Improving Recovery Time of Children Missing from State Care Using Quantitative Analysis Techniques

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A Praxis submitted to

The Faculty of
The School of Engineering and Applied Science
of The George Washington University
in partial fulfillment of the requirements
for the degree of Doctor of Engineering

January 19, 2018

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Dedication

This document is dedicated to my grandmother, Rose Surak. She grew up during the depression and was forced to leave school to enter the workforce just after the 8th grade. She was extremely intelligent and taught my younger brother, two older sisters, and me the value of money and the need for higher education. With that, upon her passing, she left each of us few hundred dollars to invest in our college education. She was not wealthy but she loved us dearly and wanted to ensure we all continued our formal education. Although she will never read this document since she passed away several years ago, her encouragement, kindness, and faith will long live on through the actions of her grandchildren and great-grandchildren.

Acknowledgements

In addition to my primary advisor, I would like to acknowledge the assistance of Dr. Bereket Tanju, Adjunct Professor for the George Washington University and Deputy Chief Data Officer (CDO) at Federal Student Aid, U.S. Department of Education. His overall guidance in reviewing methodologies and calculations were very helpful in the completion of this document.

In addition, I would like to acknowledge the assistance of Robert G. Lowery Jr., Vice President of the Missing Children Division at the National Center for Missing & Exploited Children. His dedication to finding missing children and his knowledge of missing child issues were key to the foundational work within this document.

Abstract of Praxis

Improving Recovery Time of Children Missing from State Care Using Quantitative Analysis Techniques

Locating children missing from state care quickly is critical for their safety and overall wellbeing. This research was conducted to evaluate the time it takes to establish the team of teams, or human systems of system, to search for a missing child. Specifically, the time it takes for social service, law enforcement, and the National Center for Missing & Exploited Children® (NCMEC) to be brought together with the common goal of finding the missing child. Data gathered from the dates the child went missing, missing child posters, and recovery dates were used to analyze the timing of the missing event with the time frames to establish the human systems and overall recovery time.

When children go missing from state care, they are often faced with social and economic challenges. As teenagers or at times, pre-teens, they are not prepared for the risks that lie ahead during a missing episode. The longer they are exposed to risks, the higher the chance they will fall victim to threats such as gang activity, suicidal attempts, online enticement, commercial/sexual exploitation, and/or any other endangerments.

Although many states have local resources such as shelters, feeding plans, and other social service types of support, not many have resources dedicated to finding children missing from social service care. This leaves the primary search for the missing child to be handled by the legal/court appointed guardian, law enforcement, and the National Center for Missing & Exploited Children®. Due to local and state level issues such as the lack of awareness, policy, or resources, there is a possible impact on the overall

recovery time from delays in aligning the appropriate searching teams to look for a missing child.

Although research like this has not been conducted before, it is the expectation this analysis will shed light on the issue of children missing from state care and encourage state agencies to apply timely resources in the search for at-risk missing youth.

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Chapter 1. Problem Statement and Praxis Statement

In an issue brief by the Child Welfare League of America in July 2015, they state "youth who are involved with the justice system, are homeless, or have run away—are all at high risk of being trafficked. Often, the lack of stability in their living situation, physical distance from friends and family, and emotional vulnerability put them at risk for traffickers who are actively seeking children and teens to exploit" (CWLA 2015). On September 29th, 2014, former President Obama, in response to this broad issue, signed the Preventing Sex Trafficking and Strengthening Families Act, P.L. 113-183. This act requires Social Service agencies to report children missing from state care to law enforcement and to the National Center for Missing & Exploited Children® (NCMEC) within 24-hours of being identified, therefore engaging all the appropriate teams to search for this missing child. Unfortunately, many state agencies have yet to implement this law, apply the appropriate staffing, or implement local policies to bring all the available resources together.

This research applies the concept of human systems to improve the overall performance between team structures by looking at the correlation of recovery times of children missing from state care with the establishment of a team structure. For this research, the term "team structure" is defined as the establishment of all agencies, which include social service agencies, law enforcement agencies, and NCMEC in the search for the child missing from state care.

A child missing from state care is both a social and a legal issue, historically falling within the educational realm of the administration of justice, psychology, sociology, etc. However, as shown throughout this praxis, engineering concepts and techniques can and

should be applied to better analyze data, highlight the need for best practices, and validate direction that will positively impact this national issue.

A child is considered under state care if he/she is not living with a parent and if he/she is in the guardianship, care or custody of a court, social service agency, probation and parole, or other department of government. By federal definition, 42 USCS § 5772, a child under the age of 18 is considered missing when his/her whereabouts is unknown to his/her parent or legal guardian. When looking at the definition of children missing from state care, according to the Child Welfare League of America (CWLA), a child missing from care is one who is not in the physical custody of the agency, individual, or institution with whom the child has been placed; the child's actual whereabouts may be known or unknown (Michael 2016).

To enhance the efforts of finding children missing from state care, the intention of the Preventing Sex Trafficking and Strengthening Family Act, P.L. 113-183 (113th United States Congress 2014), focuses on timely reporting, improving the lives of those in care, and better assessment and screening for child sex trafficking victimization. Unfortunately, at present, many states do not yet have the policy infrastructure in place to support this new law's requirements.

This research investigates 5,681 children missing from state care over 2 years, which does not include those who are not being reported as missing. There is no way to estimate the number of cases not being reported, and while missing, all these children face many immense dangers such as drugs, human trafficking, gang violence, and even death. According to Robert Lowery, Vice President, Missing Children Division, NCMEC, "The longer those children are away, the more vulnerable they are, because

they have to sustain themselves. They are easy prey for those who would exploit them" (Mitch Smith 2015).

Problem Statement: If the correct organizations are not engaged in a timely manner to search for a child missing from state care, then the child will be missing for longer periods of time and thus increase the potential physical and emotional threats against the child.

Praxis Statement: Establishing a team of team's structure for locating children missing from state care, involving groups such as social service agencies, law enforcement, and NCMEC, developed on a system of systems concept, will decrease the child's overall recovery time.

This research answers the question: Can it be shown that, by quickly establishing the appropriate interactive teams to search for a child missing from state care (i.e., social service, law enforcement, and the National Center for Missing & Exploited Children®), will that reduce the overall missing child recovery time?

To answer this question, data was used to identify the current median recovery time to locate children missing from care across all states, and to establish the median time for state agencies to contact law enforcement and NCMEC to support the search for children missing from care. In addition, this research measured the correlation between the recovery rate and the establishment of teams with other state agencies and with NCMEC. Data was used from missing child posters to quantify the impact of the timely interaction between law enforcement, social service agencies, and NCMEC on the recovery rate of children missing from state care.

Through this research, the following hypotheses will be tested:

- Null Hypothesis (Ho1) – Time to organize team structure will have no impact on the performance of teams.
- Alternate Hypothesis (Ha1) – Time to organize team structure will have an impact on the performance of teams.
- Null Hypothesis (Ho2) – Organizational structure within the states will have an impact on the performance of the system of teams.
- Alternate Hypothesis (Ha2) – Organizational structure within the states will have no impact on the performance of the system of teams.
- Null Hypothesis (Ho3) – Total recovery time of missing children is not affected by the time it takes to initiate a system of teams.
- Alternate Hypothesis (Ha3) – Total recovery time of missing children is affected by the time it takes to initiate a system of teams.
- Null Hypothesis (Ho4) – Total recovery time of missing children from the initiation of a system of teams is not dependent on the time it takes to initiate the system of teams.
- Alternate Hypothesis (Ha4) – Total recovery time of missing children from the initiation of a system of teams is dependent on the time it takes to initiate the system of teams.

This research analyzes the date of children missing from state care by measuring missing, reporting, and recovery times between states that quickly establish interactive teams who are searching for the missing child with states that take longer to report missing children.

Chapter 2. Literature Review

2.1 Missing Children

According to 42 USCS § 5772 [Title 42. The Public Health and Welfare; Chapter 72, Juvenile Justice and Delinquency Prevention; Missing Children], the term "missing child" means any person less than 18 years of age whose whereabouts are not known to the persons legal custodian. (U. S. Congress 2011). When a child goes missing and the incident is reported to law enforcement, federal law requires that law enforcement agency enter the child's information into the FBI's National Crime Information Center (NCIC). NCIC is an electronic clearinghouse database of active crime data, which is accessible at any time by every criminal justice agency nationwide (FBI 2017). According to the Federal Bureau of Investigations (FBI), in 2016 the number of missing child entries into NCIC totaled 465,676. In 2015, the number of missing children entered into NCIC was 460,699 (NCMEC 2017a). These are staggering NCIC statistics given each report is a unique missing child incident. NCIC is important to this research because it is the tool for law enforcement to notify other law enforcement agencies regarding numerous types of police reports, including missing children. This type of notification system assists with the recovery of missing children when they are found in another law enforcement jurisdiction.

If a single child ran away multiple times in a year, each individual run would be entered into NCIC separately and each individual run would be calculated separately into the yearly totals. Unfortunately, there is no reliable way to identify the total children who are actually missing in the United States because many children are never reported as missing by their parents or legal guardians. This lack of reporting is due to a variety of

reasons not explored within this research and therefore out of the scope of this study.

In 2016 NCMEC aided law enforcement, parents, and legal guardians with more than 20,500 cases of missing children, of which approximately 18,500 of these reports were labeled as runaways, as shown in Figure 2-1 (NCMEC 2017a).

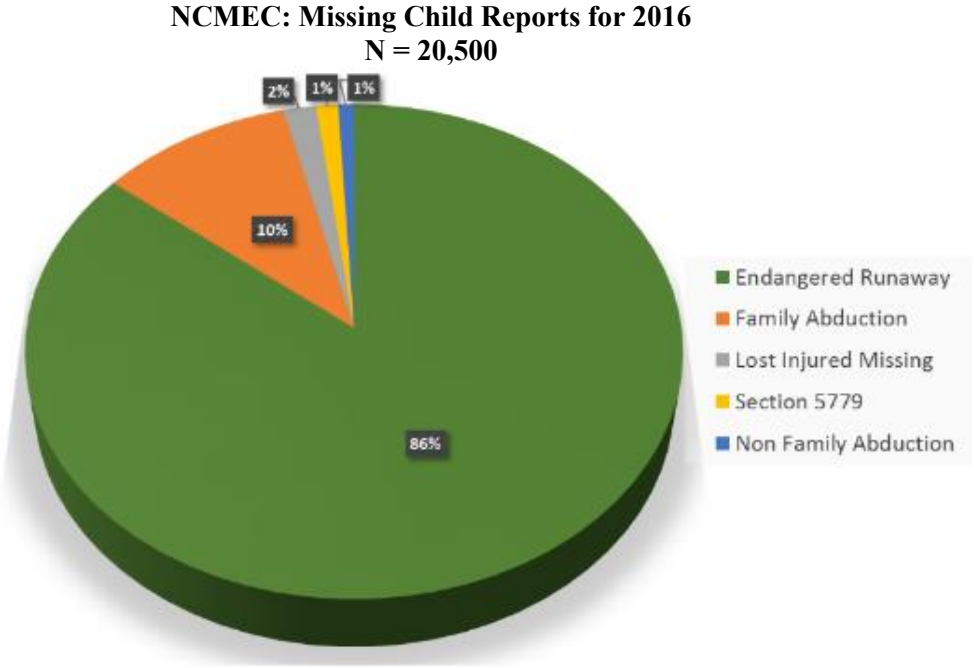


Figure 2-1: Missing Children Reports – 2016

With NCIC receiving over 465,000 reports of missing children and NCMEC only receiving requests for resources on 18,500 cases, this research emphasizes the need for better communication between law enforcement, social services, and NCMEC to ensure the other 446,500 missing children are assisted.

As shown in Figure 2-2 and as reported by NCMEC, of the more than 18,500 endangered runaways reported in 2016, one in six children were likely victims of child sex trafficking. Of those one in six children, 86 percent were in the care of social services at the time they went missing (NCMEC 2017a). Although there is no national framework

to help identify children involved in sex trafficking, especially if the child was not found in the act or does not self-identify as a victim of sex trafficking, each organization uses similar guidelines to help identify characteristics of sex trafficking exhibited by the child. One of the goals of this research was to help define ways to find missing children quicker to reduce this type of exposure.

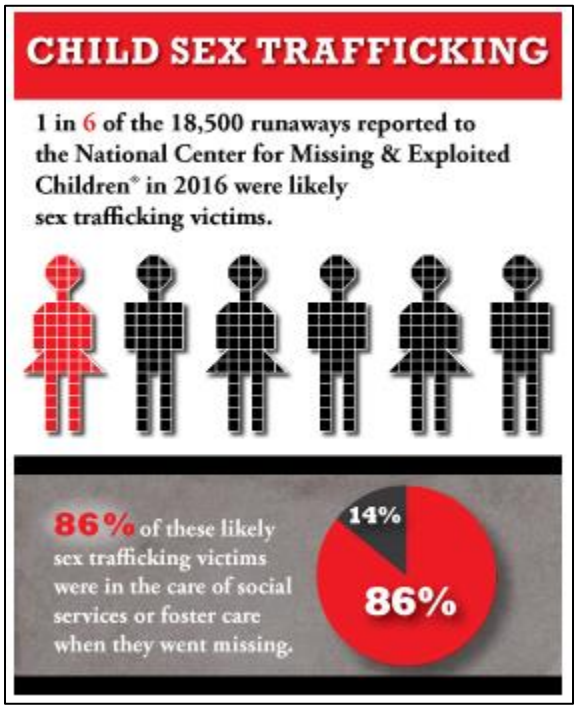


Figure 2-2: Child Sex Trafficking – 2016

According to NCMEC, missing child cases are categorized into types based on the events leading up to the child's disappearance. These categories are used as an industry standard to better account for trends and plan strategies to find the missing child.

