume of information in these repositories is overwhelming. For instance, the Terrorist Screening Database includes 700,000 individuals, while the Terrorist Identities Datamart Environment lists over one million names (Logan & Ferguson, 2016). The millions of records maintained by the FBI's National Crime Information Center (NCIC) and the Integrated

Automated Fingerprint Identification System (AFIS) databases are accessed daily by law enforcement officers from around the US. Subsequently, assessing the record accuracy of these widely used systems is a labor-intensive undertaking.

Second, since most law enforcement data are related to criminal and/or intelligence matters, and the information is not available to the general public. Without external sources for accountability, internal oversight for record validity may be insufficient and facilitate errors. In 2003, the FBI was criticized for obtaining an exemption for the NCIC from the US Privacy Act of 1974 (Stanley, 2016). Critics argued that the FBI's lack of accountability over criminal data, increased the risk for record inaccuracies to go undiscovered and unchallenged. Similarly in 2017, the FBI earned the same quality control exemption from the Privacy Act for the agency's Next Generation Information (NGI) database that stores individual biometrics for investigative purposes (Perala, 2017).

Record accuracy in large investigation data sets like NCIC, NGI, and other specialized law enforcement tools remains virtually unexamined. A dated study from several decades ago examined the NCIC database and found more than a quarter of the records were either incomplete or erroneous (Laudon, 1986). More recently, Pitts (2009) described an internal judicial study of active warrants in an unnamed state that misidentified more than 800 defendants either through name misspellings or listing inaccurate dates of birth. Unfortunately, such research appears infrequently in the literature and is not comprehensive, as government agencies control access to data and are solely responsible for ensuring validity.

Law enforcement case management systems used domestically and abroad are not above criticism regarding record accuracy. The Violent Crime Linkage Analysis System (ViCLAS) allows authorities to connect the patterns and behaviors of serial offenders to proactively address

crime. Bennell et al. (2012) studied officer interpretation of case files in terms entering characteristics into case management systems. For the 106 variables coded by participating law enforcement, the results were highly unreliable – with only 1 in 10 achieving the desired level of at least an 80% reliability score.

Similar problems with interrater reliability were found by Martineau and Corey (2008) in a study involving more than 200 hundred participating police officers who created sample ViCLAS records based on two fictitious crime scenarios. For homicide investigations, the authors found that officers agreed as to the entries only 38% of the time, while sexual assault cases produced only 25% congruity with the information recorded. From this and the overall lack of empirical research that would assure the public of the validity and reliability of records contained in case management systems like ViCLAS, the quality of information included in large-scale criminal justice databases requires improved practices of vetting.

Definition of Terms

For the purposes of this study, certain terms were conceptualized to convey specific meanings. To reduce ambiguity, the following definitions aid the reader in understanding this research:

Arrest. An arrest occurs when an authorized law enforcement official takes an individual into custody for the purposes of criminal prosecution (Brandl, 2018). The outcome of this arrest is inconsequential, as this study will focus on individual characteristics recorded by the officer at the time of arrest.

Missing person. A missing person is an individual whose whereabouts is unknown to the reporting party, and that individual's well-being is unconfirmed (College of Policing, 2019). This includes persons who may have run away, been taken involuntary or may need assistance. Since

arrest report information will be used, this definition is limited to adults or those over the age of 18 years old.

NamUs. NamUs refers to the National Missing and Unidentified Person System database, and is a central repository for US missing person records. NamUs is not a comprehensive list of every missing individual in the US, but is sponsored by the US Department of Justice and provides publicly available access to thousands of case details.

Social Exclusion. Social exclusion is the structural process that prevents certain individuals and groups from participating in the economic, social, cultural, and political activities that others in society access, thereby contributing to a reduced quality of life (Kiepal, Carrington, & Dawson, 2012).

Summary

Despite the extensive investment by authorities in missing person investigations, these incidents represent an understudied topic. With comprehensive databases like the DOJ's NamUs initiative, no published study exists that examined the validity of case records for missing adults. As such, the purpose of this research was to quantitatively assess the accuracy of missing person cases records. Specifically, the characteristics of missing persons listed in NamUs were compared with reported attributes of these same individuals after arrest incidents. This analysis empirically assessed the extent of discrepancies for missing person records, as well as examined the potential contribution of the missing person's socioeconomic status to recorded accuracy.

Chapter 2: Literature Review

Introduction

As stated previously, law enforcement in the US annually investigate thousands of missing person cases that can require substantial resource and time investment. This research examined the possibility that publicly available missing person records contain errors and incomplete details that hinder efforts for case closure. Currently, the US Department of Justice's National Missing and Unidentified Person System (NamUs) indicates over 11,000 active missing person cases. Law enforcement personnel voluntarily submit case characteristics to NamUs, but this total represents only about 12% of the annual average number of missing adults and children in the United States. The NamUs database includes a variety of descriptive and contextual characteristics involving the listed missing individuals, but the validity of this information has not been examined in the peer-reviewed literature.

The scope of this study was to evaluate the accuracy of NamUs missing person records in comparison with other existing databases. Specifically, some missing persons have previous arrest records that detail individual characteristics including height, weight, tattoos, scars, and eye color, but no published research exists that compares the validity of NamUs records to existing arrest records or any other independent database. For this study and since some attributes may change naturally over time, adult height, recorded age, hair color, and eye color were examined in terms of accuracy between NamUs and arrest report entries.

Literature Themes

For law enforcement in the United States, the investigation of missing persons is a significant problem. In 2016, the National Crime Information Center (NCIC) listed 88,040 active missing person records (Federal Bureau of Investigation, 2016). Incredibly and in the same year,

the FBI also reported that over 647,000 missing person cases were entered into NCIC, while more than 644,000 were purged from the system for reasons including location of the individual, the reporting was falsified, the individual is now deceased, etc. Missing person investigations are problematic abroad as well, but precise totals on missing individuals are unknown. Shalev, Schaefer, and Morgan (2009) estimated that authorities in the United Kingdom annually investigate between 100,000 and 250,000 missing persons, while Australia handles about 30,000 cases yearly (James, Anderson, & Putt, 2008).

In reviewing the peer-reviewed literature on missing persons, five themes were useful to categorize the available research. Specifically, studies delved into officer discretion, accuracy of reporting, relationship to homicide investigations, case typologies, and forensics. These themes were synthesized and explored in detail.

Discretion

For such a significant law enforcement problem, missing person studies are lacking in the extant literature. As such, understanding the challenges present for police within these investigations remains largely undocumented. In the last decade, research involving investigations and police approaches to those missing in the United Kingdom has provided a foundational understanding of the issue, but similar examinations in the United States are scant. From the United Kingdom, published studies have focused primarily on law enforcement triaging of missing person cases within the context of solvability (Bonny, Almond, & Woolnough, 2016; Harris & Shalev Greene, 2016; Smith & Shalev Greene, 2015; Fyfe, Stevenson, & Woolnough, 2015), and the ecological factors associated with such investigations (Fyfe, Parr, Stevenson, & Woolnough, 2015; Shalev Greene & Pakes, 2014). Moreover, officer

discretion serves to connect these studies in terms of solvability and assessing ecological characteristics.

Police classify missing persons cases based on a variety of contextual and situational factors including victim attributes, incident circumstances, experience of the investigating officer, etc. (Smith & Shalev Greene, 2015). In turn, these assessments and the resulting priority level assigned to incidents can contribute to the likelihood that cases are resolved. The use of classifications by responding officers in missing person cases is ubiquitous (Bonny, et al., 2016; Smith & Shalev Greene, 2015; Shalev Greene & Pakes, 2014), though far from a reliable system to assign priority. Bonny, et al. (2016) conducted a quantitative study of missing persons investigated by Scottish police between 2009 and 2011. The authors identified three general themes used by police with missing persons: unintentional or a crime victim, dysfunctional meaning related to a physical or mental health issue, and escape or fleeing from present circumstances. From the 362 incidents examined, more than 70% used the identified themes. The study did not find evidence that priority was related to gender, race or class, but rather age, lifestyle choices, and the believed presence of mental illnesses contained predicative value.

Smith and Shalev Greene (2015) also added to the understanding of classifications in missing person cases. Specifically, the authors examined discretionary factors related to triaging cases, and the management of risks in such investigations. The authors surveyed more than 300 police supervisors in the United Kingdom regarding prioritizing resources within three general classifications for missing persons: high, medium, and low priorities.

One observation was that responding officer discretion is a primary driver of case classification. This can be disturbing when considering Harris and Shalev Greene's (2016) finding that a majority of officers surveyed in their study admitted to not having read the

agency's policy on missing persons. Also according to Smith and Shalev Greene (2016), the lack of supervisory involvement is problematic. Supervisors were rarely involved in the assessment process, especially if the responding officer characterized the missing individual as a low or medium risk. This is a common obstacle identified in the empirical literature in that inadequate supervisory involvement hinders the effectiveness of missing person investigations (Harris & Shalev Greene, 2016; Smith & Shalev Greene, 2015; Fyfe, Stevenson, & Woolnough, 2015; Fyfe, Parr, Stevenson, & Woolnough, 2015). Smith & Shalev Greene (2015) concluded that risk mitigation strategies and completeness of reports could be enhanced with the simple step of providing additional oversight of discretion.

Researchers have delved farther into the issue of officer discretion during the initial stages of missing person investigations as well. Smith and Shalev Greene (2015) posited that officers downplayed most missing person cases. Harris and Shalev Greene (2016) asserted the same, but specifically involving individuals who had been reported missing to police more than once. Within the context of discretion and missing persons, other call types tended to be prioritized, which limited the amount of initial and follow-up investigation time and resources committed during these incidents. Further, police respondents were hesitant to involve outside agencies, thereby limiting the potential effectiveness offered by collaborations to resolve missing person incidents (Smith & Shalev Greene, 2015).

Building upon the empirical literature of officer discretion involved in missing persons, Fyfe, Stevenson, and Woolnough (2015) conducted a qualitative study of nearly two-dozen police officers from London's Metropolitan Police Service and a smaller law enforcement agency in Scotland. The authors supplemented their findings by incorporating a qualitative case study approach, focusing on three completed investigations that each averaged 18 hours and

involved multi-agency collaboration. The authors examined these cases from intake to follow-up to closure, and clarified the knowledge gleaned from police reports with intensive interviews involving investigators and supervisors.

From the results, the authors characterized the process for initial missing person classifications, dependent upon responding officer discretion, as cumbersome. Specifically, after a cursory investigation, a responding officer may deem a missing person more likely to be “absent” as opposed to “missing,” resulting in a low priority case rating. The former designation delays review by more experienced investigators and can hamper timely responses if greater urgency to the situation is required than was initially believed. Likewise, Fyfe et al. (2015) recommended that cases be classified less rigidly to allow seasoned investigators access sooner rather than later.

Another factor influencing officer discretion used in developing missing person classifications relates to attributes of the individuals involved. Sowerby and Thomas (2017) observed complacency in police response when officers had dealt previously with the missing individual. Kiepal, Carrington, and Dawson, (2012) posited that missing persons who are homeless, substance abusers, runaways, or otherwise perceived to be associated with transients or groups involved in risky-lifestyles are typically assigned less priority by investigating officers. The authors made this conclusion after a mixed methods study of a random systematic sample of 2,800 missing persons in Canada. In addition, the project’s results indicated that reporting accuracy for missing individuals was negatively impacted when transient or risk-laden groups were involved. Specifically, the authors found that reports were typically delayed to police, and individual characteristics (e.g., precise height, weight, the presence of scars, etc.) were less likely to be known by the reporting party, thereby not provided to the investigating officer.

Similarly, Harris and Shalev Greene (2016) posited that individuals, who have been reported missing more than one time, are typically viewed with suspicion by law enforcement. To better understand these repeat cases, the authors surveyed 50 police officers from an agency in the United Kingdom. Participating officers revealed frustration with repeat missing persons in that these individuals typically led risky lifestyles that resulted in complex investigations. This complexity translated into inordinate amounts of officer time dedicated to follow-up activities, as the involved transient lifestyles made these individuals extremely difficult to locate.

Ecological factors offer another influencing discretionary factor for missing person investigations (Fyfe, Parr, Stephenson, & Woolnough, 2015), especially with respect to agency costs (Shalev Greene & Pakes, 2014). Though ecological considerations can hamper investigations, they are not always negative, as illustrated by Shalev et al. (2009) in that most missing persons are located within 10 km of their residence. The authors determined this after analyzing 70 closed cases in the United Kingdom to understand spatial relationships between reported and recovered missing person locations. Related and building on the classification studies resident in the empirical literature, Shalev Greene and Pakes (2014) focused on medium risk cases as designated by police and examined 33 completed missing person investigations in the United Kingdom. The authors incorporated a mixed method approach, examined case factors, surveyed over 400 officers, and then conducted qualitative interviews with supervisors regarding case assessments and investigative tactics.

These authors estimated that the cases reviewed on average required approximately 18 hours to resolve, at a minimum cost to the agency of \$1,414. When expenses for specialists were included (e.g. canine trackers, information technology specialists, etc.) the costs increased to more than \$2,400 per investigation. The authors cautioned that their study focused strictly on

medium risk-missing persons, and that increases in priority would result in higher costs for police (2014). In sum, police agency access to resources varies and missing person investigations may necessitate time and personnel costs that some law enforcement agencies may be reluctant to commit.

Expanding beyond economic outlays, ecological space of the reported incident can also be relevant in understanding missing person investigations. Fyfe, Parr, Stephenson, and Woolnough (2015) combined case studies from 21 closed missing person investigations with intensive interviews of two dozen investigators in the United Kingdom to better understand how police respond to missing reports in private versus public spaces. Related to findings on missing person classifications, the authors observed that responding officers generally work from three missing person classifications: deliberate disappearance, involved criminality, or that some sort of accident or injury has occurred.

After additional details regarding the missing individual including previous behaviors, age, mental and physical health, as well as witness statements are collected, officers then revise classifications, if necessary. The authors learned that the ecology of the incident does play a role in officer discretion as disappearances from public spaces tended to elicit more broad searches (e.g. waterways, hospitals, etc.), whereas cases involving a residence were more likely to result in comprehensive yet narrow area searches. Similarly, Agrez and Damij (2014) employed a case study perspective and found that authorities would have benefited from a more technological approach that factored case ecology into decision-making.

Accuracy of Reporting

Though research examining the accuracy of missing person reports is scant, the literature does contain studies that identify inaccurate tabulations and documentation among other crimes.

Patterns of incomplete and invalid investigative reporting by law enforcement have long been resident in collected crime numbers (Yung, 2014). Researchers have tried to offset report shortcomings by employing multiple methods to quantify crime statistics including the FBI's Uniform Crime Reports (UCR) and the National Crime Victimization System (NCVS). Though employing diverse sources for crime information has been useful, inaccuracy in criminal justice system reporting remains common.

The UCR remain the predominant source for public crime statistics in the United States. Unfortunately, several highly publicized instances of local law enforcement agencies from Milwaukee to New York City misleading the public by underreporting or misclassifying crime counts have led to questions of credibility and unethical behaviors (Poston, 2012; Jacobs, 2012; Bernstein & Isackson, 2014). Examining homicide rates for such discrepancies, Loftin, McDowall, Curtis, and Fetzer (2015) studied two official sources for cities with large to medium-sized populations between 1998 and 2002. For criminal offense data, homicide is considered the most accurate, though empirical research conducted on this type of crime is not without challenges. For 150 selected cities, the authors calculated two sets of homicide rates for each jurisdiction: one from the FBI's Uniform Crime Reports-Supplemental Homicide Reports (SHR) and the other from the National Vital Statistics System (NVSS), a database maintained by the Centers for Disease Control.

A key finding was that some city agencies experienced significant reporting issues, which led to systematic errors within the SHR totals. For instance, Chattanooga apparently omitted submitting SHR reports for 1998 and 1999, but the agency's NVSS totals were valid. Overall, errors were found to be common in police reports. The authors argued that if timely reports are made, the resulting totals were more likely to be accurate, but submission errors were a

reoccurring theme for jurisdictions studied. This would indicate the need for better oversight prior to submitting data. Another relevant finding was that the authors noted higher error rates within certain decedent demographics including those for African-American males. The authors theorized that improved supervision in the field could improve the validity of reports in high crime areas (2015).

Nolan, Haas, and Napier (2011) also found flaws in reported incidents to the FBI. The authors conducted a quantitative study to examine the frequency of classification errors involved in annual police reports, as well as identifying potential sources of validity problems. Specifically, the authors compared more than 2,600 original crime reports from a dozen police agencies to the information reported to the FBI through the UCR program.

The authors found significance in discrepancies between burglary and larceny totals, and theorized that confusion between the legal requirements is the likely source of these entry errors. For violent crimes, the authors found issues predominantly between the classifications of assault and aggravated assault — resulting in over a 25% undercount of the latter felony crime. Further, statistical analysis also revealed errors in the robbery counts, which resulted in 462 fewer robberies reported than should have been. Like Roth et al. (2015), the authors found that classification errors were present in multiple forms being reporting to federal authorities, and recommended improved oversight to reduce mistakes. Further, since police classification errors were common in reporting crimes to the FBI and other sources, official totals like the UCR should be viewed with caution by researchers (Nolan et al., 2011).

The commonality of inaccuracies in police reports established by Loftin et al. (2015) and Nolan et al. (2011) are significant in discussions about missing person reports as well. Moore, Lampinen, and Provenzano (2016) posited that collecting valid information for spatial deduction

is essential to generate leads in missing person investigations. Similarly, Lampinen and Moore (2016) asserted that collecting and disseminating valid details regarding missing persons obviously is essential for public involvement as well, especially when tools like the Amber Alert system have been activated. Despite the dearth in research involving the accuracy of individuals who have disappeared, the wealth of published studies establishing validity problems for most other police investigative reports lends credence to the theory that errors are likely to be commonplace for missing persons as well.

Relationship to Homicide Investigations

Similar to the lack of research on the accuracy of reports for those who have vanished, there is also a lack of comprehensive studies on missing person investigations. As such, relevant insights can be gleaned by examining studies of other crimes; namely homicides. Since some homicide cases are initially classified as missing persons, several studies are useful in learning more regarding the latter.

LePard, Demers, Lanagan, and Rossmo (2015) conducted a mixed methods study to explore themes encountered by authorities when investigating serial murders with victims who are missing persons. The authors explored contextual themes between the victims of known serial killers. The authors stated that authorities trying to link serial killers to missing persons face unique challenges including not knowing if the incident is crime related or not, the lack of crime scenes and evidence, and the delay in reporting that can occur. Regarding the latter, those who are never reported as missing due to transient lifestyles not only represent favorable targets for serial killers, but also impede law enforcement when an unidentified body is recovered — as standard protocols dictate attempting to identify bodies by using individuals listed in databases as missing.

The authors also lamented investigative failures due to the diversity in police practices within the US and Canada. Specifically, failure to communicate with neighboring jurisdictions regarding cases, and ignoring or failing to prioritize missing persons who were involved in prostitution or other high-risk criminal activities. Similarly, Page & Thurston (2012) voiced concern that communication between law enforcement and social service providers complicated death investigations for homeless victims. Using a quantitative approach, the authors examined 132 death investigations by Canadian authorities between 2009 and 2011. From a policy perspective, the authors recommended greater involvement of social workers and medical professionals in end of life issues with this vulnerable population.

In similar study of death investigations but from Indiana, Quinet, Nunn, & Ballew (2016a) instead focused on 127 unclaimed bodies between 2004 and 2011. Some findings included that the mean age for unclaimed decedents was 57 (much lower than the average death age in the same jurisdiction), males were three times more likely to go unclaimed as compared to females, and the unclaimed were three times more likely to die from external causes such as drug overdose versus the county's general death cases. Further, Blacks were overrepresented for the unclaimed individuals. These findings are relevant for missing person investigations in that those considered transient or involved in risky lifestyles are more difficult for authorities to close.

A second study by the same authors explored the relationship of victim and offender in terms of homicide closure rates (Quinet, Nunn, & Ballew, 2016b). The authors posited that if more unsolved homicides featured stranger killings, then serial killers are more common in the US than initially estimated. To examine this topic, the authors developed a sample of 829 homicide investigations conducted by the Indianapolis Police Department between 2004 and

2011. They then created two data sets, one with attributes for unsolved and solved homicides, and then another with victim and offender descriptors for cleared cases.

With this research, the authors were specifically interested in assessing the number of homicide cases initially declared as having an unknown victim-offender relationship, that were resolved as a stranger being the perpetrator. They used statistical tools including correlations to evaluate this issue, but did not produce findings that supported this assertion. Instead, the authors found that a significant number of cases resolved after 12 months featured offenders with relationships to victims.

Interestingly, this observation connects to missing person cases as well in that individuals involved in transient lifestyles who associate with violent offenders, tend to be more difficult cases for authorities to resolve (Edkins, 2016; Kiepal, Carrington, & Dawson, 2012). Since the findings indicated that victims knowing perpetrators was still a significant factor in aiding police to resolve cases, the focus of even unsolved investigations should be on the decedent's friends, family members, and acquaintances. The authors admitted that a limitation to this study was the depth of relationships between victim and perpetrator, as knowing the likelihood of those involved having a dating relationship or just being acquaintances is important to practitioners in evaluating case strategies (Quinet, Nunn, & Ballew, 2016).

Another missing person insight that can be elicited from homicide studies involves the families of reported victims. Stretesky, Cope, Shelley, Hogan, and Unnithan (2016) employed a mixed methods research strategy using a survey tool and assessed the attitudes of secondary victims of homicides (referred to as covictims) toward law enforcement when cases remained unsolved after 12 months of investigation. Specifically, the authors assessed five levels of communication used by police with victims, and quantified the results as independent variables.

For the dependent variable, a calculated score regarding the extent of secondary victimization or covictim perception as to believing that authorities had “given up” on solving their loved one’s homicide.

For the analysis, the authors used correlation analysis and determined that communication approaches including annual conferences between police and covictims, increased contacts with law enforcement, and believing that police discussed shared important leads, were all significantly related to changes in the dependent variable. Further, the authors posited that improving communication between police and covictims could increase the chances that pertinent information regarding the homicide from family members is passed to investigators, which can increase the probability of case resolution (2016). Similarly, the families of missing persons also experience frustration with police (Smith & Shalev Greene, 2015; Fyfe, Stevenson, & Woolnough, 2015), and maintaining open communication to exchange updated details regarding loved ones is as essential for unsolved homicide investigations, as with those who have disappeared.

Case Typologies

Like many types of incidents, it is essential to recognize the diversity of cases that represent missing persons. Though the current research of missing person typologies is scant, some studies have considered aggregate types of investigations, while others focused on one or two specific classifications. In addition, case studies offer useful insights in gleaning practical understanding from missing person cases (Agrez & Damij, 2014). These authors offered a comprehensive examination of a closed investigation that included initial steps taken by police, costs and resources allocated, and closure strategies employed. Related, Jarvis (2013) discussed

issues concerning missing persons from a legal perspective, including the intersection of police, the courts, and family members of those missing.

Researchers have made forays into missing person typologies, both at the onset of investigations as well as during follow-up stages. Morton (2013) examined hitchhikers from indigenous tribes in Canada as a type of missing person. The author found that the isolation with contacts between the victim and the perpetrator, as well as the demonstrated deviance of the offender in abduction cases, contributed to the significant difficulty level for law enforcement involved in the investigation. Likewise, Shalev (2011) posited that juveniles who go missing frequently are typically also involved in criminal activities. As such, investigators are likely to view this type of disappearance as a low priority, and assume that the youth is hiding to avoid detection. These findings support conclusions by other researchers that transients or those disconnected to society produce the most difficult type of disappearances for police investigators (Kiepal et al., 2012).

Edkins (2016) examined missing persons from an international context and offered useful perspective for case types when authorities have been unable to ascertain a victim's identity. The author discussed the challenges for nations around the world when the investigated missing persons are undocumented workers. Sadly, the author offered numerous global examples where government officials have failed to prioritize the disappearances of non-residents, as well as the recovery of unidentified decedents that are related to illegal immigration and missing persons. Similarly and after examining media attention generated by the type of missing person, Sommers (2017) found significant differences of police and media involvement when the involved individual was disconnected to society, as is the case for undocumented workers.

In the United States, Edkins (2016) asserted that challenges are inherent for authorities in that frequently the documentation necessary (e.g., birth certificates, identifying numbers, etc.) to file a missing person report is not immediately available for these individuals, as the incidents occur far from home and family. Cases are further complicated by the reluctance of friends and coworkers to file reports on someone missing due to the person involved as well as the reporting party, may be in violation of local residency laws. Similarly, when authorities recover an unidentified person who is a crime victim and undocumented worker, they are faced with similar obstacles in ascertaining the decedent's name as starting point for an investigation. For missing persons involved in this typology, the author recommended improved multinational cooperation to provide services that are more effective to families (2016).

Paralleling the challenges identified by Edkins (2016), Reineke (2013) studied missing persons and unidentified body investigations between the United States and Mexico. Specifically, the author wanted to identify obstacles for family members searching for information regarding lost loved ones, and employed a qualitative case study approach to discuss common issues for families of the missing as well as authorities in missing person investigations. These obstacles for families included that no central repository of information exists for missing persons leaving Mexico, authorities from Mexico and the US are highly bureaucratic and provide only limited support to families, and that language barriers, which complicate matters, may exist between authorities and the reporting party. Further, families may be hesitant to report missing loved ones in fear of law enforcement and the resulting sanctions.

Interestingly, the individual featured in Reineke's (2013) case study was identified as a decedent recovered two years earlier by authorities near Tucson, AZ. The man's body spent a year with the medical examiner and then was cremated and placed in a local cemetery. The

identification process had been slowed due to body characteristics of the missing man that had been inaccurately listed by law enforcement and incorporated into the official records. This connects to the previously discussed research theme describing the commonality of inaccuracies resident in law enforcement reports (Loftin, McDowall, Curtis, & Fetzer, 2015; Yung, 2014; Nolan, Haas, & Napier, 2011). From a policy perspective, Reineke (2013) recommended more collaboration between the US and neighboring countries to better share missing person information to resolve cases of this typology and assist families searching for loved ones.

Understanding case typologies for those who have disappeared is not only important in the initial phase of the investigation, but also as the case progresses. As such, existing studies have utilized quantitative and qualitative approaches to shape law enforcement response based on the type of individual that has gone missing. Bunch, Kim, and Brunelli (2016) analyzed body recovery locations for involving 71 New York missing person cases, and offered search recommendations based on geospatial evidence. Similarly, Phillips et al. (2014) examined missing individuals that were afflicted with specific medical conditions, and lost in wilderness settings. Using a quantitative approach, the authors asserted that typology is essential for law enforcement to assess immediately in the investigation. With a rapid assessment of perceived risk involving the victim (e.g. suicidal, lost elderly person or child, endangered due to a mental or physical condition, etc.), specialists in tracking and other resources can be deployed in the most effective and timely manner.

Related and using a similar typology approach, White and Montgomery (2016) studied the behaviors of lost dementia patients, with the intent of educating family members, law enforcement, and medical personnel. To study this phenomenon, 281 cases investigated by police in the United Kingdom between 2005 and 2009 were selected. The authors limited the

study to that of persons afflicted with dementia, and first collected descriptive statistics regarding the sample including that the average age of participants was 78, with the oldest being 97. Gender of the sample was balanced at about 50%, and 252 of the total were missing from urban areas. The majority of the missing were reported only once, were found in a public place, and traveled by foot. The median recovery time for those found unharmed was 1.07 hours, while the time increased to 3.55 hours for those with injuries,

One challenge identified by the authors was that if a delay occurred in reporting the missing person, there was a resulting increase in the time required by police to locate the individual. They posited that not all missing incidents are reported to police in a timely manner, as caregivers and family are sometimes able to resolve the situations based on knowledge of the individual and prior experience. Limitations of the study included record selection, the modest sample size, and not knowing the extent of harm that occurred in certain cases or the level of dementia. The authors recommended additional research in this area, not only to aid police investigations, but also to assist medical practitioners and family members with being proactive and preventing those with dementia from becoming lost (2016).

In sum, understanding the type of missing person is useful to law enforcement in terms of proven response strategies, resources required, and hypothesized victim behavioral patterns. Existing research has explored missing person typologies both at the beginning and during follow-up phases of investigations, but unfortunately only cursory examinations have been conducted to date. As more quantitative and qualitative research is performed, law enforcement responders can better conduct missing person investigations, as well as improve collaborations with other service providers offering assistance.

Forensics

With the significant advances in contemporary law enforcement forensics, collecting and protecting evidence is critical for missing person investigations. The extant literature contains research specific to missing persons, as well as overlap with other types of investigations. Further and similar to previously discussed overlaps within reporting accuracy and investigative challenges, peer-reviewed articles offer useful lessons from homicide studies. Further, investigative resources including DNA from the family members of those missing may be limited (Ge, Budowle, & Chakaraborty, 2011).

Hartman, Benton, Spiden, and Stock (2015) used an exploratory qualitative research approach to examine challenges encountered by Australian law enforcement and medical examiners involved in missing person investigations. The authors discussed missing person and unidentified body databases utilized by authorities, and then selected two death investigations as case studies for insights into process evaluation. For the results, the authors offered anecdotal descriptions of problems encountered when direct DNA comparisons are not always available in missing person cases. Also via the two cases provided, the authors examined the necessity and benefits of collecting two types of DNA to assist investigators and medical authorities with identifications.

The authors recognized the important contributions that a national missing person database can make to improve case closure rates. The advantage of such a database is that it allows for a central repository that can be expediently accessed by authorities. Further and to improve the chance for matches between missing persons and unidentified decedents, authorities should collect mitochondrial DNA or kinship samples to increase the accuracy of database matches (2015).

Case studies connecting forensics and the closure of missing person cases are useful as well. Parmalee (2011) discussed a technological innovation that can be used by authorities to assist with identification of missing persons and unidentified decedents. The case selected involved a young male decedent that committed suicide in New York City in 2002. In this investigation, authorities were unable to ascertain the decedent's identity, and his remains were buried in an unmarked grave.

Initially, the decedent's family made a missing person report with their local police department, and had spoken with investigators on numerous occasions, but it was not until 7 years later that the unidentified body in NYC and the missing teen were connected. Due to the passage of time, authorities were unable to obtain a direct DNA sample from the missing teen, so instead used an innovative approach and obtained the decedent's infant blood spot card from the State of New Jersey. With the specimen from the missing teen's infant card, authorities were able to conclusively match the individual to the remains in NYC. The author discussed this case in the context of problems for investigations of similar cases including lack of reliability decedent characteristics, and absence of other salient records such as fingerprints and dental records. Further, the author recommended that investigators and medical examiners receive education regarding the value of blood spot cards and the process for accessing information (2011).