The case type categories include the following (Lowery 2016):

- **Nonfamily abduction:** The unauthorized taking, retention, luring, confinement or concealment of a child by someone other than a family member.

- **Family abduction:** The taking, retention or concealment of a child by a parent, person with a family relationship to the child, or his or her agent, in violation of the custody rights. This is also referred to as parental kidnapping and custodial interference.
- **Endangered runaway:** A child aged 17 or younger, most commonly a teenager, who is missing of his or her own accord and whose whereabouts are unknown to his or her legal guardian. Endangered runaways include two subcategories of children who may be at increased risk of exploitation, sexual victimization and physical victimization:
    - **Child missing from care:** Although most often reported as endangered runaways, this includes a child who is missing under any circumstances while in foster care, under the legal custody or supervision of a child protective service or social service agency or otherwise a dependent or ward of the state. Because many of these children are at high risk for child sex trafficking and other endangerments, these cases should be treated as critical and given a high priority.
    - **Throwaway child:** A child whose caregiver makes no effort to recover him or her after the child has run away or failed to return home, who has been abandoned, or who has been asked to leave his or her home and is not permitted to return by a parent or guardian. While not necessarily reported to authorities as missing, children in this category may come to the attention of law enforcement for other reasons.

- **Lost, injured or otherwise missing:** A child who is missing under unknown circumstances, a situation where there are insufficient facts to determine the cause, or a child missing of his or her own accord whose young age or special needs puts the child at increased risk of harm. In these cases, the possibilities cover a wide range, from a child who inadvertently wandered away and became lost, to a child who was abducted without anyone witnessing the act. These cases sometimes involve foul play and deception, or when those reporting the incident are attempting to cover up a crime involving the child.
- **Critically missing young adults (Section 5779):** Missing person cases reported to NCMEC by a law enforcement agency or sworn law enforcement officer when the individual is 18 years of age or older but younger than the age of 21 (U.S. Congress 2011).

For the purposes of this research, the only case category that was utilized and within scope is the Endangered Runaway/Children Missing from Care. Given the disparity of the unknown variables within other case categories, Endangered Runaway/Children Missing from Care was used in this research to illustrate the need for better communication.

2.2 The Primary Teams

For this research, there are three (3) primary teams consisting of law enforcement agencies, social service agencies, and NCMEC. Each of these teams has a critical role in the process of finding children missing from state care. Understanding the relationship between them is critical to comprehending the problem this research was conducted to analyze. Although the focus of the research was not on any one of these teams

individually, it is about the interaction between them and the critical and timely flow of information required for children to be found. Although there are other teams that may be involved in the overall process, this research focused strictly on these three (3) primary teams.

Figure 2-3 shows an example of how to establish the system of teams to aid the search for a missing child. Within block 1 (1 Searchers), the searching party is just the legal guardian. The reach is normally limited to the area where the child went missing. Within block 2 (2 Searchers), the searching party is expanded to include local law enforcement. The search area is slightly expanded based on the reach of local law enforcement and the resources they have available to commit to the missing child case. Within block 3 (3 Searchers), NCMEC is added to the search efforts. This step brings additional resources to aide in the search as discussed in the literature review, and brings regional and national resources, if needed. The establishment of the national effort applied to the search for the missing child is greatly expanded.

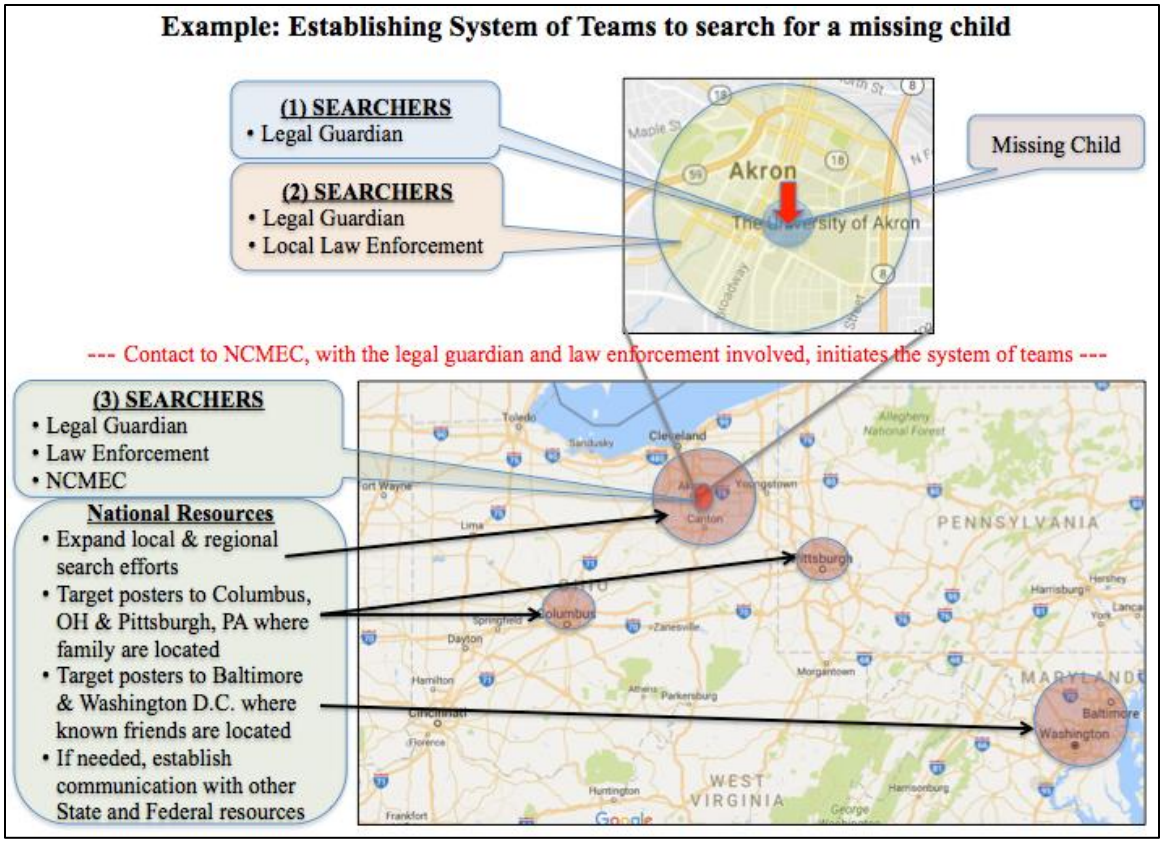


Figure 2-3: Establishing the System of Teams

2.2.1 Law Enforcement:

According to a study in 2012 conducted by the Bureau of Justice Statistics, "Law enforcement" in the United States today is made up of approximately 18,000 federal, state, county, and local agencies (Banks et al. 2016). This statistic represents law enforcement agencies from local, state and federal organizations with sworn authorities to uphold federal, state or local laws. As shown below in Figure 2-4, 13,096 out of a total of 17,985 police agencies have less than 24 staff (Reaves 2011). This statistic provides insight into one challenge that could impact the timeliness of reporting missing children. Each of these law enforcement teams has different staffing resources to apply to missing child cases and therefore, could impact their timeliness of communication.

Full-time state and local law enforcement employees, by size of agency, 2008

Size of agency*	Agencies	Full-time employees		
		Total	Sworn	Nonsworn
All agencies	17,985	1,133,915	765,246	368,669
1,000 or more officers	83	326,197	230,759	95,438
500–999	89	94,168	60,124	34,044
250–499	237	133,024	83,851	49,173
100–249	778	174,505	115,535	58,970
50–99	1,300	136,390	89,999	46,391
25–49	2,402	124,492	83,349	41,143
10–24	4,300	98,563	67,132	31,431
5–9	3,446	32,493	23,107	9,386
2–4	3,225	11,498	9,470	2,028
0–1	2,125	2,585	1,920	665

Note: Excludes agencies employing less than one full-time officer or the equivalent in part-time officers.
*Based on number of full-time sworn personnel.

Figure 2-4: Full-time State & Local Law Enforcement Employees, 2008

In addition, from 1992 to 2008, the approximate total count of sworn personnel employed by law enforcement agencies increased by 141,000, or 25%. As shown in Figure 2-5, in 2008, the agencies hired approximately 61,000 officers, but lost approximately 51,000 through resignations (54%), non-medical retirements (23%), dismissals (10%), probationary rejections (5%), and medical or disability retirements (5%) (Reaves 2012). These constant changes in staffing increase the need to formalize communication practices and policies across all primary teams. This would ensure best practices are not lost when new employees are hired or when turnover occurs.

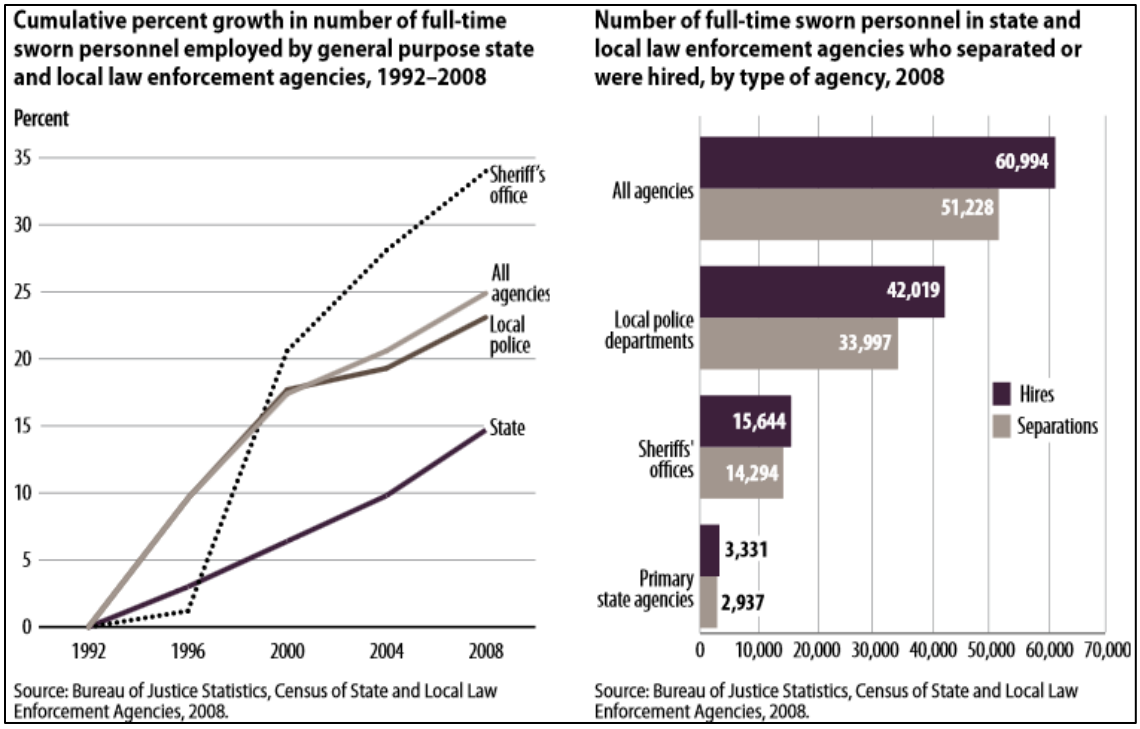


Figure 2-5: Bureau of Justice Statistics, Census of State & Local Law Enforcement Agencies, 2008

2.2.2 Social Service Agencies:

According to the Department of Professional Employees, The American Federation of Labor and Congress of Industrial Organizations, in May 2015, there were 294,080 children, family, and school social workers; 155,590 healthcare social workers, and 110,000 mental health and substance abuse social workers (AFL-CIO 2016). The Bureau of Labor Statistics (BLS) has predicted a 12 percent growth rate for social worker employment projected between 2014-2024, an increase in average rate in comparison to other occupations. This will occur due to an increased demand for health care and health related services (BLS 2015). Additionally, in the event of any economic down-turn, social services are often the first to see their budgets cut, even if demand for services increases. These are variables that increase the need to highlight the value in timely

reporting that could support future policy creation, enforcement, and training.

Public child welfare agencies experience frontline worker turnover rates as high as 25% each year. Prior research has linked organizational factors, such as organizational climate, culture, and supervisor satisfaction to turnover intent in child welfare populations (Sage 2010). This turnover creates significant training complications when it comes to knowledge of the children, polices and processes, and has been linked to negative outcomes for children in state care.

According to the 2015 Adoption and Foster Care Analysis and Reporting System (AFCARS) report, as shown in Figure 2-6, social service agencies across the United States are responsible for 427,910 children under the age of 18 (HHS and CB 2015). The AFCARS report is created from information of children in state care gathered on September 30th each year through a statistical survey from state agencies and given to the Department of Health and Human Services (HHS). With 427,910 children in state care with an unknown number going missing, this research emphasizes the need for more timely communication between these social service agencies, law enforcement, and NCMEC. This effort would ensure any missing children are reported in a timely fashion and the primary teams are established to help search for the child.