Wedel, Found, and Nusse (2015) expanded on Parmalee's (2011) proposition. The authors emphasized that care be given to evidence and documentation of unsolved homicides so that forensic techniques developed decades later can be utilized to solve cases. The authors employed a qualitative case study approach of a modern death investigation involving a decedent from 1971. Buried in an unmarked grave in California, authorities exhumed the body more than

40 years later, and with contemporary forensic practices, were able to glean new details about the individuals' identity. Specifically, the victim's age was adjusted, additional evidence reinforcing homicide as the cause of death was found, and new measurements of the victim's head and facial area led to an updated sketch of the deceased woman's appearance; greatly increasing the chance that the victim would someday be identified and the case resolved.

Finally, media depictions represent an overlap with forensics in homicide and missing person cases as well. In exploring this, Beauregard and Martineau (2014) examined whether greater knowledge of forensics among the population makes it more difficult for investigators to close homicide cases. The authors employed a quantitative research approach on a sample of 350 solved and unsolved homicides investigated by the Royal Canadian Mounted Police between 1948 and 2010. With known results, the authors were able to better understand the investigative process and how ambiguities dealing with missing persons were handled by authorities.

For the results, the authors' found that specific efforts to disrupt a crime scene had more of an effect on case closure than the total number of efforts. For instance, hiding a body was more a detriment to solving crime as opposed to an offender concealing their identity, cleaning-up a scene, and removing evidence. Regarding case closures, those decedents involved in prostitution and/or narcotics were significantly more likely to have cases remain unsolved. Similar to what is known about missing persons, this attests to the difficulties faced by investigators when the involved individual has a transient and disconnected lifestyle that accompanies high-risk behaviors. The authors also theorized that discretionary victim attributes (i.e., is known to have an extensive criminal history) could influence the level of police vigor applied to investigating homicides.

Literature Review Summary

Despite the frequency of missing persons in the United States, overall research on the topic is scant. Fortunately, the vast majority of these types of case are resolved within a few weeks, with the individual returning home or otherwise unharmed and accounted for by police. Regrettably, the large number of investigations being non-criminal in nature tends to lull authorities into inaction. As such, when the cause of the disappearance is nefarious in nature, law enforcement agencies are often playing catch-up in terms of the investigative work required to properly examine the case. Accordingly in these situations, important leads and details are then lost or incorrectly recorded as a product of the resulting delays.

The scope of this study was to evaluate the accuracy of NamUs missing person records in comparison with other existing databases. A comprehensive search of the current peer-reviewed literature failed to produce a study that examined this issue specifically. Conversely, employing the extant literature as a guide for evaluating law enforcement investigations of missing persons lends several useful clues to the discussion. As stated previously, a paucity of scholarly publications on missing persons exists (Shalev Greene & Alys, 2017). The lack of materials limits a literature review such as the one required for the purposes of this study, and therefore necessitated a comprehensive inspection of each article located on the topic. As such, no peer-reviewed article was excluded purposefully from this review.

From the peer-reviewed journals, five themes were advantageous in categorizing the related and available research. Specifically, studies tended to delve into officer discretion, accuracy of reporting, relationship to homicide investigations, case typologies, and forensics. From these themes, a foundation was constructed to employ a quantitative research design and test the accuracy of compiled missing person case details.

Theoretical Underpinnings and Methodology

Fortunately, strong theoretical support exists to explain potential inaccuracies in missing person records. Black's *Behavior of Law* (1976) represents a seminal contribution to the discussion of sociology, criminal justice, and law. This theory attempts to explain variances in the amount of criminal and civil law within the context of societal and group factors. Black (1976) asserted that law can be quantified based on five dimensions embedded in American social life: stratification, morphology, culture, organization, and social control. From these precepts, the author constructed several propositions to understand the diverse application of law across time and space.

For instance, Black (1976) described morphology as horizontal relationships between people including levels of intimacy and how labor is divided among families and groups. Black asserted that the higher the degree of morphology present, the less likely that law would be invoked. Applying the level of morphology to intimate partner violence, this proposition is sensible and the veracity demonstrated in the contemporary literature: when violence occurs between intimate partners, the victim is less likely to involve the criminal justice system, as compared to if the perpetrator was a stranger.

For the purposes of this study, Black's dimension of stratification or the perceived social level of a missing person was examined. By stratification, the author referred to the vertical aspects of life that feature unequal distributions of wealth and opportunity within society (1976). Black posited that an individual's status can dictate response from the criminal justice system in that a wealthy victim accusing an impoverished suspect of a crime would elicit the most attention, while the opposite would generate the least. In essence, the level of potential service provided by police, the courts, and corrections varies by perceived social rank of the victim and

the accused. Unfortunately, this could lead to disparate treatment of ethnic minorities, the impoverished, as well as others being judged upon extralegal factors by authorities (Rojek, Rosenfeld, & Decker, 2012).

Similarly, stratification may impact missing person investigations. Specifically, the perceived social rank of a missing person by governmental authorities could influence the level of service provided. In a quantitative study of Canadian missing persons, Kiepal, Carrington, and Dawson (2012) found evidence of disparity in missing person cases. The authors posited that missing person cases involving an individual who was transient or otherwise disconnected with society were less likely to be treated seriously by authorities, and featured an increased delay between time missing and time reported to police. As such, the authors' contention that the social exclusion level for those missing dictates varied responses by police, implicitly described the proposed contribution of stratification to involvement of law by Black (1976).

Combining Black's presumption of the negative impact on the criminal justice system of stratification with Kiepal, Carrington, and Dawson's argument that those perceived to be socially excluded by society may receive disparate treatment by authorities, offered the theoretical foundation for this project's research methodology. The methodology employed was a quantitative non-experimental design that allowed for empirical comparisons of missing person characteristics as recorded in the NamUs database versus those obtained by law enforcement during previous arrest incidents. Among other assessments, the potential role of stratification was examined. This methodology will be comprehensively explained in Chapter 3, including descriptions of theoretical foundations, participants, instruments, procedures, data analysis approaches, and limitations.

Research Questions

Employing Black's premise (1976), this research sought to understand the accuracy of missing person records using publicly available arrest data for comparisons. Unfortunately, a dearth exists in missing person research in the United States. As stated previously, the author was unable to locate any published study that attempted to assess the validity of missing person records, yet the literature contains numerous instances of the challenges present for law enforcement when compiling investigative reports. Despite this challenge, this study offers foundational research exploring report accuracy using publicly available secondary data. Subsequently, the following quantitative research questions were pursued:

Research question one. Do the recorded characteristics (e.g., height, age, eye color, and hair color) for missing adults differ between those included in previous arrest histories as compared to entries in the NamUs database? The independent variables for this question were an individual's height, eye color, hair color, and recorded age at time of arrest as recorded by the involved law enforcement agency. For comparison, the dependent variables were the same individual's height, eye color, hair color, and age at time of reported missing as recorded in the NamUs database.

Research question two. Is there a difference between the socioeconomic status of the missing adult and the accuracy of the recorded characteristics (e.g., height, age, eye color, and hair color) in NamUs? The independent variable for this question was an individual's socioeconomic status at time of arrest or when reported missing based upon the recorded home address by the involved law enforcement agency. The dependent variable was the recorded accuracy of the same individual's height, eye color, hair color, and recorded age after comparing listings from the NamUs database and police arrest reports.

Research question three. Is there a relationship between the difference in number of days missing and being reported missing and the accuracy of the recorded characteristics (e.g., height, age, eye color, and hair color) in NamUs? The independent variable for this question was be the number of days between when an individual disappears and when that person is reported missing to authorities. The dependent variable was the recorded accuracy of the same individual's height, eye color, hair color, and age after comparing listings from the NamUs database and police arrest reports.

Chapter 3: Methodology

Rationale

This project's primary assertion was that a significant number of missing person records contain inaccuracies that create obstacles hindering case closures. Currently, no study exists in the empirical literature that assesses the validity of missing person records in the US. To appraise the accuracy of these listings, this research examined missing person records from the NamUs database, as well as compared specific records with attributes previously collected in arrest histories by law enforcement.

Theoretical Summary

As discussed previously, Black's Behavior of Law (1976) represented the theoretical basis for this project. Black espoused that through stratification or perceived social status, victims and perpetrators receive varying applications of law from the criminal justice system. For instance, an individual involved in prostitution reporting a crime to law enforcement would be treated differently as compared to a wealthy community member. Implicitly describing stratification within the context of missing persons, Kiepal, Carrington, and Dawson (2012) posited that those less connected to society or individuals considered socially excluded receive lower levels of service from police. This project quantitatively assessed the accuracy of missing person reports, and by classifying missing persons within the context of socioeconomic status, also examined cases for evidence of variance potentially due to stratification.

Participants

For the study's sample, the project used secondary data from two separate sources. First, in 2008, the National Institute of Justice and two other federal agencies launched the North American Missing and Unidentified Person System (NamUs) to better publicize active missing

person cases, as well as investigations involving unidentified decedents (NamUs.gov). In 2011, daily management of the program was transitioned to the University of North Texas Health Science Center. Available to the public at no charge, NamUs offers a searchable online database that contains a wealth of more than 50 characteristics about individuals who are currently missing. To be listed in the system, a missing person report is filed with the appropriate law enforcement agency, and then the assigned investigator voluntarily works with a NamUs representative to create an online record for the individual case.

Second, some missing persons have previous criminal arrests. Individual arrest report information was compiled from local arrest histories. In a comprehensive empirical study of missing persons in Australia, Sowerby and Thomas (2017) determined that missing persons were 31 times more likely to have criminal histories as compared to the general public. As such, the sampling strategy was to compare records from the NamUs database with local arrest history details. Specifically, adult attributes that are unlikely to change over time including height, eye color, hair color, etc. were recorded and compared. Further, the individual's age from both sources was obtained and compared as well.

Since the NamUs online database is comprehensive and a public record, inclusion in a research study and subsequently obtaining attribute measurements, did not present formidable problems. In contrast, obtaining arrest histories for persons listed as missing is not available to the public in one location, but does exist in various publicly available databases. As such, collecting this information was essentially a two-step process: determining which adult missing persons possessed criminal histories and then locating the appropriate data set that contained the arrest specifics. Criminal history and active warrant databases were accessed to collect such arrest histories and exist at the federal, state, and local government levels. Resources searched

included the Federal Bureau of Investigation's Most Wanted, US Marshals Profiled Fugitives list, North Carolina Department of Public Safety Offender Search, the Florida Crime Information Center Public Access System, and dozens of local sheriff and police departments arrest history databases.

Since this project involved only adult missing person records that also have a criminal history record in accessible states, the sampling strategy was considered non-probability. Specifically, the approach was non-probability because not every case has an equal chance of being selected for study (Bachman & Schutt, 2014). Further, the sampling strategy was purposive, as specific records and attributes were selected that yielded meaningful comparisons.

To calculate the number of records necessary for the relational questions, Phillips and Jiang (2016) recommended power analysis as a tool to quantitatively estimate the number of cases for valid effect sizes. Specifically, there are two types of power analysis: priori and post hoc. With the former, the analysis is based on what sample size is necessary to produce the desired effect. With the latter, the technique is used retrospectively or after the research has been completed to better understand the observed effect size. For this study and using an effect size of .8 or greater, a sample size of more than 100 was utilized, when feasible.

Instruments

This project used two sources of secondary data: missing person records from NamUs, as well as arrest report attributes collected by local law enforcement agencies for individuals that were previously arrested. NamUs includes some records back to the early 1900s, and cases are well documented within the last three decades, which fit with the time parameters of this study. Similarly, arrest reports are electronically stored for most local agencies for up to the last 30 years.

Since arrest history records may contain incomplete listings as needed for the purposes of this study, some partial records were gathered. Gloyd, Wagenaar, Woelk, and Kalibala (2016) characterized the issue of missing fields as the most frequently experienced challenge for researchers in working with secondary data analysis. The authors recommended using multiple data sources to triangulate the accuracy of listed attributes, as well as potentially locating missing case characteristics. Cheng and Phillips (2013) added that once missing fields have been obtained, the researchers can carefully recode the data, documenting each step to ensure integrity of values from the original source.

Concerning potential entry bias, since missing person reports originate in the jurisdiction that the event occurred, policies vary widely between local, state, and federal agencies involved in the investigations. As such, a regional NamUs representative is assigned to each case to provide reliable and valid entry into the system. Further, integrity of some of the records can be verified by state or local agency missing person databases, which are also publicly available.

Proposed Research Design and Methodology

Because this research did not involve random assignment of cases to groups, the design was non-experimental (Edmonds & Kennedy, 2017). As previously stated, the sampling technique was purposive or that included records held value via a matching arrest record that allowed for the proposed research questions to be addressed. This study was also retrospective or that the data sets compared were already in existence. Specifically, the inclusion subjects were missing adults in the United States who had also been listed in the NamUs database. The subjects were not selected randomly but were included if there is a corresponding arrest report from a separate law enforcement listing.

For comparison purposes, characteristics for each selected adult missing person were obtained from NamUs, and then separate characteristics for the same individuals were collected from various publicly available criminal histories. Specific conceptualization and operationalization of the missing person variables were as follows:

Height. The missing person's height in inches. This was collected as ratio level data from NamUs and from arrest histories.

Recorded Age. The missing person's year of birth was collected, and then expressed as total years old by subtracting it from a selected future date prior to analysis. The result was ratio level data from NamUs and from arrest histories.

Eye color. The missing person's eye color. Collected as nominal level data from NamUs and from arrest histories.

Hair color. The missing person's hair color. Collected as nominal level data from NamUs and from arrest histories.

NamUs record accuracy. First, the four comparisons of height, age, eye color, and hair color between missing persons in NamUs and their corresponding arrest history descriptors were assessed for accuracy. Next and for each record, height, age, eye color, and hair color were assigned a weighted value of either .25 for "accurate" or a "0" for "inaccurate. These 4 values were then added to compute the NamUs Record Accuracy. For instance, if a record contained completely accurate information, .25 scores would be assigned for height, age, eye color, and hair color each, and then totaled for 100% (Fahsing, Ask, & Granhag, 2004).

Socioeconomic status. First, the missing person's home address was collected from an arrest history. Second, the address was entered into the US Small Business Administration's Historically Underutilized Business Zone (HUBZone) web-based mapping program. The

HUBZone map then determined whether the address is considered within a high unemployment or economically distressed area. From this exercise, individuals with home addresses designated as high unemployment/economically distressed were entered as "low," while other results were classified as "moderate" or "high." Finally, if the individual was listed as homeless, a transient, or a prostitute, a third category of "very low" was assigned. The result was ordinal data.

Days missing. The date the person went missing was recorded, and then expressed as total days by subtracting it from a selected future date prior to analysis. This was collected as ratio level data from NamUs.

Days reported missing. The date the person was reported to authorities as missing was recorded, and then expressed as total days by subtracting it from a selected future date prior to analysis. This was collected as ratio level data from NamUs.

Adjusted days missing and days reported missing. As described above, Days Missing was subtracted from Days Reported Missing to calculate an Adjusted Days Missing and Days Reported Missing. This data was also ratio level data.

Data Analysis

For statistical analysis, researchers can generally select from two approaches: descriptive or inferential. This study employed each of these types of statistics to examine both the datasets and assess the three quantitative research questions. To properly describe the NamUs and arrest data, measures of central tendency including mean, median, mode, and standard deviation were necessary descriptive statistics. Further and since partial records were considered, separate descriptive statistics were accumulated for each hypothesis evaluated.

In addition, inferential statistics were also utilized for the study. To explore potential differences between NamUs and arrest characteristics for missing persons, t-tests and Chi-Square

analysis were employed. To assess potential relationships between variables, the inferential approaches of ANOVA and regression were used. Accordingly, an explanation of the specific inferential statistical approach is included with each research question and falsifiable hypothesis.

The study examined three research questions with 6 falsifiable hypotheses. The ensuing text restates the research questions from Chapter 1, followed by the applicable testable hypotheses. The first research question was: Do the recorded characteristics (e.g., height, age, eye color, and hair color) for missing adults differ between those included in previous arrest histories as compared to entries in the NamUs database? (RQ 1)

Hypothesis one. A significant difference exists between the recorded heights of missing adults listed in NamUs as compared to those contained in arrest histories.

Hypothesis two. A significant difference exists between the recorded ages of missing adults listed in NamUs as compared to those contained in arrest histories.

Hypothesis three. A significant difference exists between the recorded eye colors of missing adults listed in NamUs as compared to those contained in arrest histories.

Hypothesis four. A significant difference exists between the recorded hair colors of missing adults listed in NamUs as compared to those contained in arrest histories.

Hypothesis 1 and Hypothesis 2 featured ratio level independent and dependent variables (age and recorded height for each missing person). The appropriate statistical tests for these were t-tests to assess for statistical differences in the two source data sets. Hypotheses 3 and 4 feature nominal level/categorical independent and dependent variables (hair color and eye color for each missing person). As such, the questions were addressed using Chi-Square to assess for statistical differences.

The second research question addressed was: Is there a relationship between the socioeconomic status of the missing adult and the accuracy of the recorded characteristics (e.g., height, age, eye color, and hair color) in NamUs? (RQ 2)

Hypothesis five. If a missing adult record is categorized as of very low socioeconomic status, the listing is more likely to contain inaccuracies.

This hypothesis was assessed using a one-factor ANOVA since this test examines the different averages on the dependent variable or DV that a missing person of low, medium, or high socioeconomic status may have (Fitzgerald & Fitzgerald, 2014). The ANOVA yields a probability value that describes the likelihood of the calculated score being attributed to random chance. Further, individual socioeconomic status was determined by accessing the US Small Business Administration's Historically Underutilized Business Zone website and entering listed addresses for each missing person to obtain a rating.

The final research question addressed was: Is there a relationship between the difference in number of days missing and being reported missing and the accuracy of the recorded characteristics (e.g., height, age, eye color, and hair color) in NamUs? (RQ 3)

Hypothesis six. If a missing adult record features a large discrepancy between the number of days missing and when reported missing, the listing is more likely to contain inaccuracies.

This hypothesis was statistically assessed using regression analysis with the ratio level dependent variables of height and age. With this hypothesis test and the other stated quantitative assessments, accepted practices dictate that probability values of less than 5% are statistically significant due to the small likelihood of chance producing the observed result (2014).

Limitations

The proposed research had several limitations concerning internal and external validity. First with internal, the research methodology was not a true experiment. As such, the results of the project's statistical analysis do not permit as much confidence in terms of addressing causation that an experiment using random selection and assignment would provide (Creswell, 2014). Since the purposive sample examined cannot be considered a representative sample, the calculated results were limited in terms of inferences that can be made about the population. In addition, since groups are not being randomly assigned, selection bias could have been an issue (2014). In addition and since secondary data were used, socioeconomic descriptors may not have been accurately recorded and cases incorrectly labeled. To control for this possibility, separate addresses from multiple previous arrests were considered, where feasible.

Regarding threats to external validity, the lack of random selection and non-experimental design sacrificed the generalizability of the results (Bachman & Schutt, 2014). Since the NamUs database is voluntarily used by law enforcement, it is not a comprehensive list of missing individuals. As a result, the research questions and resulting analysis may or may not have been representative of other more complete data sets for missing person cases in the United States.

Finally, the study involved selecting certain cases to examine for accuracy. Since the research only includes adults with previous criminal histories, projecting findings as conclusive evidence to accuracy/inaccuracy of records for the entire database population was inappropriate. Instead, this study was meant to provide an initial test for data validity and develop insights from a national database of missing persons, an exercise that had not been previously attempted.

Chapter 4: Results

Introduction

The purpose of this study was to assess the accuracy of missing person records from the US Department of Justice's NamUs database by comparing individual characteristics that were documented in local arrest reports. Selected variables for comparison included individual height, year of birth, hair color, and eye color. Further, information collected on the socioeconomic status of the individual and the length of time between when a missing person report was filed and the actual date the person was last seen was examined. This is a quantitative study that employed statistical analysis to assess nominal, ordinal, interval, and ratio level variables. Finally, and modeling the weighted approach used to assess record accuracy in criminal justice case files, Fahsing, Ask, and Granhag's (2004) scoring technique was employed to compare the validity of missing person records.

Methodology Review

As a quantitative research study intended to statistically examine characteristics through multivariate analysis, the selected research design for arguing cause and effect is essential. Of the three general quantitative research designs of true, quasi, and non-experimental, the former represents the strongest assertion toward causality (Bachman & Schutt, 2017), but is difficult for researchers to abide by due to the approach's strict conditions. Specifically, possessing at least two comparison groups (one receiving the treatment and one not), randomly assigning between those comparison groups, and utilizing an assessment of change in the dependent variable for each of the two or more formed groups after the independent variable or proposed treatment has been received are often unfeasible for research projects (2017).

Regrettably and as stated earlier in this document, no previous studies or comparisons of missing person case data were located in the peer-review literature. Subsequently, this research was foundational and offers a first attempt at assessment. As such, a non-experimental design was employed to compare the validity of characteristics of missing persons between NamUs and arrest reports. Specifically, data were collected at one point in time using a traditional design. For NamUs, missing person case attributes were collected from the initiative's publicly searchable database during the spring of 2019. Arrest report data were gathered from historical and publicly available sources that reflected characteristics collected by the reporting law enforcement agency at the time of the incident. In essence, the methodology was cross sectional, while employing elements of an ex-post facto design in that the events being studied were historical in nature.

The goal of this research was to connect portions of two theories, Black's Behavior of Law and social exclusion, to potentially explain discrepancies in missing person case records. In contrast to an inductive logical approach that would have involved beginning with data, empirically generalizing observations, and then attempting to connect findings to existing theory, this research used a deductive strategy. Specifically, this study began with Black's theoretical construct of stratification or that perceived status of an individual could impact the treatment by law enforcement in terms of investigation quality. Research questions and falsifiable hypotheses were formulated to test the assertion that perceived stratification would be different for those with a low socioeconomic status versus other missing persons. As such, a deductive strategy that attempted to connect theory to data was employed.

To effectively assess NamUs missing person records, an alternate source for records had to be identified — in this instance, arrest reports. With this strategy, only a portion of missing persons have been previously arrested, so a limited number of records were included for

examination. Further restricting the number of cases included for examination, inclusion in the study was limited to those arrest records made publicly available by the involved law enforcement agency. As such, the sampling strategy was non-probability in that not every missing person case file had an equal chance of being selected for comparison.

In addition to the non-probability sampling used, the selection approach utilized was purposive. Bachman and Schutt (2017) described purposive or judgement sampling as selecting records based on position within or knowledge about a population. For instance, a researcher studying citizen complaints against police from traffic citations could interview numerous police officers who make traffic stops or interview select supervisors about the topic. The advantage with the latter is that the supervisors would be most knowledgeable about overall complaints in the patrol sector, while researchers could make the study's logistics more manageable by reducing the number of police personnel to interview. Through judgement sampling, a more focused approach is used that selects records with a purpose, allowing a researcher to collect in-depth information without sacrificing quality. The deductive research approach was employed to assess the study's three research questions as stated previously (see pages 45-47 for these research questions, as well as for the associated hypotheses).

Participant Demographics

A total of 161 records of missing persons were located on NamUs and publicly available arrest or warrant databases. Selected cases were limited to adults (18 years of age or older at time of being reported missing), and to those missing in the United States. Even though those 18 years of age were eligible for inclusion in the study, the practicality of locating arrest records for those in the youngest age bracket was unfeasible. Explicitly, juvenile arrest records are sealed for the most part, and locating a previous arrest history from publicly available sources is unlikely for

someone under 18 years of age. Consequently, the older the missing person is at time of report, the more likely existing historical records were to be located.

The derived cases of missing person investigations in this study reflected cases from 38 states. Florida had the highest number of missing persons examined with 34 or 21.1% of the sample, while North Carolina (n= 14 or 8.7%) and Kentucky (n = 8 or 5.0%) were respectively the next highest states represented. Again, the study was limited by the availability of public arrest records, so unfortunately information for individuals from states like Illinois, Hawaii, Nevada, and North Dakota was not located. Similarly, populous states like California (n = 5 or 3.1%) and New York (n = 1 or 0.1%) that seemingly restrict publication of arrest data were significantly underrepresented in the sample.

The Old South including Florida, Georgia, South Carolina, North Carolina, Alabama, Virginia, Mississippi, Louisiana, Arkansas, and Texas had the most missing person incidents evaluated (see Table 1), and comprised more than half of the sample (n = 87). More specifically, Western region states like California, Arizona, Colorado, New Mexico, Oregon, and Washington comprised only 13.6% of the sample of missing persons. Similarly, states in the Northeast were underrepresented as cases examined from New York, New Jersey, Pennsylvania, Connecticut, and Vermont comprised only 6.2% of the missing person records assessed.

Since this study compared publicly available arrest report data to NamUs missing person records, more recently published cases were more likely to be located online. Although cases range from 2002 to 2018, the sample predominantly featured cases from the past few years – unfortunately ignoring older incidents where arrest histories were less likely to be located. More specifically, the mean year of sampled cases was 2013, while the median year was 2014, and the modal year (n = 23) was 2016 (for cases by year, see Table 1).

Reported biological gender of the missing person cases was 28% female ($n = 45$) and 72% male ($n = 116$). According to published demographics of missing persons (Kepple, Epstein, & Grisham 2014), males represented only approximately 52% of cases, suggesting that males in the sample were overrepresented. This discrepancy can be accounted for insofar as that this study targeted missing persons who have also been arrested, and research indicates that males are significantly more likely than females to be arrested. According to the FBI's Uniform Crime Reports (UCR) in 2017, 73.0% of total arrestees in the US were male, while males accounted for almost 8 out of 10 arrest for violent offenses (2017). For this study, any person with misdemeanor or felony arrest at the local, state, or federal level was eligible for inclusion.

The sample was comprised of 99 missing persons who were listed as White (61.5%), 39 who were Black (24.2%), and 18 (11.2%) were persons reported as Other races. A small portion of the sample's race was unknown (3.7%) as the missing person cases were solved prior to that field being documented for this study. Similar to gender, these arrest by race percentages are congruent to 2017 UCR reports by race in that White represents about 69% of total arrests, while Black is 27.2% of total arrests. The year of birth was located for 120 of the 161 missing persons studied. The mean age was 38, the median age was 36, and the modal age was 22 ($n = 8$). Further and from published national studies, persons with race listed as Black comprise about 33% of missing person cases (Kepple, Epstein, & Grisham 2014), which is 9 percent higher as compared to this study's sample.

Table 1
Case Counts by Gender, Race, Geography, and Year

Characteristic	N	Percent of Total
Gender		
Female	45	28%
Male	116	72%
Race		
Black	39	24.2%
White	99	61.5%
Other	18	11.2%
Unknown	6	3.7%
Geography		
Florida	34	21.1%
North Carolina	14	8.7%
Kentucky	8	5.0%
Alabama	7	4.3%
Mississippi	7	4.3%
Arizona	6	3.7%
Michigan	6	3.7%
By Year		
2014-2018	79	51.3%
2009-2013	54	35.0%
Pre 2009	21	13.6%

For cases examined, the average number of days between actually missing and being reported to authorities as missing was 33. This mean is ineffective though in understanding the sample though as the median is seven days, while the standard deviation is a bloated 78 days. This is due to a couple of extraneous values from investigations in which the individuals were not reported missing to authorities for more than a year. As discussed previously, those disconnected to society may go unnoticed when they are missing, and not reported to police for years — thus impacting measures of central tendency when included in a sample.

Finally, missing person addresses were noted when available. Since this study was limited to publicly accessible databases, locating home addresses was a challenging task. Understandably, publishing home addresses infringes on the privacy of those missing as well as the families involved — as such, it is typically not done. Despite this obstacle, the residential street address resided was located for 73 of the sample cases (45.3%) by scouring through news articles and published police reports. Persons identified as homeless or transient by law enforcement were also included in the 73 cases, and represented almost one-third ($n = 23$, 31.5%) of the missing persons.

Coding

To prepare the data from NamUs and the located arrest reports for analyses, various coding procedures were followed. Several variables required little adjustment and were directly transcribed as located from the relevant secondary source to the study's database. For instance, geographic location of the incidents and gender were simply collected and transferred to the created database. Some of the characteristics required only minor conversions/calculations to prepare for analysis. For instance, the height for each missing person was converted to inches. NamUs uses a range of heights for some of listed individuals, so the average NamUs height was

compared to arrested height, and any differences were noted. Similarly, NamUs only reports a missing person's current age, so the date of birth noted by the arresting agency was modified to year of birth as well.

Other fields in the database required more effort to code. To quantify the disparity between the days actually missing and when the person was reported missing required two steps. First, NamUs lists a field for when the individual was reported missing, but not always a date of the actual disappearance — so that information was noted either from NamUs files or more frequently studying law enforcement press releases from the incidents. Where possible, the date missing was recorded. Once the two dates were noted, the difference in days of incident to report was calculated. As stated in the previous section, this disparity was calculated for just over 45% of the cases.

Three other groups of variables created complexity for the subsequent analyses: hair color, eye color, and socioeconomic status of the missing persons. The problem encountered with hair and eye colors was not with NamUs, but rather with the scarcity of finding comparative records from arresting agencies. Within the public information of arrest data, hair and eye color for arrestees were not frequently released impacting the collected sample. For hair color, only 33 of the 161 records (20.5%) contained the necessary descriptors for comparison. Similarly, only 32 of the sample cases included eye color within the missing person and arrest reports.

Since hair and eye color are nominal values and the posed research questions necessitated Chi-Square analyses, the low number of cases limited the test's ability to work. To improve the likelihood that the Chi-Square would function properly, eye colors were coded in terms of human genetic properties into a binary categorical variable that was either dominant or recessive. These categories are consistent with general genetic classifications of the independent alleles that

drive visible human eye and hair colors (Bonner, 2011; Sturm & Larsson, 2009). As such, dark colors like black and brown were considered dominant hair and eye colors, while lighter colors comprised the recessive category.

Coding for socioeconomic status among individuals is typically a challenge for researchers (Svedberg, Nygren, Staland-Nyman, & Nyholm, 2016; Delaney, Tangtulyangkul, & McCormack, 2013). To assign this status, researchers may use responses from self-report surveys, but certainly home address can be indicative of wealth or poverty within jurisdictions. Typically, large urban areas have detailed resources to assess what geographic locations are impoverished within a city. Conversely, evaluating suburban and rural communities by location is significantly more challenging; especially for projects like this study that required assessment of urban and non-urban residential addresses from across the US.