Children in Foster Care on September 30, 2015 ● N=427,910

Age as of September 30th	Years
Mean	8.6
Median	7.8

Age as of September 30th	Percent	Number
Less than 1 Year	7%	29,684
1 Year	8%	35,642
2 Years	7%	31,340
3 Years	6%	27,633
4 Years	6%	24,613
5 Years	5%	22,825
6 Years	5%	22,469
7 Years	5%	21,526
8 Years	5%	20,129
9 Years	4%	18,482
10 Years	4%	16,967
11 Years	4%	15,528
12 Years	4%	15,603
13 Years	4%	16,587
14 Years	5%	19,266
15 Years	5%	22,310
16 Years	6%	25,669
17 Years	6%	26,668
18 Years	2%	8,459
19 Years	1%	3,010
20 Years	1%	2,299

Sex	Percent	Number
Male	52%	222,849
Female	48%	204,999

Most Recent Placement Setting	Percent	Number
Pre-Adoptive Home	4%	15,107
Foster Family Home (Relative)	30%	127,821
Foster Family Home (Non-Relative)	45%	191,842
Group Home	6%	24,021
Institution	8%	32,204
Supervised Independent Living	1%	4,107
Runaway	1%	4,648
Trial Home Visit	5%	22,974

Case Plan Goal	Percent	Number
Reunify with Parent(s) or Principal Caretaker(s)	55%	227,955
Live with Other Relative(s)	3%	12,408
Adoption	25%	102,798
Long Term Foster Care	3%	13,546
Emancipation	4%	17,188
Guardianship	3%	14,214
Case Plan Goal Not Yet Established	6%	23,573

Race/Ethnicity	Percent	Number
American Indian/Alaskan Native	2%	10,130
Asian	1%	2,232
Black or African American	24%	103,376
Native Hawaiian/Other Pacific Islander	0%	850
Hispanic (of any race)	21%	91,105
White	43%	182,711
Unknown/Unable to Determine	2%	7,990
Two or more Races	7%	28,751

NOTE: All races exclude children of Hispanic origin. Children of Hispanic ethnicity may be any race.

Time in Care	Months
Mean	20.4
Median	12.6

Time in Care (Months)	Percent	Number
Less than 1 Month	6%	23,846
1 - 5 Months	22%	95,999
6 - 11 Months	20%	85,865
12 - 17 Months	15%	65,321
18 - 23 Months	10%	42,721
24 - 29 Months	7%	30,751
30 - 35 Months	4%	19,227
3 - 4 Years	9%	37,130
5 Years or More	6%	27,000

Figure 2-6: Children in Foster Care AFCARS Report, 2015

2.2.3 The National Center for Missing & Exploited Children®

In addition to social service and law enforcement, NCMEC is one of the primary teams because they provide missing child resources for law enforcement, legal guardians,

and families. NCMEC is a non-profit 501(c)(3) organization that has functioned as a national clearinghouse for missing children since 1984. They provide a variety of resources and publications regarding missing child cases, child sexual exploitation, and child safety. Partnering with the Justice Department, corporate leaders, private individuals and communities, NCMEC has become the leading nonprofit organization in the United States working with families, law enforcement, private companies, attorneys and other professionals on issues related to missing and sexually exploited children (NCMEC, 2016).

One of the main tools to assist law enforcement and families or legal guardians is the dissemination of missing child posters. As shown in Figure 2-7, these posters contain key information about the missing child such as a picture, name, date-of-birth, and any supporting information that may be of assistance in identifying the child.

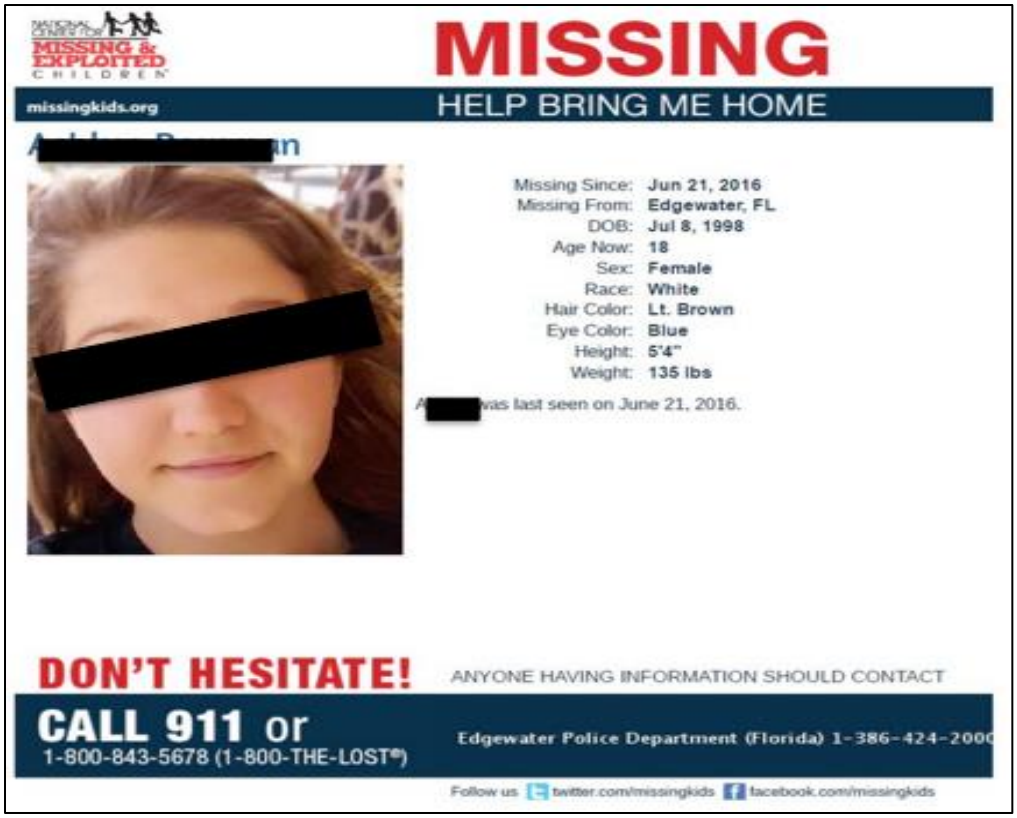


Figure 2-7: Missing Child Poster – Example

For NCMEC to create and publicly disseminate a poster like the one shown in Figure 2-7, several steps must be completed, as shown in Figure 2-8. The most critical step is to ensure a law enforcement agency is involved in the missing child case, they can accept imminent or on-going leads reported through NCMEC, and they will work with NCMEC in the safe recovery of the child.

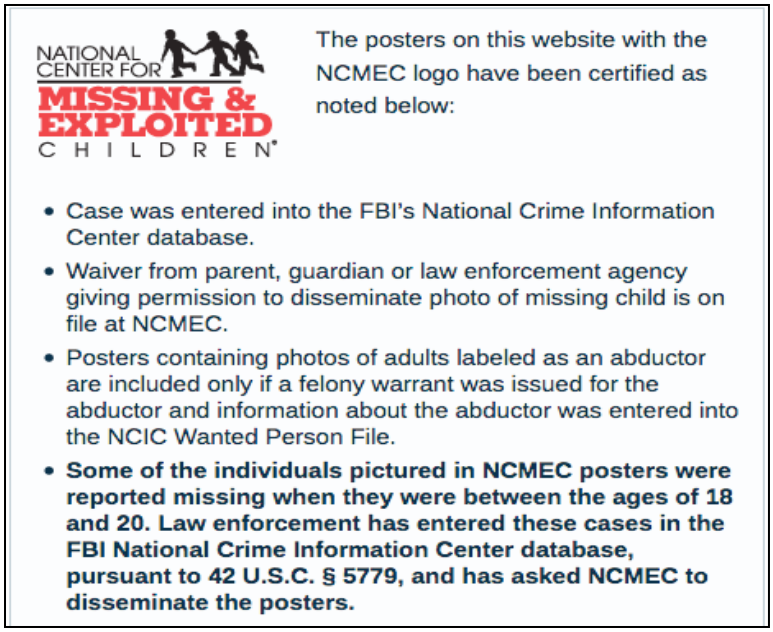


Figure 2-8: NCMEC Poster Creation Criteria

The distribution of missing child posters is accomplished through a variety of different ways. More than 270 corporate photo partners work directly with NCMEC to help disseminate photos of missing children to millions of homes across the United States every day (NCMEC 2017b). The posters are targeted to locations as precise as all the hair salons within a specific zip code or square-mile radius of where the child is believed to be located. Additionally, social media also plays a role in NCMEC's electronic poster distribution. As of July 2017, NCMEC has over 37,000 followers on Twitter® and over 450,000 followers on Facebook®. Through the reach of social media, NCMEC uses these followers to target the distribution of posters where the child is believed to be located. In addition, as shown in Figure 2-9, NCMEC often "tags" local news affiliates, local law enforcement agencies, and state names within the posts to drive more awareness to the missing child case.

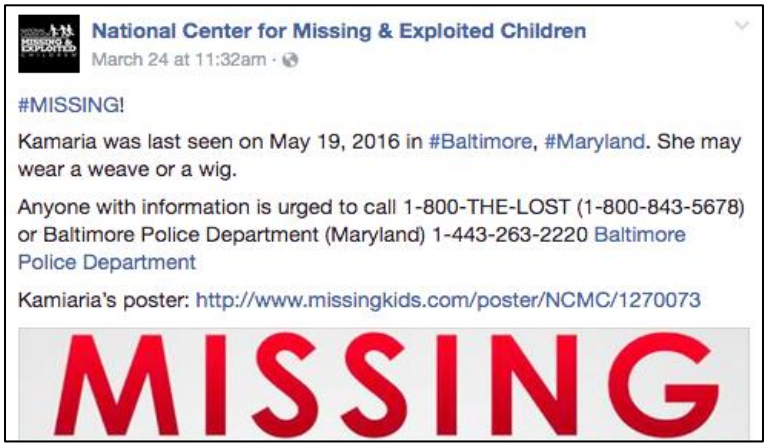


Figure 2-9: NCMEC Social Media

NCMEC has been working with Valassis, a leader in intelligent media delivery, for over 30 years to disseminate missing child posters to homes across the United States. Valassis hosts a program called "Have You Seen Me?" that sends flyers of missing children to more than 100 million households each week (Broaddus 2015).

In addition to poster distribution, NCMEC has access to public data records through corporate entities such as LexisNexis (LexisNexis 2004). NCMEC searches these databases for in-depth publicly accessible information about the missing child, such as family member locations, phone numbers, etc. and passes that information to the investigating law enforcement agency.

Posters, social media, and partnerships are just a few examples of why NCMEC is one of the primary teams within this research. Their national and international reach gives them the ability to communicate that a child is missing and utilize resources and partnerships to help locate the child. NCMEC applies these tools to each case through coordination with law enforcement and social service agencies. As outlined within this research, the timeliness of establishing communication between all three (3) primary

teams is needed to ensure resources are applied as soon as possible once a child is reported missing from care.

2.3 Systems of Human Systems, Interactive Teams

In his book "*Team of Teams: New Rules of Engagement for a Complex World*," General Stanley McChrystal explains how combining a system of organizations into a single system can improve communications and efficiency. The diagram in Figure 2-10 shows the evolution of a command structure to a team of teams' structure (McChrystal et al., n.d. 2015).

In this book, General McChrystal describes how he transformed a large organization of diverse disconnected teams into a highly efficient team of teams (or a human system of systems). The system of systems was developed to transfer actionable knowledge so it could be best utilized. The author coordinated teams from the U.S. Army, U.S. Navy, U.S. Air Force, U.S. Marine Corps, Central Intelligence Agency, National Security, and local military. The knowledge transferred through this new system was critical to the success of the organization.

General McChrystal goes into great depth to describe the differences in team structures from the least interactive to the most interactive. As illustrated in Figure 2-11, there are three distinct structures; Standard Line (silos), Interactive Teams within Standard Line Teams, and Fully Interactive Organizational Structure Team of Teams Structure.

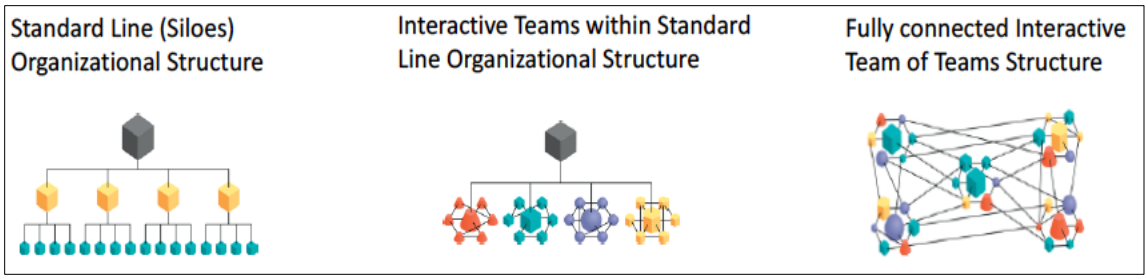


Figure 2-10: Evolution from a Command Structure to a Team of Teams Structure (McChrystal et al., n.d.)

The standard view of cross-functional teams is that they are key for innovation projects, while at the same time, functional diversity also introduces conflict, which may hinder a team's optimal performance. Blindenbach investigates the moderating role of organizational context on the relationship between cross-functional teams and performance. With a multilevel sample of 142 projects in 95 firms he demonstrates that cross-functionality positively contributes to the performance of innovation projects in more functionally organized firms, with a separate innovation unit, and above-average levels of organizational connectedness (Blindenbach-Driessen 2015). He concludes that cross-functional teams correlate significantly and positively with performance (Blindenbach-Driessen 2015). Figure 2-12 illustrates that teams assembled on functionality outperform teams assembled by project. As recognized within his research, Blindenbach highlights positive contributions of cross functional teams working towards a specific project. The research within praxis will also work to show the positive impact of cross-functional teams working towards the goal of finding a missing child.