Provisionally, a part of the US Small Business Administration's Historically Underutilized Business (HUBZone) certification process provides a valuable tool for examining estimated poverty level by home address (2019). With this online resource, individual addresses can be entered and the results provide a determination as to whether the location is in a historically deprived area. This tool uses US Census economic data, American Indian and Alaskan Native land boundaries, and other factors to classify impoverished areas.

Though challenging to locate due to privacy reasons, just under half of the sample's home addresses were recorded. These addresses were manually entered into the HUBZone search tool, and classified as either within a low socioeconomic area or not. Socioeconomic status was then coded as an ordinal variable in that either the missing person residence was considered "low" due to HUBZone determination, or "moderate or higher" again from the HUBZone tool. A third category of "very low" was also added for missing persons that were

characterized as homeless or transients by law enforcement agencies. Using this coding approach, 73 of the 161 cases or 45.3% were assigned a socioeconomic status of moderate/high, low, or very low.

Finally, a total accuracy score was coded to better reflect the recorded validity of variables in the NamUs database. Composite weighted scores to reflect accuracy in complex relationships have been employed successfully to illustrate other incidents in the criminal justice peer-review literature. For example, Fahsing, Ask, and Granhag (2004) examined the accuracy of eye-witness statements from bank robberies based on historical police records. As opposed to examining an eye-witnesses' description for dozens of characteristics about the perpetrator (e.g. height, weight, clothing description, direction of flight, etc.), the researchers weighted each characteristic and assigned a percentage score based on aggregate validity of the description.

Using Fahsing, Ask, and Granhag's (2004) composite score model, four recorded characteristics of missing persons were assessed for accuracy: eye color, hair color, height, and age. These four attributes were weighted equally at 25%, with a perfect score for a completely accurate record being 100%. For hair and eye color, if a discrepancy existed between the recorded characteristic in NamUs and the arrest report, the case was assigned a -25% for each.

For recorded heights, a discrepancy between $\frac{1}{2}$ inch and up to two inches was ignored and counted as an accurate listing. For recorded differences between two and three inches, a modest 5% was deducted, while discrepancies over 3 inches resulted in a 25% accuracy deduction. A similar approach was used with grading age — a one-year difference in NamUs and arrest ages resulted in a 5% accuracy score deduction, while for more than a one-year discrepancy, 25% was subtracted from the total accuracy score. Since NamUs does not reveal the missing person's date of birth to the general public, the date of birth listed on the arrest report

had to be compared by the researcher to the listed age (in terms of year of birth) that appeared on the NamUs record at time of reference.

Lastly and as stated previously, obtaining comprehensive arrest records for comparison with NamUs missing person data were difficult to obtain. This especially hindered the researcher's ability to assess potential differences in eye color and hair colors, with only 32 and 33 records available for consideration, respectively. Further, numerous records lacked a recorded height, socio-economic status, and/or days missing, that precluded the cases from being analyzed for differences, correlations, regression, etc.

Fortunately, researchers can employ valid statistical tools that estimate missing variables in data sets. Linear interpolation or analyzing existing data to create best estimates that geometrically connect two known points with a straight line (Salomon, 2006) is a commonly used strategy for estimating missing data . The empirical literature in the social science discipline contains numerous examples of using linear interpolation to predict variables including studies examining neighborhood populations (Papachristos & Bastomski, 2018), poverty characteristics (Kovanidzic & Vieraitis, 2006), and police leadership demographics (Miller & Segal, 2012).

As a final step in coding, linear interpolation was applied to create estimated values for 7 variables that contained missing data from the 161 cases selected. The cases impacted by this process were 135 or 85% of the data set. Specific variables coded using this interpolation approach included the difference between days actually missing and days reported missing, height, hair color, eye color, socioeconomic status, race, and age as represented by year of birth (See Tables 2 and 10).

For eye color and hair color, linear interpolation created the most values with almost four out of five being estimated by the technique. Around half of the values were developed for

height and the difference between days actually missing and days reported missing. In contrast, missing values were few for a missing person's age (5.59%) and race (3.10%). The total number of missing values generated for each variable is depicted in Table 2.

Table 2

Linear Interpolation: Summary Results of Created Variables and Values

Characteristic	Values Created	Pct. of Total Values
Hair Color	126	79.3%
Eye Color	126	79.3%
Socioeconomic Status (SES)	88	54.7%
Days Missing minus Days Reported	81	51.6%
Height	50	31.3%
Age	9	5.6%
Race	5	3.1%

Data Analysis

Descriptive analysis in comparing NamUs characteristics for missing persons versus arrest report data did reveal some discordance. For the total accuracy score computed by using Fahsing, Ask, and Granhag's model (2004) and weighted by hair and eye colors, age, and height, 23.0% of the total cases (n = 37) contained a least one discrepancy. Of these 37 records, 17 (46.0%) contained a very minor conflict between arrest and missing person reports (e.g. a difference of between two and 2.5 inches in recorded height). Further, only one record (0.6%)

contained conflicts in two of the assessed categories, and no record contained discrepancies in more than two characteristics.

Table 3

Available Demographics for Missing Persons: From NamUs and Arrest History Datasets

Characteristic	n (Records Available)	Pct. of Total
Height	109	67.7%
Age	120	74.5%
Eye Color	32	19.9%
Hair Color	33	20.5%
Socioeconomic Status (SES)	73	45.3%
Days Missing minus Days Reported	76	47.2%

Unfortunately, comprehensive arrest records that could be fully compared to NamUs cases were difficult to locate, and Table 3 above displays a summary of the number of partial records used for each of the six statistical analyses. Accordingly, specific demographic information for missing person incidents included in tests of each of this study's hypotheses will be described. Further, each statistical test was conducted using SPSS software.

Hypothesis one: There will be a significant difference in missing person heights as recorded on NamUs and arrest histories.

As stated previously, the first research question and accompanying four falsifiable hypotheses to examine potential differences in recorded characteristics (e.g. height, age, eye color, and hair color) between NamUs and arrest information. Of the 161 cases in the sample,

only 109 contained comparable recorded heights between NamUs and arrest reports, and this subset's demographics were similar in some ways yet differed in others from the entire sample collected. First, cases included with heights were consistent with the gender and racial composition of the full sample. This subset was comprised of 27.5% females, while the full sample included 28.0% females. Race of the height subset was White 62.9% and Black 26.7% as compared to the complete sample's makeup of White 61.5% and Black 24.2%, respectively.

Geographic representation of the cases with heights is consistent with the full sample in that it is overrepresented by incidents occurring in Florida (22.5%) and Kentucky (7.4%), while being distinctive in that Arizona provided 6 cases (5.6%) for this analysis. One difference between this subset and the overall sample is with age in that persons considered for this analysis tended to be older. Mean year of birth for records with heights was 1973 with a median of 1976, while the full sample mean year of birth was 1980, with a median of 1983.

With two ratio level variables in terms of listed height in inches, an independent measures T-Test was performed to determine whether there was a significant difference in the recorded heights of missing person cases from NamUs and in arrest reports. Again, 109 records or 67.8% of the cases sampled had listed heights and could be included in this analysis (see Table 4). From this independent samples t-test, the null hypothesis ($H_0: \mu_1 = \mu_2$) was that no significant difference existed between heights recorded in NamUs ($M = 68.30, SD = 4.17$) versus those in arrest reports ($M = 68.17, SD = 4.04$). The alternative hypothesis ($H_1: \mu_1 \neq \mu_2$) was that there was a significant difference between heights recorded in NamUs versus those in arrest reports. Results generated a p-value = .821 and suggested that no significant difference existed between the heights recorded in NamUs versus those in arrest reports [$t(216) = 0.227, p > .05$].

Table 4

Output of Independent Samples T-Test for Missing Persons: NamUs Heights and Arrest Heights

Height Source	n	Mean	Std. Deviation	Std. Error Mean
NamUs	109	68.3005	4.16830	.39925
Arrest	109	68.1743	4.04339	.38729
t	df	Sig. (2-Tailed)	Mean Diff.	Std. Error Diff.
.227	216	.821	.12	.56

Hypothesis two: There will be a significant difference in missing person ages as recorded on NamUs and arrest histories.

To analyze listed missing person ages in NamUs and arrest reports, 120 (74.5%) records from the total sample were available. In comparing demographics of the age subset versus the full sample: the age subset was older with a mean year of birth of 1975 and a median year of birth of 1977 (sample mean = 1980 and median = 1982), and contained a higher percent of individuals with race/ethnicity listed as Black (29.2%) as compared to the full sample (Black = 24.2%). Gender between the age subset and full sample were equivalent with Males representing 72% of both groups, while geographically Florida and North Carolina contributed the most cases for the subset and sample.

Similar to the analysis conducted for the first hypothesis, this test involved age of the missing person as both the independent and dependent variables — also both ratio variables. Subsequently, an independent measures t-test was used to evaluate whether there was a significant difference in the recorded ages of the missing persons as documented by NamUs and

in arrest records (see Table 4). Year of birth for each missing person was used to calculate age, and again, 120 records contained the information necessary for calculating missing person ages.

From this independent samples t-test, the null hypothesis ($H_0: \mu_1 = \mu_2$) was that no significant difference existed between ages recorded in NamUs ($M = 1974.74$, $SD = 12.695$) versus those in arrest reports ($M = 1974.64$, $SD = 12.713$). The alternative hypothesis ($H_1: \mu_1 \neq \mu_2$) was that there was a significant difference between ages recorded in NamUs versus those in arrest reports. Results generated a p-value = .992 (see Table 5) and suggested that no significant difference existed between the ages recorded in NamUs versus those in arrest reports [$t(238) = 0.061$, $p > .05$].

Table 5

Output of Independent Samples T-Test for Missing Persons: NamUs Age/Year of Birth and Arrest Age/Year of Birth

Age Source	n	Mean (Yr.)	Std. Deviation	Std. Error Mean
NamUs	120	1974.74	12.695	1.159
Arrest	120	1974.64	12.713	1.160
t	df	Sig. (2-Tailed)	Mean Diff.	Std. Error Diff.
.061	238	.992	.100	1.640

Hypothesis three: Missing persons' eye colors as recorded in NamUs and arrest records will not be significantly related.

To assess discrepancies between recorded eye color for missing persons in NamUs and arrest reports, only 32 (19.9%) cases of the full sample could be employed. Geographic location

of missing person cases included in the subset were similar in overrepresentation by states in the Old South Region including Kentucky, Florida, and Mississippi, but otherwise differed from the full sample. Specifically, males were overrepresented in the eye color subset in that males comprised 87.1% of the cases used in this analysis versus only 72% of the entire sample.

Similarly, persons listed as Black were overrepresented and comprised 38.7% of the subset versus 24.2% Black for the entire sample. Conversely, individuals recorded as Other were vastly underrepresented accounting for only 3.2% of the subset versus 11.2% of the Other category for the full sample. Further, the eye color subset was generally comprised of older persons (Mean birth year = 1975) as compared to the entire sample (Mean birth year = 1980).

Table 6

Chi-Square Test for Missing Persons: NamUs Eye Colors and Arrest Eye Colors

			Eye Color (Genetic)		Total
			Dominant	Recessive	
Eye Color (Genetic)	Dominant	Count	18	1	19
		Expected Count	11.3	7.7	19
	Recessive	Count	1	12	13
		Expected Count	7.7	5.3	13
Total	Count		19	13	32
	Expected Count		19	13	32

Because eye-color is a nominal scaled variable, a Chi-Square test for Independence was used to evaluate whether missing persons' eye color as recorded in NamUs and in arrest reports

were significantly related. As discussed above in the coding section, dark colored eyes were categorized as “dominant,” while lighter colored eyes were categorized as “recessive” to properly denote their genetic origination. Results suggested that missing persons’ eye colors as recorded in NamUs and in arrest records were significantly related ($p < .05$; see Table 6 above). Thus, the two data sets were almost completely similar in documenting this attribute ($\chi^2 = 24.246, p = .000$).

Hypothesis four: Missing persons’ hair colors as recorded in NamUs and arrest records will not be significantly related.

Similar to the analysis conducted for the third hypothesis, the number of cases with hair color recorded for both NamUs and arrest reports was limited ($n = 33$). Also, the demographics for the hair cases subset were very similar to that of the eye color subset, and likewise differed from the full sample. Specifically, the hair color subset included a greater percentage of male subjects (84.4% = subset versus 72% for the full sample), and the mean birth year was younger for cases with hair colors ($M = 1975$) versus the total missing person sample ($M = 1980$). Conversely, geographic representation of the hair color subset was consistent with that of the larger sample whereas cases from Florida and Kentucky were the most common, and racial composition of the subset and full sample were very similar in that those listed as White represented 59.1% of the subset and 61.5% of all cases.

Similar to eye color, hair color is also a nominal scaled variable. Accordingly, a Chi-Square test for Independence was used to evaluate whether missing persons’ hair color as recorded in NamUs and in arrest reports were significantly related. As previously discussed in the coding section, dark colored hair entries were categorized as “dominant,” while lighter colored hair entries were categorized as “recessive” to properly denote their genetic origination.

Unfortunately, due to the small number of cases available for analysis, the Chi-Square test was deemed invalid as three cells had expected frequency counts below 5 (see Table 7). As such, the results were not useable in assessing recorded hair colors between NamUs and arrest reports.

Table 7

Chi-Square Test for Missing Persons: NamUs Hair Colors and Arrest Hair Colors

			Hair Color (Genetic)		Total
			Dominant	Recessive	
Eye Color (Genetic)	Dominant	Count	26	1	27
		Expected Count	22.1	4.9	27.0
	Recessive	Count ^a	1	5	6
		Expected Count	4.9	1.1	6
Total		Count	27	6	33
		Expected Count	27	6	33

a. 3 cells (75.0%) have expected count less than 5. The minimum expected count is 1.09.

Hypothesis five: Socioeconomic Status (SES) will have a significant effect on overall missing person record accuracy.

The fifth hypothesis explored the second research question: Is there a difference between the socioeconomic status (SES) and the accuracy of the recorded characteristics (e.g., height, age, eye color, and hair color) in NamUs? To examine SES of the missing persons in terms of overall case accuracy, 73 (45.3%) records were available for analysis. The demographics for the SES subset were similar to the overall sample in that females represented about 28% of both

datasets, while racial assignment by NamUs and arrest reports was also alike with about 62% of the cases involving White individuals and around 25% identified as Black. The mean birth year of individuals in the subset was 1974 — which was older than the mean birth year of the full sample (1980). Further, both the SES subset and overall sample were overrepresented by cases from the Deep South region as states like Florida and North Carolina offered the most incidents for inclusion.

As discussed above in the section on coding, a missing person's socioeconomic status was assigned based on individual home address using the US Small Business Administration HUBZone certification tool. Each record with an address was then assigned one of three levels (i.e., Moderate/High, Low, or Very Low). The dependent variable was an interval level/continuous variable that represented overall calculated accuracy of each of the missing person records, and was based on compared values in four areas: eye color, hair color, recorded height, and recorded age (See Table 7). This variable was denoted using a weighted total accuracy score as previously discussed and demonstrated by Fahsing, Ask, and Granhag (2004).

For this analysis, the independent variable was ordinal with SES, while the dependent variable was interval/continuous as the overall record accuracy. As such, an independent measures single factor design Analysis of Variance (ANOVA) was used to evaluate SES as an effect on the overall accuracy of missing persons' case information. The ANOVA yields a probability value that describes the likelihood of the calculated score being attributed to random chance (Fitzgerald & Fitzgerald, 2014). The conventional probability value of less than 5% was used to verify that any established relationship has only a small likelihood to be the product of chance. Again, 73 records were suitable and included in this analysis. Statistical results computed a p-value = .312 and suggested SES had no significant effect on the overall accuracy

of the four recorded variables between NamUs and arrest records [$F(2, 70) = 1.18, p > .05$]. For the calculations associated with this ANOVA, see Tables 8 and 9.