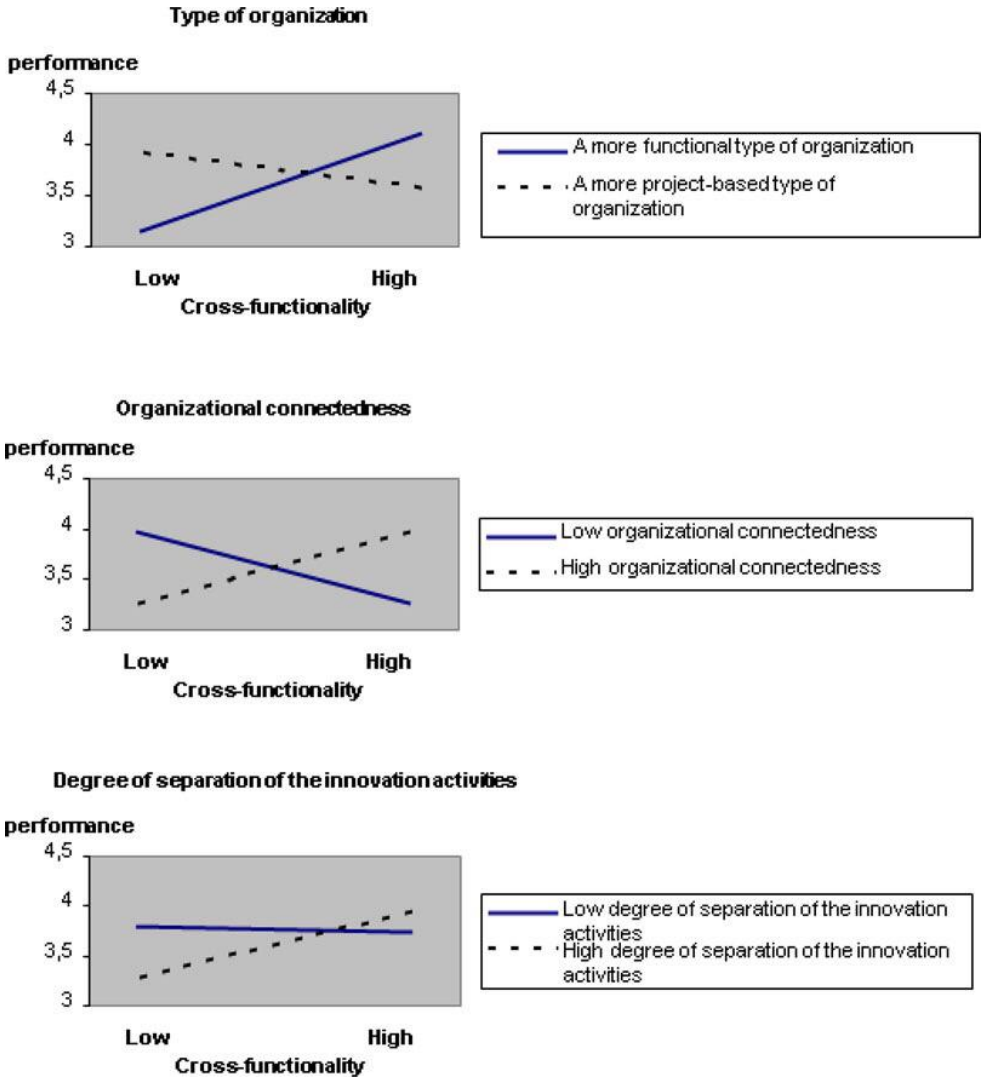


Figure 2-11: Blindenbach, 2015 (Blindenbach-Driessen 2015)

Many of the organizational models in use today, such as functional structures or hierarchical structures, have their roots in theories and practices developed at the height of the industrial revolution. As the rate change in the environment increases these models are no longer adequate to handle the demands they are currently facing (Coughlan 2016). Coughlan explores the need for new social technologies and products to replace those that are failing, and the need for these structures to be designed to more natively deal with the challenges we face today. The author reviews several of these models with

an eye to discussing the attributes that are increasing the effectiveness of modern organizations. Coughlan cites previous work by Laoux, as shown in Figure 2-13, who developed five distinct stages of organizational development. Laoux believes that given the changing landscape, a new stage needs to be developed (Coughlan 2016).

Exhibit 1: Evolutionary Breakthroughs in Human Collaboration

Color	Description	Guiding Metaphor	Key Breakthroughs	Current Examples
RED	Constant exercise of power by chief to keep foot soldiers in line. Highly reactive, short-term focus. Thrives in chaotic environments.	Wolf pack	• Division of labor • Command authority	• Organized crime • Street gangs • Tribal militias
AMBER	Highly formal roles within a hierarchical pyramid. Top-down command and control. Future is repetition of the past.	Army	• Formal roles (stable and scalable hierarchies) • Stable, replicable processes (long-term perspectives	• Catholic Church • Military • Most government organizations (public school systems, police departments)
ORANGE	Goal is to beat competition; achieve profit and growth. Management by objectives (command and control over what, freedom over how).	Machine	• Innovation • Accountability • Meritocracy	• Multinational companies • Investment banks • Charter schools
GREEN	Focus on culture and empowerment to boost employee motivation. Stakeholders replace shareholders as primary purpose.	Family	• Empowerment • Egalitarian management • Stakeholder model	Businesses known for idealistic practices (Ben & Jerry's, Southwest Airlines, Starbucks, Zappos)
TEAL	Self-management replaces hierarchical pyramid. Organizations are seen as living entities, oriented toward realizing their potential.	Living organism	• Self-management • Wholeness • Evolutionary purpose	A few pioneering organizations (see "Examples of Teal Management")

Source: Frederic Laloux, *Reinventing Organizations* (Nelson Parker, 2014)

Figure 2-12: Coughlan, 2016 (Coughlan 2016)

Cross-functional collaboration has become a critical success factor for new product teams to succeed in today's intensely competitive business environment. It is especially essential for complex and geographically dispersed developments helping to integrate

subsystems, creating visibility throughout the project organization, and unifying team members behind the requirements, keeping the project effort focused and synchronized (H.J. Thamhain 2011).

Thamhain and Coughlan's research, along with the comments in McChrystal's book, emphasizes that more cross-functional collaboration is required. This praxis uses this research to illustrate the impact of a human system of systems approach on the communication patterns between the primary teams utilized to find missing children.

2.4 Knowledge Transfer

Interactive teams are the foundation for knowledge transfer. In a 2004 study on knowledge transfer in the public sector, Sharifuddin tested and failed to reject the hypothesis that; there is a significant association between an organization's knowledge sharing culture and the knowledge transfer performance (Omar, Syed-Ikhsan, and Rowland 2004).

They also tested the impact on politicians within the public sector with the hypothesis: "Political directives have a positive effect on knowledge transfer performance." This hypothesis also failed to reject. This study revealed that there are a number of positive relationships with knowledge transfer in the public sector (Omar, Syed-Ikhsan, and Rowland 2004).

In 2011, Suppiah and Sandhu researched the question of how organizational structure influences knowledge transfer. They define four types of organizational culture, including clan, adhocracy, market, and hierarchy. Clan culture is defined as having a high teamwork organizational structure. Adhocracy culture is a dynamic entrepreneurial environment where employees are empowered and risk taking is encouraged. Market

culture is when the stakeholders create a competitive environment. In this culture knowledge becomes a proxy for power. Hierarchy culture is found in organizations that have formalized multiple hierarchy structures (Suppiah and Singh Sandhu 2011). The primary focus for this praxis is researching the time to establish interactive teams and the knowledge transfer component plays a role in the reporting process once communication is established.

2.5 National Statistics

With regard to national research and statistics, the *National Incidence Study of Missing, Abducted, Runaway, and Throwaway Children* (Sedlak et al. 2002) conducts periodic national incident studies in an attempt to determine the actual number of children reported missing and recovered for a given year. In addition, statistics from *The Adoption and Foster Care Analysis and Reporting System* report gives us an understanding of the number of children in care in the United States (Smith et al. 2005). These two data sets have historically provided insight into the issues facing children in care today. With the recent passage of The Preventing Sex Trafficking and Strengthening Families Act, P.L.113-183, there is hope that enhanced knowledge sharing and technical innovations through the implementation of a human system of systems approach will bring groups together to provide more accurate data for these reports and better assist this underserved and at-risk population.

2.6 State Policies to Support Children Missing from State Care

Certain state agencies have worked to alter existing policies or create new policies to help improve communication related to children missing from care. For example, in September 2015, New York State passed Executive Law § 837-f, requiring their social

workers to "share the data and analysis on a regular basis with the National Center for Missing & Exploited Children®" (New York State Executive Law 2015). Similarly, in May 2016, the State of Utah passed Title 53 Chapter 10 Part 2 Section 202 requiring their social workers to coordinate with the National Center for Missing & Exploited Children® and other agencies to facilitate the identification and location of missing children (Utah Legislation 2016). Unfortunately, these types of laws and policy modifications have not been adopted in many states.

Compared to social service agencies, law enforcement is faced with slightly different issues when it comes to children missing from care and knowledge sharing. Law enforcement recognizes the need to collaborate, share, and exchange information; however, legal and artificial boundaries between them create a serious impediment (AFCEA Intelligence Committee 2007). Law enforcement agencies are, at times, not able to share information due to local laws or local departmental policies. Efforts to adjust laws, regulations, and practices over the past 20-plus years have only been moderately successful, drawing strong opposition from civil libertarians. Nevertheless, many law enforcement agencies are working internally to alter existing policies or create new policies to improve information sharing. For example, the State of New Jersey altered an existing statute, N.J. § 52:17B-215, stating if the person reported missing is age 17 or under, the person filing the report shall be provided with contact information for NCMEC (New Jersey Legislature 2016).

Many state organizations recognize the need for more efficient collaboration when searching for children missing from care and are taking positive steps to enhance communication between the primary teams. This praxis will assist states seeking to

advance children missing from care legislation by showing the positive outcome of quickly establishing a human system of systems model.

2.7 Federal Mandates

Until 2014, there were no federal laws specifically designed to assist with the issues of children missing from state care. This was true until former President Obama signed into law the Preventing Sex Trafficking and Strengthening Family Act, P.L.113-183 (113th U.S. Congress) on September 29th, 2016. This law requires social service agencies to report children missing from care to law enforcement and to NCMEC, no later than 24 hours once identified.

Many state agencies have limited resources and a clear correlation between agency cooperation and recovery rates is needed to encourage them to apply more resources to the compliance of this law. There are no legal consequences within the law to force compliance from state agencies, and unless they see a positive effect they will not be inclined to allocate the necessary resources.

P.L.113-183 has increased visibility at the federal level due to the newly proposed H.R.4058 - Preventing Sex Trafficking and Improving Opportunities for Youth in Foster Care Act. This new legislation, which also recommends enhanced communication, was approved in the U.S. House of Representatives and is currently in the U.S. Senate for approval (113th U.S. Congress). Unfortunately, similar to P.L.113-183, this act is an unfunded legislation without consequences for non-compliance.

Other laws have been passed at the federal level to assist with locating missing children but not specific to children missing from state care. These laws have some type of enforcement or funding tied to them, however, which makes them more beneficial for

state and federal agencies to be compliant. For example, in 2006 the 109th U.S. Congress signed the Adam Walsh Act allowing the United States Marshals to work with local law enforcement agencies on missing children cases and track registered sex offenders (109th U.S. Congress 2006). This law funded a majority of the United States Marshals Sex Offender Investigations Branch, which did not exist previously (USMS 2006).

Although it is not yet known if the newly signed P.L.113-183 will have any substantial positive effect on recovery rates, this praxis will validate the reporting time requirement of this new law by showing that the more quickly a team is established, the more positive the effect on recovery rate. By providing additional data to support the need for quick communication between the primary teams, the intention is to encourage more state agencies to comply with this new law.

2.8 Statistical Methods

As illustrated in Chapter 3 of this praxis, the data used for analysis is non-parametric. The non-parametric model does, counter-intuitively, contain parameters and can become more and more complex with an increasing amount of data. The differentiation between parametric models and non-parametric models is in a parametric model there are a finite number of parameters. In nonparametric models, the number of parameters is potentially unlimited and not based on parameterized families of probability distributions. With that, tools recommended to compare groups of non-parametric data include the Kruskal-Wallis for groups of three or more and the Mann-Whitney test for pairwise comparisons of two groups (Urdan 2016). The Kruskal-Wallis model is one of the more common tools used to study and analyze non-parametric data. Additionally, the Mann-Whitney test is used in conjunction with Kruskal-Wallis to study the distribution free test in place of the t-test.

The Mann-Whitney test is used for pairwise comparisons when the two groups have non-parametric data. By using the ranks of the sample data instead of their specific values, the Mann-Whitney test determines whether the population medians of two groups differ. With both examples in mind, and with non-parametric data being researched with this praxis, the Kruskal-Wallis test and the Mann-Whitney test are used as the research mythologies.

2.8.1 Kruskal-Wallis

Named after William Kruskal and W. Allen Wallis, the Kruskal–Wallis H test, or a One-Way ANOVA by ranks, is a non-parametric test for the situation where the ANOVA normality assumptions may not consistently apply. Although this test is for identical populations, it is designed to be sensitive to unequal means (National Institute of Standards and Technology 2015). It has become popular for comparing two or more independent samples of equal or different sample sizes. Many engineering journals utilize this test as a method for testing non-parametric data. For example, throughout many of his research articles, H.J. Thamhain from Bentley University in Waltham, MA, utilized this methodology to test different team-based concepts. The team-building concept is not entirely new, but its application to systematic efforts within a permanent organization framework is relatively recent (Hans J. Thamhain and Wilemon 1987). Thamhain used the Kruskal-Wallis model as one of the methods in his research of the drivers and obstacles of effective teambuilding in engineering work environments. Specifically, he used it to highlight the significance of determining team performance characteristics of effective teams and the measures of team characteristics of an effective team environment. Separately, Thamhain used the Kruskal-Wallis method to analyze a

two-year field study in management practices and business processes of cross-functional teams. He tested the connections among organizational sub-units, the necessity to be developed and managed, and different organizational cultures, and team structures. His observations were grouped into six organizational sub-systems: (1) business environment, (2) organizational culture, (3) people, (4) project work, (5) work process, and (6) managerial tools and techniques. These organizational sub-systems affect cross-functional project integration, and therefore must be managed effectively (H. Thamhain 2006).