Table 8

Group Statistics: Socioeconomic Status (SES) and Overall Record Accuracy

SES Level	n	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Min.	Max.
Mod/High	30	.9633	.08604	.01571	.9312	.9955	.75	1.00
Low	20	.9575	.09072	.02029	.9150	1.0000	.75	1.00
Very Low	23	.9891	.02109	.00440	.9800	.9982	.75	1.00
Total	73	.9699	.07395	.00865	.9526	.9871	.75	1.00

a. Computed using alpha = .05

Table 9

Socioeconomic Status and Overall Record Accuracy (ANOVA)

		Sum of Squares	df	Mean Square	F	Sig.
Assigned SES and Overall Accuracy Profile	Between Groups	.013	2	.006	1.183	.312
	Within Groups	.381	70	.005		
Total		.394	72			

Hypothesis six: Delay in reporting a missing person would be significantly related to overall accuracy score of reported records.

The sixth hypothesis was used to test the third and final research question exploring the potential relationship between the difference in number of days missing and being reported missing and the total accuracy score of the recorded characteristics. For this analysis, 76 cases (47.2%) of the total sample were available for examination. The demographics for the days missing subset were consistent with the total sample with respect to gender and racial composition. Males accounted for approximate 3 out of 4 cases for both data sets, while cases involving persons identified as White represented 62% for NamUs and arrest records. This subset's average year of birth (1977) was similar to the overall sample's mean year of birth (1980). Finally, the Southern states were overrepresented in both the delay in reported days missing subset and the overall sample, but Florida even more so with the former dataset. Specifically, cases from Florida comprised over 35% of the days missing subset — while only 21% of the total sample.

For this analysis, the independent variable (delay in days reported missing which was calculated by subtracting days actually missing from days reported missing) and the dependent variable (overall accuracy score) were both continuous variables, and were categorized as ratio and interval level values respectively. Subsequently, regression analysis was used to assess potential relationships between these variables. Again, 76 cases (47.2% of the sample) were suitable for inclusion in this analysis. Results of the regression generated a p-value = .501, and suggested no significant linear relationship between the delay in days reported missing and the overall accuracy score [$F(1, 74) = .458, p > .05$]. For computed results from the regression analysis, see Table 10.

Table 10

Regression Analysis: Difference in Days Reported and Actually Missing and Overall Record Accuracy

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.002	1	.002	.458	.501 ^b
	Residual	.393	74	.005		
	Total	.396	75			

Model	R	R Square	Adj. R Square	Std. Error of Est.
1	.078 ^a	.006	-.007	.07292

a. Dependent Variable: Overall record accuracy ^a

b. Predictor: (Constant); delay in reported missing (days)

Additional Analysis: Missing Variables

As stated previously, the quantitative aspects of the study were hindered by incomplete records. As such, it was necessary to employ linear interpolation as a tool to estimate missing data, with the intent of providing more complete variables within the 161 cases. Through this process, seven tables with more comprehensive variables were generated, and a factor analysis was employed to examine potential explanations of variances between characteristics. Also, reported gender was included in the factor analysis. The goal with this approach was to reduce multiple variable values into a factor that best explains the relationship within the isolated variables, and to identify potential relationships. Table 11 displays the results of the factor analysis, via principal component analysis, with computed Eigenvalues. For the factor to be considered a viable predictor of variability, it must have at least an Eigenvalue greater than 1,

with higher Eigenvalues indicating most usefulness (George & Mallery, 2016). Unfortunately, only four factors possessed Eigenvalues of greater than 1, and all were just percentage points above that minimum threshold. As such, no single factor was deemed particularly useful in predicting more than 20% of the variance between the examined characteristics.

Further, two of the six analyses presented previously to statistically test this study's hypotheses were recomputed using the new variables now more complete with the missing values included from the linear interpolation process described above. Chi-Square tests were not performed again on the eye color and hair color characteristics, as these attributes were comprised of almost 80% estimated values. Similarly, using linear interpolation to create heights and year of birth data for t-tests would not be particularly meaningful either. Conversely, linear interpolation increased the number of cases available to examine the potential relationship of SES to record accuracy, as well as the difference between days missing and reported missing and record accuracy. Regrettably but consistent with the study's previous findings, none of these four statistical tests yielded a p value of less than .05.

Table 11

Factor Analysis: Variables With Computed Missing Values and Eigenvalues Above One

Component	Computed Eigenvalue	Pct. of Variance Explained
Days Missing minus Days Reported	1.36	17.0%
Height	1.29	16.2%
Hair	1.17	14.7%
Eyes	1.10	13.8%

Summary

Of the 161 cases examined in the study, four variables (age, eye color, hair color, and height) were utilized to measure potential differences between missing person listings in NamUs and historical arrest reports. Descriptive counts indicated that 23% of the compared records contained at least one discrepancy between data sets. To assess each of the three research questions and six falsifiable hypotheses, statistical tests were conducted with all indicating that NamUs records and arrest information were very similar. T-tests were conducted to ascertain differences between recorded heights as well as ages between the NamUs database and historical arrest reports. No significant differences were determined. Then, two Chi-Square tests were employed to assess recorded differences between NamUs and arrest reports for recorded eye and hair colors. Unfortunately, the limited number of responses in all dominant and recessive hair categories, rendered the test results incomplete. Despite the limited number of cases examined for eye color, the Chi-Square results indicated that NamUs and arrest data were related (insinuating accurate) — that discrepancies between the two sources were minimal. In addition, it was observed that discrepancies existed in two cases each from the hair and eye comparisons. An ANOVA was used to exam the relationship between socioeconomic status and overall record accuracy — the latter being a composite category modeled after published eyewitness research (Fahsing, Ask, & Granhag, 2004). From this analysis, no evidence of a significant predictor of complete record accuracy was produced. Finally, overall record accuracy again was used as the dependent variable, but this time the delay difference in days between actually being missing and reported missing was computed employing regression analysis. As with the previous assessments, this difference in days as an independent variable was not proven to be a useful predictor of case accuracy.

Chapter 5: Discussion

This chapter discusses conclusions drawn from the study's research questions, falsifiable hypotheses, and related statistical examination regarding the NamUs database, as well as missing person investigations as conducted by law enforcement in the US.

Conclusions: Connections to Scholarly Literature

In examining the accuracy of missing person reports and the possible impact of social exclusion of victims to validity, several of this study's findings offered viable comparisons to the current literature. In Chapter 2, the author found little published research on missing persons in the US, but identified several studies that exist in relation to these incidents. The following represents a connection of findings from the current study to previous themes identified in the peer-reviewed literature.

case typologies.

First and though beyond the scope of this study, the author encountered multiple typologies of missing persons present in the sampled cases as was detailed in previous studies. For instance, the connection between missing persons cases and homicides (Quinet, Nunn, & Ballew, 2016) was observed in that the author noted multiple disappearances that authorities attributed to homicide. Similarly, individuals that were believed to be intentionally missing comprised cases in the sample. Any information gleaned on incident typologies from NamUs was derived from the general case descriptions as constructed by NamUs representatives and not from a separate reporting field. For instance, Sowerby and Thomas (2017) noted that missing persons with mental illness were frequently treated with complacency by authorities. Regrettably, additional specificity regarding this aspect and NamUs, as well as with the assertion

by LePard et al. (2015) that investigators may deemphasize homicide cases involving persons considered transient, were beyond the scope of this study.

Examining missing person typologies in conjunction with this study, the discrepancies found between arrest reports and NamUs could be connected to cautionary commentary inferred by Hartman et al. (2015), as well as Phillips et al. (2014). With the former, the authors lamented the overreliance on the availability of DNA from missing individuals, and inferred that investigators should comprehensively and accurately collect information for possible matches to unidentified decedents (Hartman et al., 2015). Regarding the latter, the quantitative work recommended by Phillips et al. (2014) toward best practices based in search and rescue operations for lost and missing persons is contingent upon factual individual attributes and situational factors being recorded during preliminary investigations.

Unfortunately, the frequency of occurrence and associated problems with the subtype of cases deriving from border areas described by Edkins (2016) and Reinecke (2013) were not aspects verified in the study's findings. Specifically the latter study examined the challenges for law enforcement agencies trying to match missing person reports to unidentified remains related to unsuccessful border crossings. The author discussed how the resources extended to county coroners in these border areas, some offices being located in sparsely populated and rural communities, can quickly be overwhelmed. Anecdotally, the author also noted individual cases where an unidentified decedent was hastily buried and incomplete records were collected, creating additional obstacles for investigators in terms of identification and subsequent criminal investigations (2013).

Inauspiciously, the current study was hampered by small sample sizes of missing persons cases from border regions. As such, this research's few cases from states like California,

Arizona, and Texas did not show evidence of increased record inaccuracies, but is obviously not convincing either way in statistical terms. Further the difficulty in obtaining publicly available arrest statistics in border states did not permit the author to portray the high volume of missing person investigations associated with US immigration issues.

Finally and as stated previously, the variables of socioeconomic status and difference in days missing were not considered viable predictors for overall record accuracy. A better predictor may have been repeat missing persons as a typology. In examining missing person typologies and police response, Bonny, Almond and Woolnough (2016) found that the best predictors of assigned risk were an individual's lifestyle choices and mental health. Indirectly, these variables are related to socioeconomic status and would have been useful to assess as part of the present study. Unfortunately, only sporadic clues related to the missing persons lifestyle and mental health were noted in some of the NamUs profiles—and even then, indicators were limited to the comments section as opposed to having a unique field. Subsequently, measuring these variables for the author's study was not possible within the selected framework.

accuracy.

With respect to accuracy problems and the empirical literature, no previous studies on those missing in the US were located by the author for comparison. Nonetheless, the author noting more than three dozen discrepancies in NamUs missing person characteristics is consistent with potential validity issues identified in other published studies using official criminal justice data (Loftin, McDowall, Curtis, & Fetzer, 2015; Roth et al., 2015; Yung, 2014). Further, this study's findings of discrepancies between an official data source like NamUs and another official data source with arrest histories were consistent with Pettem's (2013) anecdotal

descriptions of inaccurately recorded attributes in unsolved homicide cases that hindered missing person investigations.

In addition, the sample of missing persons considered in this study was consistent with the current literature in terms of biological gender and arrest, but not with gender of the individual. Regarding the former, it is more common for a male to have a previous arrest history than a female (FBI, 2017). Not surprisingly, the study's sample was comprised of nearly 3 out of 4 males. In contrast and with the latter, the study's inclusion of so many males was in contrast to the literature on missing persons that described the likelihood of females and males as near equal in terms of being reported missing (Kepple, Epstein, & Grisham 2014).

In contrast to the theoretical predictions that social exclusion would impact the completeness of missing person investigations (Kiepal, Carrington, & Dawson, 2012) and the findings by Nolan, Haas, and Napier (2011) that connected race to UCR record errors, this study did not find any statistical evidence of inaccuracies being linked to the missing person's listed race/ethnicity or estimated level of social exclusion. As described previously, the small sample size considered for each hypothesis limited conclusions that can be drawn from the study's statistical analyses, but other explanations are plausible.

For instance, authorities may access criminal history information to compile missing person reports more than what was hypothesized by the author. This would support the higher levels of accuracy found in this study, and could indicate that the reports for missing individuals without previous arrests might be more prone to error—though this remains uncertain. Another explanation for the lack of evidence found that connected social exclusion to record accuracy could be that the present study's design focused solely on adults. As such, the observation by Shalev (2011) that repeat missing juveniles were typically treated with less seriousness by

authorities in the United Kingdom was not a premise that could be assessed due to this research's selected methodology.

discretion.

This study focused on aggregate missing person statistics limited to the United States, which made comparing findings from published studies from other countries, previous qualitative or mixed methods research, or documented case studies challenging. As more of a macro-level analysis of selected records, nuisances noted by observing field officers during preliminary and follow-up investigations were beyond the scope of the present research. Nevertheless, several consistencies and inconsistencies between the author's research and other published missing persons studies related to discretion issues were notable.

Connecting this effort's findings within the peer-reviewed literature on discretion and missing person cases was ambiguous. Although the research from Bonny, Almond, and Woolnaugh (2015) involved policing outside the United States, it is a common practice domestically for first responders to also triage missing person cases based on level of risk. The author's study can do little more than acknowledge the diversity in response and resources expended related to the sample's 162 examined cases, as it is unclear which instances were the result of high priority responses by police.

The design of this study also does not contribute to the literature in relation to potential relationships between the experience level of officers conducting preliminary investigations, and how that might impact the accuracy of reporting. Previous studies have detailed that the initial investigations for missing persons are typically conducted by uniformed field officers--personnel that may be the most inexperienced employees within the agency (Fyfe, Stevenson, & Woolnough, 2015). The cases included in NamUs are derived from agencies of diverse sizes and

structure. These agencies may cover urban, suburban, and rural areas, yet they still would have primary investigative responsibilities for missing persons and utilize NCIC and NamUs.

For example, large city police departments like Philadelphia and New York City have specialty investigative personnel for all sorts of cases, while small police departments may have one investigator for all crimes or no separate investigative division. For these small departments, all cases are worked by uniformed personnel, while state police may be contacted for additional assistance. The findings of discrepancies between arrest reports and NamUs could be consistent with the results of previous studies, but additional research assessing agency size and record accuracy is needed to clarify this potential relationship.

As described in the literature review section, previous peer-reviewed studies discussed the importance of having agency policies for missing persons reflect best practices (Perry, 2019; Harris & Shalev Greene, 2016). As was discussed previously, an agency having a policy for this type of investigation and having practitioners following that policy may be two separate issues for researchers to consider. The disparate nature of policing in the United States with thousands of agencies responsible for investigations and enumerable policies, would make assessing reporting procedures on a macro level a daunting task.

The findings of the current study provide little insight into the effectiveness of an individual reporting agency's missing person's policy, but perhaps can be revealing in terms of the overall accuracy found in this study. Specifically, the majority of the cases included in the study were completely accurate in terms of the four measured variables and that could be reflective of law enforcement agencies typically accessing criminal histories and other direct sources of information in collect attributes. Unfortunately, additional research is required to understand the connection between current agency policies and reporting practices.

Another aspect related to discretion noted in the literature that widely impacted missing person investigations was with supervision (Harris & Shalev Greene, 2016; Smith & Shalev Greene, 2015; Fyfe, Stevenson, & Woolnough, 2015; Fyfe, Parr, Stevenson, & Woolnough, 2015). The stage and level of supervisory involvement provides oversight for missing person cases, and as noted previously, can compensate for inexperienced officers that may be assigned to conduct preliminary investigations. This is not always the case though, as noted by Smith and Shalev Greene (2016), in that supervisors may be called to handle what are denoted by an agency as higher-level priorities.

Regrettably, the influence of supervisors on the 161 cases examined for this study was not a variable available for assessment. Perhaps, the study's findings of no significant statistical differences in the case attributes of height, age, eye color, and hair color may be indicative of effective supervisory involvement. Specifically, sergeants and other supervisors could be providing sufficient levels of oversight and correcting potential mistakes before the information flows into datasets like NamUs. Unfortunately, this notion represents only one explanation, and future examinations of supervision levels would make valuable contributions to a better understanding of missing person investigations in the States.

Finally, the purpose of NamUs to broadcast missing person details to audiences in the US and around the world was evident through this study. With the system being revised and relaunched in 2019, the author found NamUs case fields well-constructed and easy to find desired information. The design is supportive of the variety of public, law enforcement, and medical professional users that might utilize searches.

A similar aspect related to cooperation among user stakeholders that was not assessed with this study related to Page & Thurston's (2012) concerns about the lack of cooperation

among Canadian law enforcement and local social service providers. Specifically, for socially disconnected populations like runaways, the mentally ill, and the homeless, social welfare organizations are likely to possess relevant details on persons from these typologies that go missing. If information is not shared and included in repositories like NamUs, authorities could be lacking details necessary for case resolution. This can be especially challenging when the missing person is an unidentified homicide victim which is discussed in relation to findings in the next section.

relationship to homicides and forensics.

Of the sampled cases in which home address could be documented and the appropriate level of high/medium, low, or very low socioeconomic status assigned, 20 of the 73 or 27% were identified as homeless persons. As was discussed in the literature review section, those disconnected to society (e.g., prostitutes, the homeless, etc.) are more likely to be selected as victims by serial killers (LePard et al., 2015; Quinet, Nunn, & Ballew, 2016). It is unknown how many cases listed in NamUs represent such homicide victims, but it is certainly plausible that active missing persons cases are the result of serial killers. For incidents that are eventually resolved, tracking the accuracy of cases for murder victims who are considered marginalized by society would be insightful, and could provide practitioners with additional information on modus operandi, including specifics on target selection.

Tracking connections between those missing who were considered to have low socioeconomic status and were also linked to homicide victimization is supportive of information discussed previously in the context of forensics and missing person. From this study's findings, 43 of the 73 cases were coded as having a socioeconomic status as either "Very Low" or "Low." From the previous literature, this would in general indicate that these cases would provide more

obstacles for investigators. Specifically, that those with fewer social attachments within the community are taken less seriously by authorities and are more likely to go unnoticed as missing. This creates complexity in that involvement by authorities may be delayed, as compared to a close-knitted family that reports a loved one missing the same day that the individual fails to return home from work at the expected time.

Knowing that individuals less connected to society, as with 59% of those considered in this study, will likely require more effort by investigators makes for connecting forensic resources essential. Hartman et al. (2015) described the need for obtaining mitochondrial DNA or DNA samples from a missing person's mother to assist with investigations. Parmalee (2011) discussed the potential availability of Phenylketonuria cards for missing persons. These records, better known as infant blood spot cards, are collected for every hospital birth in the US, and in some states retained for years or even indefinitely. For example, these samples are destroyed within a few months for infants born in Texas, while in Michigan, the cards are retained indefinitely (Duncan, 2019). If investigators are dealing with missing persons from perceived lower socioeconomic statuses as was found to be found in almost 3 out of 5 incidences, knowing about these forensic options are available can be useful in resolving incidents pertaining to the homeless or transient individuals.

Conclusions: Assessed Hypotheses and Additional Descriptives

The two-fold nature of the research was to assess the accuracy of certain missing cases files contained in the NamUs database, and to examine whether socioeconomic status could be used to predict patterns within those records. Interestingly and for the 6 testable hypotheses, not one of the tests indicated that statistically significant accuracy problems existed between the two data sets. In non-technical terms, the four attributes of NamUs data examined (e.g., height, age,

eye color, and hair color) fared well in terms of validity. Further, there was no statistical evidence that an individual's real or perceived socioeconomic status impacted the accuracy of data obtained for missing person case files.

Despite not producing any statistically significant findings, the results provided a first-hand look at cases files involving missing person in the US. Without using law enforcement sources, the sample consisted of 161 missing person cases that have been previously arrested. Consistent with the contributions of Black's Behavior of Law and exclusionary theory, it is then reasonable conjecture that those with previous arrest histories comprise a significant portion of active missing person investigations. About one in four of the NamUs cases examined contained at least one minor discrepancy between recorded height, age, eye color, or hair color at time of arrest.

The non-probability sample was comprised of 72% males and 28% females, with an average age of 38, and a median of 36 years old. Racial composition of the study's sample was White = 61.5%, Black = 24.2%, and Other = 11.2%. In comparison to missing persons in the US, these numbers are generally inconsistent with aggregate numbers for those missing. Men and women are more likely to be listed as officially missing at equal frequencies (Kepple, Epstein, and Grisham, 2014). Nevertheless, the 7:3 ratio male-female ratio found in the present study is similar to FBI statistics in that men are much more likely to be arrested than women (2013).

Further, Kepple, Epstein, and Grisham (2014) reported that approximately 33% of missing persons were Black, which is about 9% higher than the present study's sample. Applying the same rationale to race that was described above with biological gender, these numbers are similar to annual reporting frequencies of arrest by race. The issue of missing person and race warrants additional study as it can be argued that the families of persons of Color who go

missing face additional challenges related to discrimination in reporting and publicity of cases (Sommers, 2017), and this could impact the validity of voluntary repositories involving like NamUs. Subsequent studies could examine this premise and quantify cases for statistical analysis, but unfortunately the author could not assess this variable due to the study's nonexperimental design.

As discussed previously, even with considering an outlier case in which an individual was not reported to police as missing for more than a year, the median reporting time to authorities was 7 days after missing. In general, the days difference between when a missing person went missing and when that individual was reported to police can be considered a measurement tool for identifying related socioeconomic status. Specifically for this study and applying Black's theory with an emphasis on stratification, this week-long difference may be indicative of the potentially disconnected lives that those with frequent police contacts lead — contributing to at least 7 days of delay before being reported to authorities.

The challenge of examining partial records for the majority of the sampled cases led the author to employ factor analysis. The approach was an attempt to use variances and replicate missing variables to provide a more robust dataset for analysis. Regrettably, the calculated Eigenvalues produced no additional insights in terms of relationships between the collected variables. For future studies involving missing persons, using factorial analysis should be employed with caution as discrepancies were noted in the NamUs database and those could cause generated numbers to lack usefulness. Also, this study was hampered by a small sample size and for variables like difference in days missing and reported missing involved a large variance—some individuals were reported the day they went missing, while authorities were not notified about other individuals until years later.

Finally, the scoring method described previously as employed in the literature by Fahsing, Ask, & Granhag (2004) worked well with calculating an overall accuracy for record comparisons, but was not without faults. Since the records between NamUs and arrest histories were only assessed using 4 publicly available variables, it does not mean that the overall record is without error. NamUs contains several pages of descriptive and situational factors and mistakes beyond the assessed variables could very well exist, unnoticed by the methodology employed within this study. Further, weighted averages defined earlier represented significant deductions if found to contain a discrepancy between eye color or hair color, yet this point deduction could only be assessed for less than 33 or 21% of the cases collected in the sample. More discrepancies might have been resident in the other cases, but those attributes were not available for collection and comparison.

Strengths of the Study

This study offered several strengths with respect to missing person investigations. As stated previously, no examination of the missing person record validity for NamUs appears in the peer-review literature. An asset of this study is that it is foundational and offers one constructive attempt at assessing the accuracy of information contained in the NamUs — the official data that are publicly accessible. By bringing attention to a relatively unknown data set, it can encourage others to conduct quantitative and qualitative research to benefit practitioners of the discipline.

Second, multiple case characteristics were tested including hair and eye color, recorded height, and age of the missing individual that allowed for a more comprehensive evaluation of the NamUs data. Though not every arrest record located of included missing persons was complete, still 161 persons were found that were both listed as missing and had arrest histories. This sizeable sample size allowed greater confidence in the computed results. Further, the

sample was diverse and the demographics for those included in the sample were comparable to the UCR's published totals for crimes by gender and race.

Another strength was illustrating the value of using official reports like arrest histories as a data source for missing person investigations. When an individual has no close family or social circle or is otherwise disconnected from society, the reporting party for the missing person may have very limited information for authorities. For instance, if a landlord wants to report a tenant missing to police, he or she will likely know little about the missing individual's attributes like height, weight, presence of tattoos or scars, etc. Yet, these characteristics are essential for authorities in conducting follow-ups and searches. This research demonstrated that such specific information can be located using arrest histories and then used to enhance subsequent missing person reports.

An unexpected strength from this study was the technique used to quantify socioeconomic status (SES) for a person. The peer-reviewed literature echoed the challenges of assigning accurate socioeconomic status for individuals (Svedberg, Nygren, Staland-Nyman, & Nyholm, 2016; Delaney, Tangtulyangkul, & McCormack, 2013). Researchers have employed a variety of means to assign an SES including location-based measures, self-reporting through surveys that elicit income and educational information, as well as relying on self-reporting focused on the respondent's perception of being socioeconomically deprived. Certainly, self-reports of estimated SES and perceived SES have merit, but with the availability of mapping and location-based technology, researchers see the value in obtaining the home address for each participant, so that Census data can be used to assess each person's SES.

Anecdotally, three social science professors told the researcher that they were unaware of any national search tool that could be used to assign a socioeconomic status by location.

Typically, location-based tools are limited to Census and other government economic data in large urban areas only. The researcher's previous work experience in government consulting provided knowledge of the US Small Business Administration's HUBZone mapping tool, which does provide specific information on disadvantaged locations by address. Subsequently, the study allowed for a valid method to assign socioeconomic status based upon street address throughout the United States — an approach that could be useful for studies well beyond just missing persons research.

Weaknesses of the Study

In contrast, several weaknesses of this study were notable. First, sample size was a prohibiting factor in terms of the findings. Although 161 missing persons were located with arrest histories, this represents only around 1% of the 16,000 or so cases listed in the NamUs database. If it was feasible to use random selection and employ probability sampling techniques, the sample size of 161 could be argued as representative of that larger population. Unfortunately, a non-probability research design was used that employed purposive sampling. Subsequently, findings should be viewed with more caution in that there is a greater risk that the records examined were not reflective of the NamUs case population.

Second, using publicly available arrest histories created multiple obstacles for developing valid conclusions. Of the 161 records located, many included only partial listings for the arrestee. This was apparent with the analyses for eye and hair color as only 32 and 33 records respectively were available for examination. Similarly, the lack of availability of the published home addresses weakened the ability to assign a socioeconomic status through the HUBZone certification tool. Subsequently, less than half of the examined cases ($n = 73$) were included in the assessment of socioeconomic status on the overall record accuracy. More of the sample was

utilized to compare heights between NamUs and arrest records, but still the analysis was limited to only 109 of the sample cases (67.7%).

Another weakness of the study was related to geography of the investigated records. Although any case in the US could be considered for inclusion, the availability of arrest reports was more common in Southern states. As such, the cases examined were plentiful for states like Florida and North Carolina, but predominantly absent for populous states like New York and California. Further and despite collecting 161 sampled cases, most states had only a handful of records to be evaluated — thus, potential patterns for discrepancies that could be resident in the reporting by specific states would not be observed with this study's methodology.

Related to the geographic challenge and the diverse number of agencies that are involved in the investigation of missing persons are cases derived from tribal lands. The present study featured a handful of incidents that were being managed by either investigators with a specific tribe or by the FBI—the federal law enforcement agency with jurisdiction within Indian lands in states like Arizona, Utah, and Minnesota. Perry (2019) described that the exact number of missing persons in the Navajo Nation is presently unknown--a territory that covers a vast land area in four states--but that tribal investigators utilize NamUs regularly when working cases. Thought it was beyond the scope of this study, a subcategory related to the weakness in this research was that the selected design did not delineate incidents in Indian territories, and therefore could not consider record accuracy specifically involving incidents within tribal lands.

Finally, the study's design that required missing persons cases be compared to publicly available arrest reports created weakness through an unintended recency bias. As stated previously, the earliest case included in the sample was from 2002, while the mean year of missing persons considered was 2013. Unfortunately, NamUs contains thousands of records

prior to 2002, but locating older arrest reports online is improbable. Subsequently, discrepancies may be present in missing person cases that are decades old, but could not be detected due to the absence of comparable records.

Limitations of the Study

The challenge of assessing missing person data in NamUs is evident in that no published studies exist in the peer-review literature for this topic. With the current study, practical decisions were made in terms of feasibility. As mentioned in the previous section, the incorporated sampling strategy was necessary to locate sufficient data for analysis, but is not considered representative of the population. To accomplish this research, a non-probability purposive sample was collected that limits the validity of the discussed findings. In essence, arrest records that were conveniently located were included, which is inconsistent with random selection in that all cases of a population should have an equal chance of being chosen for a sample.

Another limitation for this study pertained to the inclusion of only adults, as well as only those with criminal histories. This was necessary as only adult records would be accessible for public view — juvenile arrest/petition to the court records are for the most part sealed. Conversely, juveniles comprise a significant percentage of missing persons, yet these non-adult records were not assessed for accuracy. Similarly, the general availability of the arrest information to the public restricted the number of records that could be examined, as well as obtaining complete cases that listed eye color, hair color, age, and height. Regarding the exclusion of missing persons without criminal histories, this approach restricts the aggregate assessment of NamUs record validity. Unfortunately, the percentage of missing persons with

criminal histories is unknown, but this study's approach limited the accuracy assessment to perhaps half of NamUs' case population.

Despite examining individual characteristics, as well as using an aggregate score for accuracy, assessing the validity of NamUs records is a monumental task. Consistent with the design of the project, record accuracy was limited to eye color, hair color, age, and height, yet law enforcement investigations of missing persons would include dozens of additional characteristics. For instance, documenting scars and tattoos would be essential for authorities in properly documenting a missing person to assist others, if an identification is required later. NamUs cases include numerous descriptors like this, but only the four selected attributes were feasible in obtaining and represents a limitation for this research. Further, arrest reports may periodically contain inaccuracies and the discrepancy in specific cases may reside with the involved law enforcement agency as opposed to NamUs.

Further, the design of the NamUs system created limitation for the project. To protect privacy for individuals, NamUs does not reveal date of birth, which makes age comparisons to arrest reports challenging. Similarly and as mentioned above, not having home addresses for all missing persons to assign socioeconomic status limited conclusions drawn about the role of disconnectedness to case accuracy. NamUs is also a voluntary reporting system for law enforcement and other interested parties, so not all missing person cases are included in the NamUs database. This limits findings in that representatives from certain states are more active in posting cases. As such, findings attempting to address potential deficiencies for missing person investigations using only NamUs records, are limited to part of the total population for this type of incident.

Contributions to the Field. Implications, and Recommendations for Future Research

As foundational research, the implications and recommendations for future research are numerous but first and foremost is the need for valid records. The accuracy of police records is essential for the thousands of missing persons cases investigated in the US annually. For police, protecting and assisting individuals who have gone missing often involves multiple agencies and the public, therefore it is imperative that descriptions of missing persons are comprehensive and accurate prior to dissemination. The following discussion relates to specifics from this study concerning potential improvements for missing person investigations and conducting additional research.

NamUs as an opportunity.

An implication of this study is that NamUs is used by law enforcement only sparingly for missing persons as compared to the National Crime Information Center (NCIC). Specifically, NamUs contains more than 16,000 records, while there are over 100,000 missing individuals in the US annually. This observation is consistent with published research that law enforcement agencies in the US may omit listing missing persons in the established database of NCIC (Ritter, 2006). Ritter (2006) attributed oversights by agencies in properly publicizing those missing to personnel and resource shortages, as well as inferring that since many of these cases are resolved quickly, that agency effort expended on seemingly low risk cases is futile.