Kruskal-Wallis is a one-way analysis by ranks, the H Test. It determines if three or more independent groups are the same or different on a variable (Chan and Walmsley 1997). The skewed distributions cannot be properly analyzed with the ANOVA analysis, but rather requires the Kruskal-Wallis analysis of the medians.

The Mean Rank is calculated by providing each observation a rank: the smallest observation has rank 1, the next observation has a rank 2, and so on (Wild 1997). If two or more observations are linked together, the analysis tool, in this research is Minitab, assigns the average rank to both of the observations. Minitab then calculates the average of the ranks of each sample (Minitab Inc. and State College Penn 2017). Minitab will then calculate the z-value for each group using the following statistic:

Kruskal Wallis Z Statistic

$$z_j = \frac{\overline{R}_j - \overline{R}}{\sqrt{\frac{(N+1)(\frac{N}{n_j} - 1)}{12}}} \qquad (2.1)$$

Where R_j is the average rank for the group, R is the average rank for all observations. N is calculated as the number of observations, and n_j is calculated as the the number of observations in the j^{th} group (Minitab Inc. and State College Penn 2017).

This calculation approximates a chi-square distribution with k-1 degrees of freedom, only if the null hypothesis of equal populations is found to be true. Each of the ni should be at least 5 for the approximation to be valid (National Institute of Standards and Technology 2015). A higher H value affords stronger evidence that the difference between some of the medians is statistically significant. The formal calculation for the H statistic is as follows (Minitab Inc. and State College Penn 2017):

Kruskal Wallis H Test Statistic

$$H = \frac{12\Sigma n_j(\overline{R}_j - \overline{R})^2}{N(N+1)} \qquad (2.2)$$

Shown within the calculation above, $(\overline{R}_j$ is the average rank for the group, $\overline{R}$ is the average rank for all observations, N is the number of observations, and n_j is the number of observations in the j group (Minitab Inc. and State College Penn 2017). The H statistic test in the samples come from the same population distributions by ranking the observations (Chan and Walmsley 1997).

The p-value, calculated through Minitab by using the H test statistic, is a probability that measures the evidence against the null hypothesis. Under the null hypothesis, the chi-square distribution with k-1 degrees of freedom uses an approximation to identify the distribution of H. The p-value is calculated as follows (Minitab Inc. and State College

Penn 2017):

Kruskal-Wallis p-value

$$P\text{-value} = 1 - CDF\left(\chi^2_{H,\,df}\right) \qquad (2.3)$$

To interpret the Mean Rank, a group's average rank is shown to be higher than the overall average rank. Additionally, the observation values within that group tend to be higher than those of the other groups. Conversely if the average rank is lower than the overall average rank, then the observation values in those groups tend to be lower than those of the other groups (Minitab Inc. and State College Penn 2017).

The Median is the midpoint of the dataset and its value is the point where 50% of the observations are above the value and 50% are below the point. The sample median within the results is shown as an estimate of the population median of each group, while the overall median is shown as the median of all observations.

For the Kruskal-Wallis analysis, N is the sample size derived from the total number of observations identified within each analysis group. It must be noted that the sample size affects the confidence interval and overall test. Most often, by having a larger sample, this yields a narrower confidence interval and also provides the test more capability to detect a difference in the data.

H test and p-value are interpreted together. If the H value is higher, this provides greater evidence that the difference between some of the medians is statistically significant. This is then used to calculate the p-value, which is used to determine whether any of the differences between the medians are statistically significant (Minitab Inc. and State College Penn 2017).

To determine whether any of the differences between the medians are statistically significant, the p-value is compared to the significance level to assess the null hypothesis. The null hypothesis states whether or not the population medians are all equal. For this research, a significance level (denoted as α or alpha) of 0.05 was applied. By having a significance level of 0.05, this indicates a 5% risk of concluding that a difference exists when there is no actual difference (Minitab Inc. and State College Penn 2017).

P-value ≤ α: Shows that differences between some of the medians are statistically significant.

If the p-value is shown to be less than or equal to the significance level, in this case, 0.05, the research will reject the null hypothesis and conclude that not all the group medians are equal. Specialized topic knowledge could be used to determine whether the differences identified are practically significant.

P-value > α: Shows the differences between the medians are not statistically significant

If the p-value is greater than the significance level, in this case, 0.05, this illustrates there is not enough evidence to reject the null hypothesis. This would show that the group medians are all equal. The test must be verified to ensure it has enough power, or data to calculate, to detect is any difference is practically significant.

The average rank for each group compared to the average rank of all observations is shown through the z-value. The higher the absolute value, the further the group's average rank is from the overall average rank (Minitab Inc. and State College Penn 2017). If the z-value is shown as negative, this indicates that a group's average rank is

less than the overall average rank. If the z-value is shown as positive, this indicates that a group's average rank is greater than the overall average rank.

2.8.2 Mann-Whitney

The Mann-Whitney U test, also referred to as the Wilcoxon-Mann-Whitney test, Wilcoxon rank-sum test, or the Mann-Whitney-Wilcoxon (MWW), is a non-parametric test of the null hypothesis. The t-test is the standard test for testing that the difference between population means for two non-paired samples are equal (National Institute of Standards and Technology 2013). The test is showing if a randomly selected value from one sample will be less than or greater than a randomly selected value from a second sample. In 2015, Jose Villalon, Gonzalo Agustin, and Tomas Gilabert relied upon the Mann-Whitney test within their research into the taxonomy for software testing projects. This research allowed the development team or testing personnel to identify the tests to which the project must be subjected for validation. The taxonomy was focused on identifying software projects according to their technology (Villalon et al. 2015). Separately, in 2016, researchers from the University of Southern California used the Mann-Whitney test to validate their findings of nonlinear modeling of causal interrelationships in neuronal ensembles. The Mann-Whitney statistic is used to select the significant inputs for each output by examining the statistical significance of improvements in the predictive accuracy of the model when the respective inputs are included (Zanos et al. 2008).

The Mann-Whitney test is a frequently used, distribution free test in place of the t-test (Feir and Toothaker 1974). The Mann-Whitney test is used for pairwise comparisons when the two groups have non-parametric data. The Mann-Whitney test determines

whether the population medians of two groups differ from each other and uses the ranks of the sample data instead of their specific values to discover statistical significance. The null hypothesis for the Mann-Whitney test is Ho: $n_1 = n_2$. The median of the first population (n_1) equals the median of the second population (n_2). This test compares the distribution of the samples with the null hypothesis assuming they are equal (Gold 2017).

The alternative hypothesis can be one of the following three (3) outcomes: H1: $n_1 \neq n_2$., Ho: $n_1 < n_2$., Ho: $n_1 > n_2$.. Within the first outcome, H1: $n_1 \neq n_2$, the median of the first population (n_1) is not equal to the median of the second population (n_2). Within the second outcome, Ho: $n_1 < n_2$, the median of the first population (n_1) is less than the median of the second population (n_2). Lastly, within the third outcome, Ho: $n_1 > n_2$, the median of the first population (n_1) is greater than the median of the second population (n_2).

The Mann-Whitney test is a non-parametric statistical test is a test for assessing the significance of a difference in median or central tendency or mean of two series (Sheng and Chun 2002). In Minitab, the difference in the sample medians is an estimate of the difference in population medians (Minitab Inc. 2016). This value, or outcome, is based on the subset of the data, which is randomly selected by the tool, and not the entire population. It is not likely that the sample difference will equal the population difference. The confidence interval for the difference in the sample is used to make a more accurate estimate of the population differences. The confidence interval, used to assess the practical significance of the results, provides a range of likely values for the difference between the population medians. To obtain a 95% confidence level in the testing, or 0.05, at least 100 random samples will need to be used from the testing population.

Comparing the p-value to the significance level determines whether the difference between the medians is statistically significant. Most often, a significance level (denoted as α or alpha) of 0.05 is used for testing. A significance level of 0.05 indicates a 5% risk of concluding that a difference exists within the testing when there is no actual difference (Minitab Inc. and State College Penn 2017).

P-value ≤ α: Shows the difference between medians is statistically significant, and the outcome would reject H

A decision is to reject the null hypothesis can be made if the p-value is less than or equal to the significance level. One can conclude that the difference between the population medians is statistically significant.

P-value > α: Shows the difference between the medians is not statistically significant, and the outcome would fail to reject H.

A decision is to fail to reject the null hypothesis can be made if the p-value is greater than the significance level. The outcomes do not provide enough evidence to conclude there is enough difference and enough to show the population medians are statistically significantly.

The Mann-Whitney test uses normal approximation methods to calculate and determine the p-value of the test. The calculation of the p-value is as follows:

Mann-Whitney p-value

$$Z = \frac{w - \frac{n(n+m+1)}{2}}{\sqrt{\frac{nm(n+m+1)}{12}}} \qquad (2.4)$$

Where: W = the Mann-Whitney test statistic.

n = size of sample 1

m = size of sample 2

As discussed throughout this literature review, establishing the primary teams to search for a child missing from care can be complex. There are legal, social, organizational, and of course, analytical factors to take into consideration. The hope is that through analytical research, there will be a positive influence on the legal, social, and organizational factors to locate children missing from care more quickly. The methodologies selected are key to illustrating the analysis properly and creating this positive influence.

Chapter 3. Methodology and Data

3.1 The Research Project

The question being researched is whether there is a relationship between the time it takes to recover a child missing from state care and the time it takes to establish the primary searching teams (i.e., social service, law enforcement, and NCMEC). This study will show that the implementation of a system of teams earlier in the process of searching for missing children, such as less than 10 days, is more effective than establishing a system of teams later in the missing child incident.

The Kruskal-Wallis analysis, Mann-Whitney testing, correlations, and plot creations were performed with the Minitab statistical analysis tool. The output of a Minitab was then analyzed and applied to this praxis research.

For this research, a 95% confidence interval was used for testing. The 95% confidence interval is the standard threshold used in hypothesis testing and analysis, and the parameter set in the Minitab analysis tool. When 95% (0.05) confidence intervals are used for analysis, all values within the interval are considered plausible values and the values outside the interval are rejected.

3.1.1 The Data

This research analyzes data submitted to NCMEC of children missing from state care, as reported by either social service agencies or law enforcement agencies over a two (2) year period between October 1, 2014 and September 30, 2016. The data consists of cases where the local agency contacted NCMEC within 90 days of the child going missing. This condition applies to all states no matter what their population or reporting method.

The database of cases used in the study totals 5,681 reports of missing children.

The data analyzed in this research consists of independent variables taken from the time the child went missing to when NCMEC was called, and the time taken from the call to NCMEC to the recovery of the child. The sum of these two independent variables equals the dependent variable of the total missing to recovery time.

- Missing/Call (MC): Time of missing to the time of call to NCMEC
- Call/Recovery (CR): Call to NCMEC to the time of recovery
- Missing/Recovery (MR): Time of missing to the time of recovery

Dependent Variable

$$MC + CR = MR \tag{3.1}$$

Data was cleaned to target the relevant case information needed for this research. Specifically, the date missing, the date of call to NCMEC, and the recovery date were fields used for this research. The following items were removed from the initial dataset prior to analysis since they were either errors in the data, included personal identifiable information, or displayed information beyond the scope of this research.

- Cases that were listed as active or closed
- Cases that did not have a recovery date listed
- Data showing the recovery date was listed before the missing date
- The child's first name and last name
- All cases outside of the Children Missing from Care / ERU case type
- Cases that were reported past or recovered past 365 days (1 year)

To apply a level of anonymity for the states studied within this research, a random

number was assigned to each state, including the District of Columbia, between 201 and 251. This step was taken to ensure individual states were not identified as efficient or inefficient but rather focus the research on the team structure. Once the random number was assigned to each state, the entire dataset was analyzed through the Minitab analysis tool, and then separately for the five largest states. The five largest states combined include 3,392 cases or, just below 60% of the total reports. As shown below in Table 3-1, the caseload for the five largest states is represented by state identifier. State 242 has the highest number of cases reported. This is not the largest state by population but is the most consistent state reporting children missing from care to law enforcement and to NCMEC.

Table 3-1: State Caseloads

State Identifier	Case Load
242	1,587
237	654
208	541
232	315
247	295

3.1.2 Data Groups

In this study, the data from all states was initially divided into three groups of 30, 60, and 90-day intervals for all variables analyzed. An additional dataset was developed by subsequently analyzing the data in 10 and 15-day intervals. Grouping the data within these ranges allows analysis to be conducted in monthly, half monthly, and one-third monthly ranges for all variables. Testing any lower than 10-day groups, the analysis became too granular and not useable nor clear to study for this research.

For correlation analysis, due to the large amount of data in each group, a random sample of 200 data points was selected from each group. To obtain this 200-data point

sampling, a random selection was taken from the database to create 200 samples from 5,681 records. Minitab random generator tool was used to extract the 200 samples, and a correlation analysis was performed to show the sample created is representative of the larger dataset, as discussed in Chapter 4.

3.1.3 Hypothesis Testing

Several methods were used to analyze these hypotheses. Hypothesis 1 states: Time to organize team structure will have no impact on the performance of teams. To test this hypothesis, this research measured segments of data within specific intervals to identify if they are statistically significant. The Kruskal-Wallis test and Mann-Whitney test were utilized to analyze the data through the Minitab analysis tool.

Hypothesis 2 states: Organizational structure within the states will have an impact on the performance of the system of teams. This was tested by taking three states that have statistically significant differences in their recovery medians in their total case load and comparing the recovery rates when the system of teams is initiated within the first 30 days. This analysis included the state with the overall lowest performance on total caseload and the state with the highest overall performance. The Kruskal-Wallis test and Mann-Whitney test was utilized to analyze the data through the Minitab analysis tool.

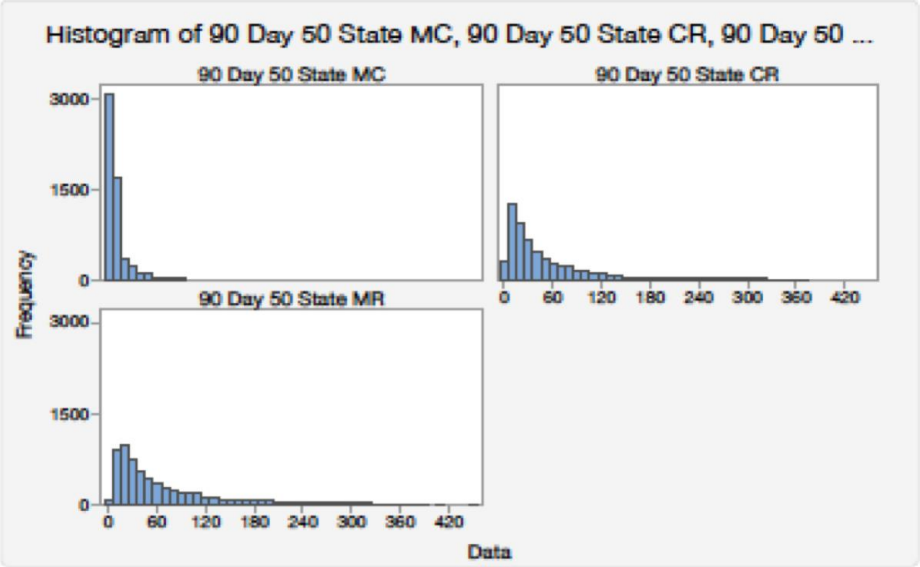
Hypothesis 3 states: Total recovery time of missing children is affected by the time it takes to initiate a system of teams. To test this hypothesis, two independent variables, Missing/Call and Call/Recovery, were used that make up the total time from missing to recovery to determine if there is a statistical difference between the initiation of the system of teams and the recovery. The Kruskal-Wallis test and Mann-Whitney test were utilized to analyze the data through the Minitab analysis tool.

Lastly, hypothesis 4 states: Recovery time of missing children from the initiation of a system of teams is dependent on the time it takes to initiate the system of teams.

The analysis was conducted to determine if there is an impact on the recovery time of missing children based on the time it takes to initiate the system of teams. The Kruskal-Wallis test and Mann-Whitney test were utilized to analyze the data. Pearson and Spearman Rho test were used to illustrate correlations.

3.1.4 Distribution of the Data

For the entire dataset, the distribution of the three variables was analyzed and is shown in Figure 3-1. These variables include: the time when the child went missing to when NCMEC was contacted (MC), the time from the call to NCMEC to the recovery of the child (CR), and the total time from the child missing to recovery of the child (MR). The graph shown in this figure illustrates a few different points. First, we know the data is nonparametric because it is not required to fit a normal distribution. Also, the data is positively skewed, meaning the rows are mainly stacked on the left side of the chart. In addition to the variables, N is the total population analyzed (5,681), mean is the average number within the series, St-Dev is the standard deviation which calculates the extent of deviation for a group, and the minimum and maximum are shown for the fields displayed. Within Figure 3-1, each variable is visually represented within its own histogram and illustrates that the research will take place with data between 1 and 451 days, and have mean values of 9, 49, and 59 for each variable respectively.

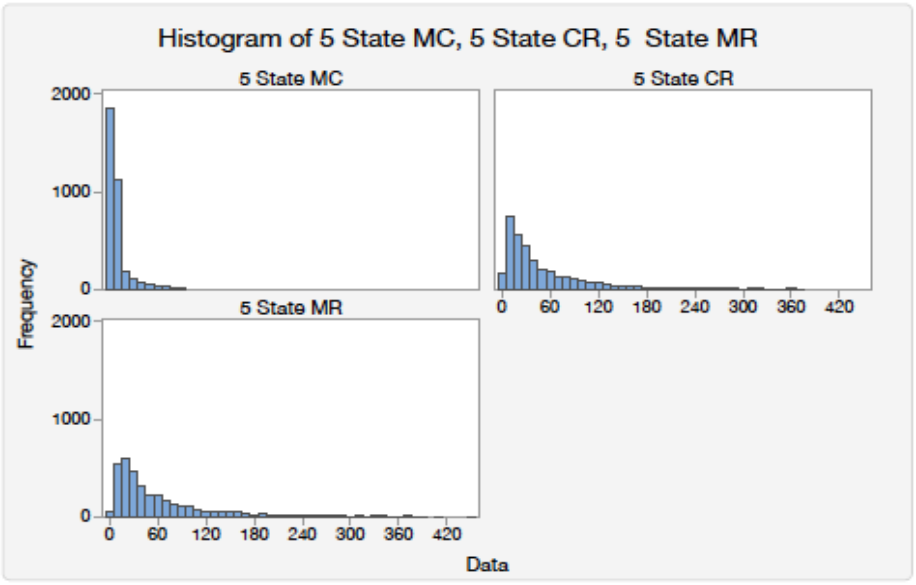


Summary Statistics

Variable	N	Mean	StDev	Minimum	Maximum
90 Day 50 State MC	5681	9.3089	13.8142	1.0000	90.0000
90 Day 50 State CR	5681	49.9303	56.3037	1.0000	365.000
90 Day 50 State MR	5681	59.2390	60.2351	2.0000	451.000

Figure 3-1: Total Data Distribution for 50 States

Figure 3-2 represents the combined data from the five largest states and the number of days for each variable researched: MC, CR, and MR. Within Figure 3-2, each variable is visually represented within its own histogram and illustrates that our research will take place with data between 1 and 451 days, and have mean values of 8.2, 49, and 57 for each variable respectively. When looking specifically at the distributions in Figure 3-1 and 3-2, this tells us the five (5) largest states represent the total population of all 50 states, because they have the same beta distribution and almost identical means and standard deviations.



Summary Statistics

Variable	N	Mean	StDev	Minimum	Maximum
5 State MC	3392	8.2597	12.1627	1.0000	90.0000
5 State CR	3392	49.5425	56.2008	1.0000	365.000
5 State MR	3392	57.802	59.780	2.000	451.000

Figure 3-2: Total Distribution for the Five Largest States

3.2 Analysis Process

Analysis began with a test for correlation. Correlation tests the variables to determine if they are related to each other. There are two standard tests for correlation, the Pearson correlation coefficient and the Spearman Rho test. The Pearson correlation examines the strength and direction of linear relationships. The Spearman Rho correlation is used when the variables are not linear but move in the same direction, but not at a constant rate (Urdan 2016). For this research, there are three variable, Missing/Call (MC), Call/Recovery (CR) and Missing/Recovery (MR). Correlation was applied in this research, which is shown in Chapter 4, to test the relationships between all the variables, MR, CR, and MC for the overall dataset and the sample dataset. This test will provide

insight to show if the sample dataset is representative of the overall population. In addition, it will show if there is a relationship between a dependent variable and one or more independent variables.

The Kruskal-Wallis analysis was applied to the total data set of 5,681 cases. The methodology is discussed here, while the analysis is shown in Chapter 4, and results are shown in Chapter 5. The analysis was separated into groups based on the time it takes from when the child went missing until the national team network was called (MC). Kruskal–Wallis analysis was then performed on the time taken to recover the missing child from the date of the call to NCMEC (CR), specifically, the 1-30 day group, 31-60 day group, and the 61-90 day group. A second Kruskal-Wallis analysis was performed on the 1-15, 16-30, 31-45, 46-60, and 61-75 day groups. A third Kruskal-Wallis analysis was performed on the 1-10, 11-20, 21-30, 31-40, 41-50 and 51-60, day groups.

After the Kruskal-Wallis analysis, a Mann-Whitney paired test was performed between all the groups in each interval to establish the actual ranking of each group. This test was performed with the Ho: $n_1 < n_2$, alternative hypothesis, n_1 was established by the group with the lowest mean rank in the Kruskal-Wallis test.

The impact of following the jurisdictional reporting procedures for children missing from care was investigated by analyzing the states with the five largest caseloads. The same procedures used above are applied to the five individual states to confirm the outcomes are the same as the overall population.

Chapter 4. Data Analysis

4.1 Correlations

The full dataset contains case records from all state jurisdictions of a two-year period where a call to NCMEC was made, along with a corresponding recovery. A correlation was performed on the three variables, Missing/Call (MC), Call/Recovery (CR), and Missing/ Recovery (MR), for the 5,681-record dataset with both the Pearson and Spearman Rho test. Another correlation was performed on the sample-set of 200 records to show if they are representative of the overall dataset.

The correlations of both the Pearson and Spearman Rho test produced very close results on the total dataset for the call to NCMEC (CR) to the missing to recovery time (MR). They show a very strong correlation at 0.974146 (Pearson), shown in Figure 4-1 and 0.951881 (Shearman Rho), shown in Figure 4-2. Shown in Figure 4-3, there was a stronger correlation with call to recovery (CR), 0.949151, compared to missing to call (MC), 0.321983. As discussed in section 3.1.2 of this praxis, a set of 200 randomly generated records were created and now analyzed through a correlation analysis, and is shown in Figure 4-3. A Spearman Rho correlation of the full dataset, shown in Figure 4-2, was almost identical to the sample dataset, shown in 4-3. When comparing Figure 4-2 and 4-3, the full dataset shows a correlation 0.951881 and the sample shows 0.949151. The significance of this test is to show the 200-sample dataset is representative of the overall dataset. The results are presented in Figures 4-1, 4-2, and 4-3, shown below.

Correlations

	90 Day MR	90 Day CR
90 Day CR	0.974146	
	<0.0001	
90 Day MC	0.389970	0.171856
	<0.0001	<0.0001

Cell Contents: Pearson correlation
P-Value

Figure 4-1: Pearson Correlation

Correlations

	90 Day MR	90 Day CR
90 Day CR	0.951881	
	<0.0001	
90 Day MC	0.365133	0.161875
	<0.0001	<0.0001

Cell Contents: Spearman rho
P-Value

Figure 4-2: Spearman Rho Correlation

Correlations

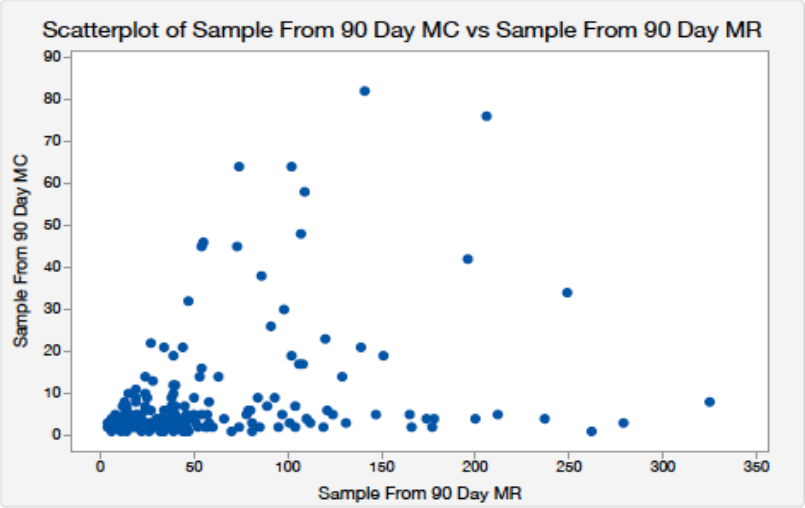
	Sample From 90 Day MR	Sample From 90 Day CR
Sample From 90 Day CR	0.949151	
	<0.0001	
Sample From 90 Day MC	0.321983	0.116342
	<0.0001	0.1009

Cell Contents: Spearman rho
P-Value

Figure 4-3: Correlation of Data Random Sample (N = 200)

From the sample dataset of 200 records, scatterplots were produced to visually identify the correlations, shown below in Figures 4-4, 4-5, and 4-6. Both the scatterplots of 90-day MC v. 90-day CR, and 90-day MC versus 90-day MR displayed a very weak positive correlation. The highest level of correlation of 0.949151, shown in Figure 4.3 and further illustrated in Figure 4-6, is between the variable call to recovery (CR) and the variable of total time of missing to recovery (MR). Therefore, the analysis was performed on the independent variable, call to recovery (CR).

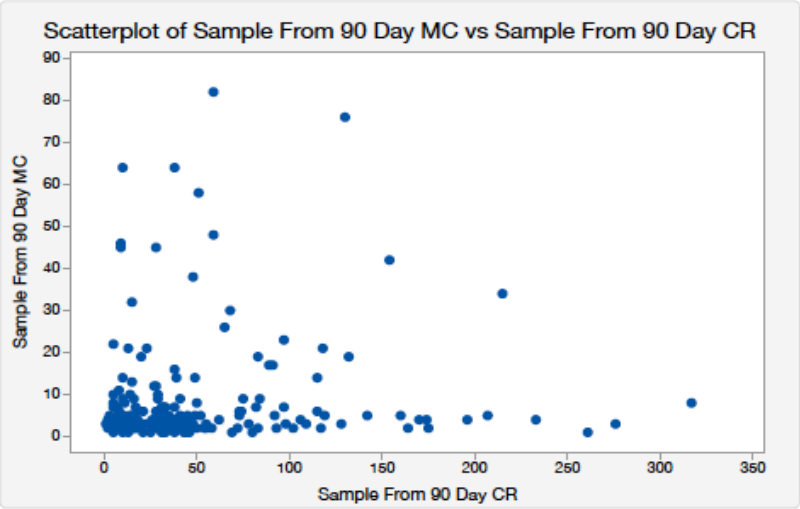
To further illustrate the correlation, below are three (3) scatter plots comparing the three (3) variables, Missing/Call, Call/Recovery, and Missing/Recovery. The 200-sample dataset provided a very weak correlation in Figures 4-4 and 4-5. However, Figure 4-6 shows a moderately strong positive correlation.