With over 15,000 law enforcement agencies in the US, gaining cooperation on uniformity in reporting from all or even a majority of these departments is a monumental challenge. American missing persons can be investigated by police at the federal, state, or local levels, but local law enforcement comprised of county, regional, city, and town, as well as state police, would handle the bulk of these cases. As such, local investigators and state police initiate NamUs

records for individuals missing, and also search the missing person database for potential matches when an unidentified decedent is recovered. In addition to promoting NamUs as a resource for law enforcement, medical examiners, and the community, work is underway via task forces to emphasize preferred practices including prompt investigations, DNA collection, and risk assessment among cases (Ritter, 2006).

With the need for community awareness of both missing persons and unidentified decedents, this foundational research reiterates the opportunity that NamUs offers to publicize cases to local, regional, and national audiences. NamUs promotes cases at no-cost and allows even the smallest police department the opportunity to publicize a missing adult or juvenile. Further, NamUs representatives are available for every region to assist investigators with online entries, thus trying to remove the potential burden of data entry or learning a new system.

As mentioned previously, more states are promoting that NamUs be used in missing person investigations, and as of July of 2019, missing persons listed on NamUs had increased to over 16,000. Oklahoma, Tennessee, New York, and Illinois now require local and state investigators list those missing in NamUs. Similarly, states like California, New Jersey, and Connecticut strongly recommend their investigators employ NamUs for publicity, and other jurisdictions are considering both direct and indirect support of this system. Also and as previously discussed, representatives like those in Tennessee falling behind and creating file backlogs in trying to comply with mandates to enter older cases into NamUs (Jaglois, 2018) create situations that can lead to the greater likelihood of error. Subsequently and as mandated and voluntary usage of NamUs continues to grow, it is essential that proper quality control measures are incorporated to ensure that characteristics contained in the data and made available for public consumption are valid.

In addition, non-profits like Trace Labs have recently partnered with the private sector and the US military to examine unsolved missing person cases using Open Source Intelligence techniques (Stover, 2019). In the summer of 2019, Trace Labs hosted an 8-hour competition featuring about 100 teams of analysts from around the globe. Teams were awarded points for identifying unique aspects about their assigned missing persons, and the leads were then provided to law enforcement assigned to the cases. Obviously, increased usage of NamUs, as well as community efforts to help police find missing persons enhances the need for valid records. Research, such as this study, demonstrates that oversight can be provided through quantitative means to assess the quality of data in systems like NamUs.

Related, public criticism for the lack of oversight in criminal justice data should encourage future studies such as this to instill confidence in the validity of official records. As discussed earlier, federal and state authorities have faced public criticism regarding the accuracy of records in FBI-maintained databases (Perala, 2017; Stanley, 2016). As part of NamUs' system upgrade in 2018, numerous cases noted previously by the researcher were purged or updated through the organization's internal review process. Future exercises like the current study would further help to emphasize transparency by authorities in demonstrating the government's interest in maintaining data integrity.

Another ambiguity in the findings relates to updating NamUs records. With news articles, it is a common practice to distinctively note the date when a record or page was modified as the author may need to include additional developments or correct something from the original posting. Unfortunately, NamUs records only list a record modified date on the search results return page—a design choice that can be easily missed. As such, the process for revising records is unclear by NamUs and other partner agencies, and distinguishing which records have been

revised and when updates are made can be challenging. Having clarity in immediately noticing which records have been modified and how long ago it occurred could have assisted the present study to identify revised entries and the associated record accuracy, and may aid future studies.

Related, families want to know that law enforcement has not stopped searching for their missing loved ones. Stretesky et al. (2016) emphasized the need for detectives working cold case homicides and related cases to provide regular updates to family members, as well as make concerted efforts for case visibility, like publicizing an unsolved case in the news on the incident's anniversary. In a similar vein, providing family members with specific information on notifications regarding updated NamUs records could in a small manner show that missing persons are not forgotten and that authorities are still investigating.

To properly design future research in this area, information flow will need to be studied. With missing person investigations, it is unclear which is the primary source for collecting individual attributes. With the wide variety of agencies involved in these incidents, it is reasonable to assume that diverse practices exist. For instance, Perry (2019) described how Navajo Nation investigators know that missing persons are underreported on tribal lands in that an adult disappearing may be considered just strictly a voluntary act by family members. As such, the author discussed how investigators working cases to match a missing person to an unidentified decedent would involve checking current missing person posters, and searching NamUs. If no matches were found, the author inferred that investigators would also rely on relationships between authorities and the community to publicize cases in hopes of stirring action by tribal members to file reports for loved ones that were missing previously.

In general practice, a reporting officer's characterization of the missing person may be based on drivers' license information, arrest reports, military identification cards, or other

official datasets. Regrettably, the frequency of use for these sources by authorities has not been previously examined in the peer-reviewed literature. For this study, NamUs records were treated as independent of these other sources, but this may not be the case. Subsequently, future research on the flow of information will provide insights into what path reported missing person attributes follow before being posted publicly in NamUs.

The goal for practitioners working investigations is to compile case files with no errors. In observing some mistakes from this very limited test of NamUs, an implication could be to encourage agencies to incorporate practices that better validate these records. For instance, instead of entering height, scars, tattoos, based on estimates by family members or other reporting parties, agencies could access prison, jail, and other official records where available — institutions that offer thorough and complete attributes for those missing. In addition and again when feasible, an investigator could subpoena a missing person's medical records to ascertain precise physical characteristics to be included in reports.

Finally, the author recommends that federal authorities and administrators of NamUs avoid the FBI's approach to protecting NCIC and NGI data and limiting oversight by utilizing the Privacy Act. Understandably, some aspects of missing persons cases like an individual's medical and mental health information should not be released to the public unless special circumstances exist, as authorities have to balance the community's need to know versus individual privacy. Nevertheless, blocking any outside attempt pursuing data validation may not only leave systems vulnerable to repeated inaccuracies, but also potentially create increased levels of mistrust from the public. In contrast, NamUs is a publicly accessible dataset, and officials should encourage quality control efforts from law enforcement, researchers, or other government agencies. Data integrity is critical for the success of NamUs in providing trustworthy

details on missing persons and unidentified bodies to public and governmental users. Allowing checks and balances of missing person attributes in NamUs will only increase public confidence in this investigative tool.

NamUs and training.

Ensuring accuracy for missing person reports requires a multifaceted approach among cooperating agencies well beyond simple oversight by NamUs or NCIC. Connecting findings from research studies such as this to training for new and veteran law enforcement involved in missing persons investigations is sensible and could help to ensure accurate records. States and jurisdictions vary in terms of the missing persons training offered to first responders, but some state offerings are comprehensive. Future research could be used to design federally sponsored training regarding the benefits of using NamUs investigating missing persons for local, state, and federal law enforcement. Training would not only emphasize the value of the unique offerings found through NamUs in working cases, but also emphasize the importance of accuracy in reporting for responding officers conducting preliminary investigations.

Further and consistent with the findings in this study, investigators should be cautious in accepting missing person attributes from NamUs as valid and beyond reproach. Although the statistical comparisons in this study showed no significant findings of inaccuracies between NamUs and arrest report listing, a number of discrepancies were noted. Therefore, investigators should always consider using alternative sources (e.g., drivers' license databases, prison records, arrest histories, etc.) to corroborate an individual's characteristics from NamUs—another aspect that could be connected to system training provided at the federal and state level to law enforcement officers.

For instance, The California Commission on Peace Officer Standards and Training produced a detailed manual entitled “Missing Persons Investigations: Guidelines and Curriculum” that is currently used for training personnel, and can be accessed electronically by officers in the field (2011). Similarly, the New Jersey State Police (2019) provided agencies with best practices for missing person cases. As such, these missing person directives offer plausible opportunities to link current research to assist investigators in collecting verified missing person descriptors, while understanding that published information may contain inaccuracies.

Using these findings to shed light upon challenges with NamUs data accuracy and the essential role of the officers collecting accurate information during the preliminary investigation can be pursued in a variety of ways. With local, state, and federal law enforcement officers all possibly benefitting from a database like NamUs, it is sensible to think broadly in terms of instruction and training. An essential aspect to any proposed training would be to gain the support of the US Department of Justice and the management of NamUs. These two agencies have performed admirably in creating the repository, as well as publicizing the site to law enforcement, medical professionals, and the public. Subsequently, new initiatives aimed at improving data quality could build upon existing relationships and platforms that have made NamUs successful.

Instead of starting with a comprehensive training program on NamUs developed at the federal level and targeting the many state and local police officers, the author recommends the opposite or a small collaboration of a handful of law enforcement and researcher partners. An issue with such a training initiative is the lack of foundational research—little is known about problems and issues faced by agencies in the US involved in missing person investigations. As

such, researchers could start with a manageable number of agencies, conduct qualitative and quantitative studies, and build trust with the goal of helping those missing and their families.

From the results of these initial studies, academicians and practitioners from around the country could provide feedback regarding similarities and differences encountered in their jurisdictions. From those discussions, new opportunities for research can be identified and facilitated. Eventually, a group of “champions” for the cause of missing persons can be identified, and efforts dedicated toward developing and disseminating best practices. By employing a bottom-up approach, local law enforcement can see the direct involvement of peers from the field in composing best practices, thereby increasing the potential of buy-in and support for the recommendations. Essentially, the effort to improve services provided to those missing is perceived to be an organic effort, rather than just direction being offered by federal authorities that may not be seen as relevant.

A final aspect of potential improvements to training regarding NamUs and missing persons investigations involves medical professionals. The impetus behind creating NamUs was to construct a publicly available missing person repository that could be easily accessed by a variety of users. The research conducted by Hickman et al. (2007) was very insightful in finding that although sampled county coroners and medical examiners had access to NCIC, 90% of these professionals were not using the database for missing person searches. Further, the authors learned that a significant number of these professionals had never accessed NCIC—thus demonstrating the need for a more user-friendly tool like NamUs for non-police users involved in these investigations.

Since it has been more than a decade that this research was published, a follow-up study assessing current usage of NamUs by coroners would be useful. The present literature does not

contain even descriptive studies detailing usage statistics by law enforcement or other user groups. From that study, training geared toward medical professionals could also be developed emphasizing previously discussed missing person issues including the need for collecting and documenting valid attributes, previous inaccuracies in the data, reporting limitations, etc.

NamUs and other approaches

Even unique approaches are available for obtaining specific information for those missing. Authorities in Michigan and other states proactively obtain DNA from the relatives of missing persons to help potentially provide future matches (Wingblad, 2019). In some states, direct yet untapped samples of missing person DNA exists through archived infant blood spot cards collected at birth that were used by health care professionals in testing for prevention of Phenylketonuria disease (Duncan, 2019). Several states retain these infant blood samples for decades after birth. In sum, this research could encourage authorities to consult additional law enforcement and non-law enforcement records in compiling the most accurate investigative case files. Subsequently, it is beneficial for investigators to know the state in which the missing person was born to determine if such records may exist and can be subpoenaed.

Further, research studies that examine the accuracy of data sourced from law enforcement in all 50 states could encourage collaboration among agencies. Practitioners from communities in rural Mississippi to those working in inner city Philadelphia are tasked with similar responsibilities in missing person investigations — use available resources to locate the individual in question and resolve cases. The knowledge and experience gleaned from assessments to understand issues like the most common aspects of missing person reporting errors, patterns involved for those cases of repeat missing persons, etc., could encourage information sharing among agencies. In comparing the published academic literature from

Europe on missing persons with the absence of equivalent studies in the US, it is apparent that academicians and practitioners in the States could learn from the European research model. This knowledge could then be expanded and develop into best practices — a useful guide for law enforcement nationwide to improve the quality of services provided to communities.

NamUs and the human connection

Finally and as stated previously, thousands of individuals go missing in the US annually. Investigations can be challenging, time consuming, and require collaboration for resolution. The complexities of such cases were illustrated in the 2017 investigation of a missing Japanese national. On December 9, 2016, authorities in New York City took a missing person report on Taku Minemura, who had recently been absent from work (Miller, 2017). The last time Mr. Minemura had been seen was 5 days prior to his reported disappearance. Police conducted an initial investigation, but were unable to locate the missing man.

On January 14, 2017, an officer from a small township police department near Harrisburg, PA had Mr. Minemura's vehicle towed from a boat launch area. Unfortunately, no connection was made with the New York missing person case. Four months later in April, a third police department became involved in the Minemura disappearance, when an unidentified and decomposed body was recovered from the Susquehanna River — downstream from where the car had been recovered earlier. The body contained no identification, and police were unable to ascertain the decedent's identify. Subsequently, officials went public with the information in hopes of generating leads as to the decedent's identity. About two weeks later, the dots were connected, and the decedent was identified using dental records as Taku Minemura of New York (2017).

Although it is unclear whether Taku Minemura was included in NamUs during the investigation, this case illustrates several points about missing persons and the potential that a system available to the public represents. These incidents can be multijurisdictional, challenging, and require collaboration. If publicly accessible tools like NamUs contain accurate and comprehensive information, county coroners and other authorities have a starting point for matching unidentified bodies with missing persons. It is unclear in what databases the missing man was listed, but while trying to identify the decomposed body, PA authorities released that the decedent was wearing jeans manufactured exclusively in Japan. Using NamUs, this could have provided investigators and the coroner a necessary clue to connecting the recovered body to the missing Japanese national. In essence, seemingly insignificant details open to the public such as this can provide authorities with the break necessary to solve these tragic and difficult cases.

Despite the findings from the present study that NamUs records and arrest reports were statistically similar, finding discrepancies between the two sources is concerning. The lack of oversight provided to the public regarding NamUs cases, lends support to arguments that errors do exist in these publicly available records. The findings demonstrate that mistakenly typing in the height for a missing person by more than six inches, as was observed with a sampled case for this study, could result in authorities overlooking a potential match between an unidentified body and a missing person. As such, adequate levels of oversight are necessary to correct potential errors. Efforts to improve data contained in NamUs are not only beneficial for law enforcement, but for everyone. It is essential not to neglect the human connection of each missing person in that every individual has a unique story to be told. As such, authorities should utilize systems and approaches to best aid those involved in the struggle to locate the thousands of current missing community members from across the US.

Summary of the Study

The purpose of this study was to assess the validity of missing persons records contained in the US Department of Justice's NamUs database. To evaluate individual case accuracy, corresponding characteristics including height, eye and hair colors, and age from publicly available arrest reports were compared to NamUs listings. Using a non-experimental research design and non-probability purposive sampling approach, the validity of 161 records were quantitatively evaluated, as well as the potential contribution of socioeconomic status and the delays in reporting to accuracy of recorded characteristics were explored. Grounded in Black's Law and exclusionary theory, three research questions and 6 falsifiable hypotheses were developed conjecturing that discrepancies existed between the two data sets and that discrepancies would be more prevalent in cases involving those with lower SES. These hypotheses were statistically examined, but revealed no significant relationships.

Weaknesses of this research included that cases from Southern states were overrepresented, there was a lack of publicly available arrest records, and an unintended recency bias was produced in that sampled cases were primarily from the past 7 years. The study focused on adults only, examined missing person cases involving those with criminal histories only, the lack of availability of arrest records, and the non-probability sampling approach all represented limitations of the study. Finally, recommendations for future research such as collaborating with authorities for access to enhanced arrest data and expanding the attributes assessed will benefit not only academicians, but also practitioners and community members using tools such as NamUs for active investigations.

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