Summary Statistics

Variable	N	Mean	StDev	Minimum	Maximum
Sample From 90 Day MC	200	8.5400	13.2361	1.0000	82.0000
Sample From 90 Day MR	200	57.455	58.214	4.000	325.000

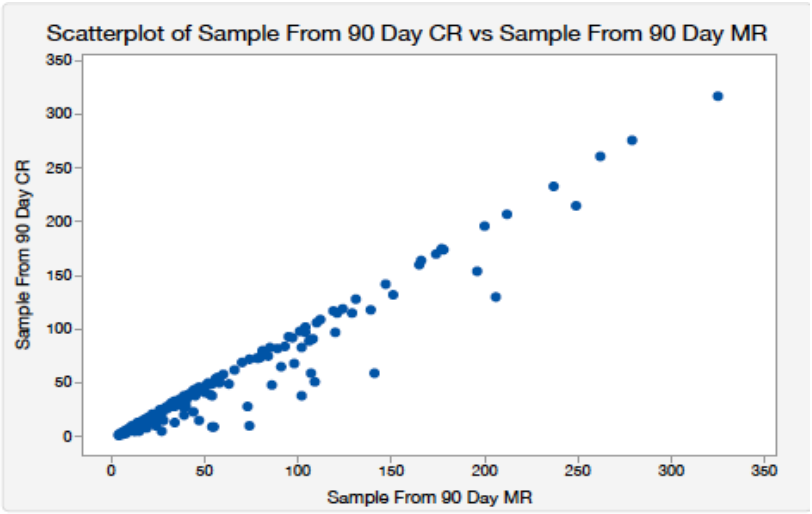
Figure 4-4: Scatterplots of Variables Missing/Call and Missing/Recovery



Summary Statistics

Variable	N	Mean	StDev	Minimum	Maximum
Sample From 90 Day MC	200	8.5400	13.2361	1.0000	82.0000
Sample From 90 Day CR	200	48.915	55.221	1.000	317.000

Figure 4-5: Scatterplots of Variables Missing/Call and Call/Recovery



Summary Statistics

Variable	N	Mean	StDev	Minimum	Maximum
Sample From 90 Day CR	200	48.915	55.221	1.000	317.000
Sample From 90 Day MR	200	57.455	58.214	4.000	325.000

Figure 4-6: Scatterplots of Variables of Call/Recovery and Missing/Recovery

4.2 30-Day Interval Data Analysis

The following series of Kruskal-Wallis analysis, Figure 4-7, shows the indication that the median time from the call to NCMEC to the recovery of the missing child (CR) is statistically different from the time taken to call NCMEC from the initial missing date (MC). As discussed in chapter 3, the first set of data divides the time to call NCMEC into three groups, 30 days or less, 31 to 60 days, and 61 to 90 days.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1 - 30 Bin CR	5240	28.0	2773.0	-10.78
31 - 60 Bin CR	326	50.5	3567.2	8.23
61 - 90 Bin CR	115	74.0	3882.5	6.88
Overall	5681		2841.0	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	119.30	<0.0001
Adjusted for ties	2	119.32	<0.0001

Figure 4-7: Kruskal-Wallis Analysis 30-Day Interval CR Variable

As discussed in the literature review in section 2.8.1 and shown in Figure 4-7, the p-value of <0.0001 indicates that at least one median is statistically different. The indication from the mean rank, shown above, is that the 1 to 30 day group has the shortest time from the call to recovery with a median of 28 days, while the 61 to 90 day group has the longest call to recovery, with a median of 74 days. To validate this indication, three

pairwise Mann-Whitney comparisons were performed between all groups.

The first Mann-Whitney comparison, shown in Figure 4-8, is a comparison between the 1-30 day group, and the 31-60 day group. The second Mann-Whitney comparison, shown in Figure 4-9, is a comparison between the 1-30 day group to the 61-90 day group. The third Mann-Whitney comparison, shown in Figure 4-10, is a comparison between the 31-60 day group to the 61-90 day group. These tests are conducted with the alternative hypothesis of $n_1 - n_2 < 0$ and a confidence interval of 95%.

The Mann-Whitney comparisons confirm that the interval with the shortest number of days to call NCMEC (MC) has the shortest number of days from the call to the recovery of the child (CR). As shown in Figures 4-8, 4-9, and 4-10, the interval 1-has a median call to recovery (CR) of 28 days, interval 31-60 has a median of 50.5 days, and interval 61-90 has a median of 74 days. The medians of all the intervals show a p-value of 0.0140 and <0.0001, identifying them as statistically different within this research, as referenced in section 2.8.2 of the literature review.

Method

η_1: median of 1 - 30 Bin CR
η_2: median of 31 - 60 Bin CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
1 - 30 Bin CR	5240	28.0
31 - 60 Bin CR	326	50.5

Estimation for Difference

Difference	Upper Bound for Difference	Achieved Confidence
-17	-13	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	14346228.50	<0.0001
Adjusted for ties	14346228.50	<0.0001

Figure 4-8: Mann Whitney Test of the 1-30 Day to 31-60 Day Intervals

Method

η_1: median of 1 - 30 Bin CR
η_2: median of 61 - 90 Bin CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
1 - 30 Bin CR	5240	28
61 - 90 Bin CR	115	74

Estimation for Difference

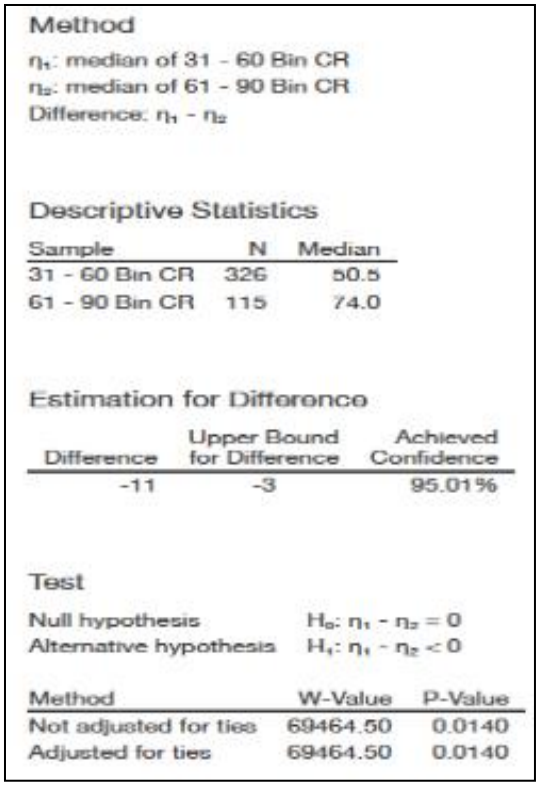
Difference	Upper Bound for Difference	Achieved Confidence
-27	-20	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	13915528.50	<0.0001
Adjusted for ties	13915528.50	<0.0001

Figure 4-9: Mann Whitney Test of the 1-30 Day to 61-90 Day Intervals



Method

η_1: median of 31 - 60 Bin CR
η_2: median of 61 - 90 Bin CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
31 - 60 Bin CR	326	50.5
61 - 90 Bin CR	115	74.0

Estimation for Difference

Difference	Upper Bound for Difference	Achieved Confidence
-11	-3	95.01%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	69464.50	0.0140
Adjusted for ties	69464.50	0.0140

Figure 4-10: Mann Whitney Test of the 31-60-Day to 61-90-Day Intervals

To determine the median of the other independent variable, missing to call (MC), and the dependent variable, missing to recovery (MR), a Kruskal-Wallis was performed on the three (3) groups for these variables. Missing to call (MC) data is found in Figure 4-11, and missing to recovery (MR) data is found in Figure 4-12. The best results were identified in the 1-30-day group where the missing to call had a median of 4 days, shown in figure 4-9, and the missing to recovery has a median of 34 days, shown in figure 4-12. The worst results are shown in the 61-90-day group where the missing to call had a median of 72 days, shown in figure 4-11, and the missing to recovery has a median of 148 days, shown in figure 4-12.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1-30 Bin MC	5240	4	2620.5	-34.93
31 - 60 Bin MC	326	41	5403.5	29.06
61 - 90 Bin MC	115	72	5624.0	18.38
Overall	5681		2841.0	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	1221.62	<0.0001
Adjusted for ties	2	1236.53	<0.0001

Figure 4-11: Kruskal-Wallis Analysis 30-Day MC Segment

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1 - 30 Bin MR	5240	34	2686.7	-24.44
31 - 60 Bin MR	326	93	4534.0	19.20
61 - 90 Bin MR	115	148	5071.5	14.73
Overall	5681		2841.0	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	606.44	<0.0001
Adjusted for ties	2	606.52	<0.0001

Figure 4-12: Kruskal-Wallis Analysis 30-Day MR Segment

4.3 15-Day Segments Data Analysis

This analysis parses the data into smaller groups to better reflect the relationship of the two variables, the time the child is missing to the call to NCMEC (MC) and the time from the call to NCMEC to recovery (CR). In this analysis, and as discussed in section 3.2 of this praxis, the 30-day intervals are divided into 15-day segments. The six 15-day segments are analyzed in the following Kruskal Wallis analysis, shown in Figure 4-13.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1 - 15 Bin CR	4805	27.0	2729.3	-12.03
16 - 30 Bin CR	435	41.0	3255.7	5.49
31 to 45 Bin CR	207	52.0	3651.6	7.24
45 - 60 Bin CR	119	48.0	3420.3	3.89
61 - 75 Bin CR	72	80.5	3909.0	5.56
76 - 90 Bin CR	43	59.0	3838.1	4.00
Overall	5681		2841.0	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	5	161.94	<0.0001
Adjusted for ties	5	161.98	<0.0001

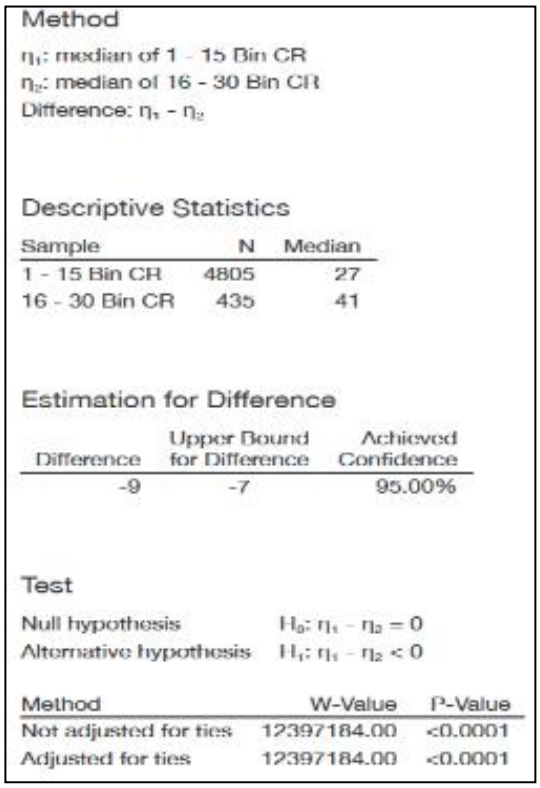
Figure 4-13: Kruskal-Wallis Analysis 15-Day CR Segments

The p-value of <0.0001 indicates at least one median is statistically different. As discussed in section 2.8 of this praxis, if the p-value is less than or equal to the significance level, the null hypothesis is rejected and it is concluded that not all the group medians are equal. Within this analysis, there is at least one segment with a median different than the others. The indication is that the group with the shortest time to call NCMEC (MC) (1 to 15 days) has the shortest time from the call to recovery (CR) by mean rank, which is calculated by taking the ranks of the combined samples and assigning the smallest observation a rank of 1, the second smallest observation a rank of 2, and so on. While the group with the longest time to call NCMEC (MC) (61 to 75 days) has the longest time from the call to recovery (CR) by mean rank. The segments 45 to 60 and 76 to 90 days statistically drop in comparison to the other groups tested. To further analyze this data, a pairwise comparison is performed on all the 15-day segments,

the results follow:

The Mann Whitney analysis, shown in Figure 4-14, shows that the 1-15 day segment has a lower median than the 16-30 day segment, for the call to recovery (CR) variable, with a p-value of <0.0001.

The Mann Whitney analysis, in Figure 4-15, shows the median of the 31-45 day segment does not have a statistically significant different median than the 46-60 day segment, call to recovery (CR) variable. The alternate hypothesis of $n_1 - n_2 < 0$, is rejected since the p-value is 0.88970. The alternative hypothesis is rejected because, as discussed in section 2.8.1, where the p-value is greater than the significance level, it is indicated to reject the alternate hypothesis. This outcome would conclude that all the groups are equal.



Method

η_1: median of 1 - 15 Bin CR
η_2: median of 16 - 30 Bin CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
1 - 15 Bin CR	4805	27
16 - 30 Bin CR	435	41

Estimation for Difference

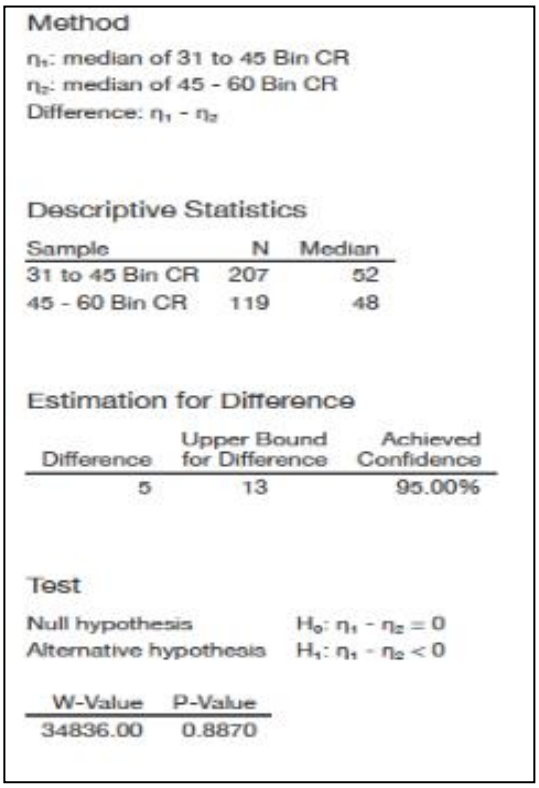
Difference	Upper Bound for Difference	Achieved Confidence
-9	-7	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	12397184.00	<0.0001
Adjusted for ties	12397184.00	<0.0001

Figure 4-14: Mann Whitney Test of the 1 – 30-Day Segments



Method

η_1: median of 31 to 45 Bin CR
η_2: median of 45 - 60 Bin CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
31 to 45 Bin CR	207	52
45 - 60 Bin CR	119	48

Estimation for Difference

Difference	Upper Bound for Difference	Achieved Confidence
5	13	95.00%

Test

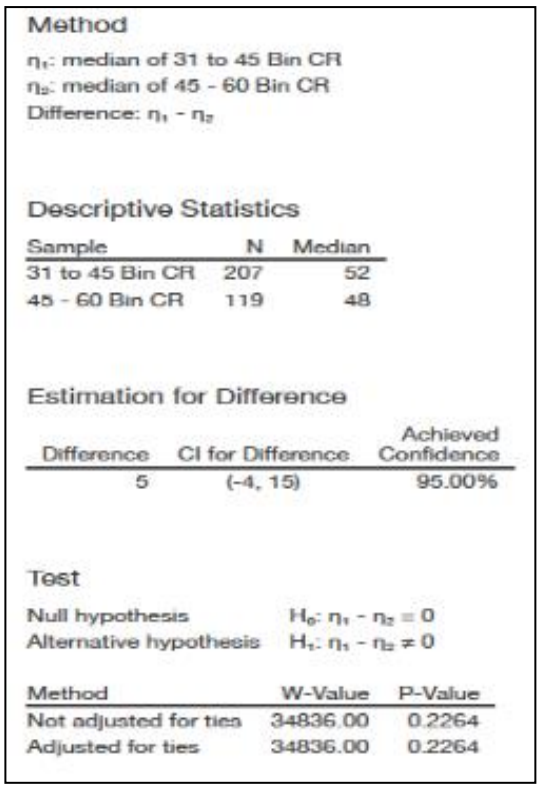
Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

W-Value	P-Value
34836.00	0.8870

Figure 4-15: Mann Whitney Test of the 31 – 60-Day Segments

A second Mann Whitney is run with the alternative of $n_1 - n_2 \neq 0$ to check for equality. The Mann Whitney analysis in Figure 4-16 shows that the median of the 31-45 day segment is statistically equal to the median of the 16-30 day segment, for the call to recover (CR) variable. The alternative hypothesis of $n_1 - n_2 \neq 0$ is rejected with a p-value of 0.2264.

The Mann Whitney analysis, in Figure 4-17, shows the 61-75 day segment does not have a statistically significant median. This also includes the 16-30 day segment, call to recovery (CR) variable. The alternative hypothesis of $n_1 - n_2 < 0$, as discussed in section 2.8.1, is rejected since the p-value is 0.5345.



Method

η_1: median of 31 to 45 Bin CR
η_2: median of 45 - 60 Bin CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
31 to 45 Bin CR	207	52
45 - 60 Bin CR	119	48

Estimation for Difference

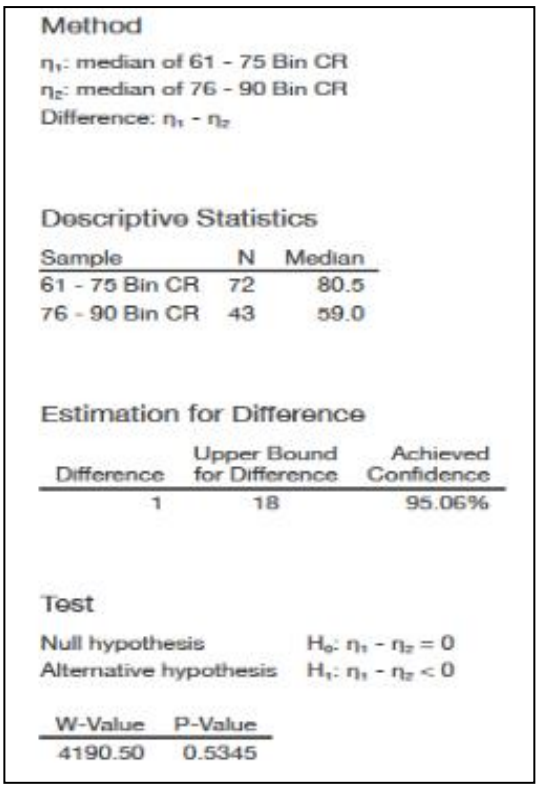
Difference	CI for Difference	Achieved Confidence
5	(-4, 15)	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 \neq 0$

Method	W-Value	P-Value
Not adjusted for ties	34836.00	0.2264
Adjusted for ties	34836.00	0.2264

Figure 4-16: Mann Whitney Equality Test 31 – 60-Day Segment



Method

η_1: median of 61 - 75 Bin CR
η_2: median of 76 - 90 Bin CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
61 - 75 Bin CR	72	80.5
76 - 90 Bin CR	43	59.0

Estimation for Difference

Difference	Upper Bound for Difference	Achieved Confidence
1	18	95.06%

Test

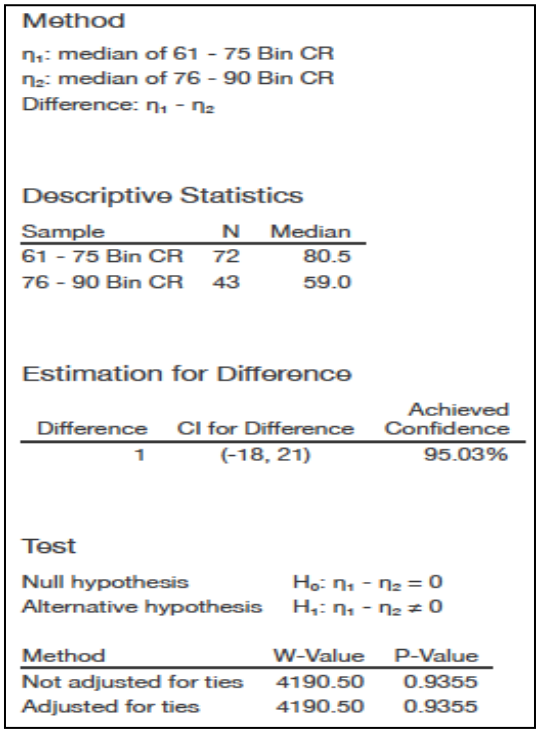
Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

W-Value	P-Value
4190.50	0.5345

Figure 4-17: Mann Whitney Test of the 61 – 90-Day Segment

A second Mann Whitney was run with the alternative of $n_1 - n_2 \neq 0$ to check for equality.

The Mann Whitney analysis in Figure 4-18 shows that the median of the 61-75 day segment is statistically equal to the median of the 76-90 day segment, for the call to recover variable, thus the alternative hypothesis of $n_1 - n_2 \neq 0$ is rejected since it has a p-value of 0.9355. The data would be considered equal if the p-value were 0.05 or less.



Method

η_1: median of 61 - 75 Bin CR
η_2: median of 76 - 90 Bin CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
61 - 75 Bin CR	72	80.5
76 - 90 Bin CR	43	59.0

Estimation for Difference

Difference	CI for Difference	Achieved Confidence
1	(-18, 21)	95.03%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 \neq 0$

Method	W-Value	P-Value
Not adjusted for ties	4190.50	0.9355
Adjusted for ties	4190.50	0.9355

Figure 4-18: Mann Whitney Equality Test 61 – 90-Day Segment

All the Mann-Whitney comparisons were performed with the alternative hypotheses $n_1 - n_2 < 0$. When this alternative hypothesis was not accepted, additional testing was required to determine if the $n_1 - n_2$ was equal to zero or $n_1 - n_2$ was greater than zero. To answer this, the alternative hypothesis was changed to $n_1 - n_2 \neq 0$. When that alternative was not accepted with 95% confidence, the null hypothesis $n_1 - n_2 = 0$ is accepted. To

confirm equality for the segments the following Kruskal-Wallis test was performed, as shown in Figure 4-19. The advantages of establishing the primary teams at this point show the results are not statistically different.

This analysis indicates that all the segments from 31-45 days to 75-90 days are statistically equal with a p-value of 0.1002 for the null hypothesis $n_1 - n_2 \neq 0$ test. All the Mann-Whitney comparisons were performed with the alternative hypotheses $n_1 - n_2 < 0$. This analysis confirmed that within the 1 to 30-day interval the first 15 days had a lower call to recovery (CR) median then the second 15 days with a p-value of <0.0001. In the second 30-day interval the two 15-day segments tested had equal medians with a $n_1 - n_2 \neq 0$, p-value of 0.2264. The third interval of 61 to 90 days also tested as equal with the null hypothesis $n_1 - n_2 = 0$, p-value of 0.9355. In fact, a review of the four segments between 31 days and 90 days shows that all four have equal call to recovery medians. The Kruskal-Wallis test in Figure 4-19 rejects the null hypothesis with a p-value of 0.1002. This indicates that at least one median is different.

While the earlier segments show that statistically there is no impact on the time to recovery based on the time to call NCMEC, in the later segments (beyond 45 days) it does have an impact.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
31 to 45 Bin CR	207	52.0	219.3	-0.26
45 - 60 Bin CR	119	48.0	202.3	-1.88
61 - 75 Bin CR	72	80.5	245.9	1.81
76 - 90 Bin CR	43	59.0	239.3	0.99
Overall	441		221.0	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	3	6.25	0.1002
Adjusted for ties	3	6.25	0.1002

Figure 4-19: Kruskal-Wallis Analysis internals 31 to 90 Days

To determine the median of the other independent variable (MC) as well as the dependent variable, a Kruskal-Wallis was performed on the six segments on these two variables. The medians are contained in that analysis and will be used in chapter 5. Figures 4-20 and 4-21 show the 15-day Kruskal-Wallis analysis.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1 - 15 BIN MC	4805	4	2403.0	-47.14
16 - 30 Bin MC	435	21	5023.0	28.88
31 - 45 Bin MC	207	36	5344.0	22.37
45 - 60 Bin MC	119	51	5507.0	17.92
61 - 75 Bin MC	72	68	5602.5	14.38
76 - 90 Bin MC	43	81	5660.0	11.31
Overall	5681		2841.0	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	5	2240.31	<0.0001
Adjusted for ties	5	2267.65	<0.0001

Figure 4-20: Kruskal-Wallis Analysis 15-Day MC Segment

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1 - 15 Bin MR	4805	32.0	2582.3	-27.84
16 - 30 Bin MR	435	62.0	3840.1	13.22
31 - 45 Bin MR	207	89.0	4469.2	14.55
45 - 60- Bin MR	119	100.0	4646.9	12.14
61 - 75 Bin MR	72	151.5	5028.3	11.39
76 - 90 Bin MR	43	141.0	5143.8	9.24
Overall	5681		2841.0	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

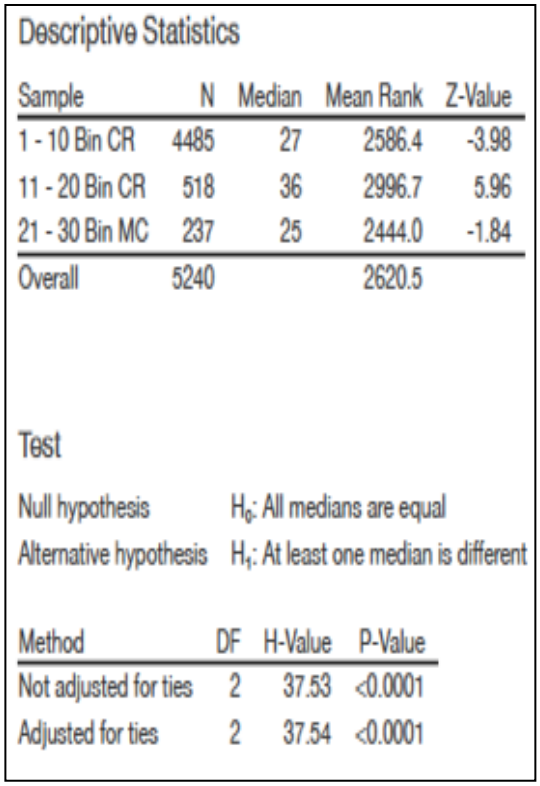
Method	DF	H-Value	P-Value
Not adjusted for ties	5	842.07	<0.0001
Adjusted for ties	5	842.18	<0.0001

Figure 4-21: Kruskal-Wallis Analysis 15-Day MR Segment

4.4 10-Day Segment Data Analysis

The data from the first 30 days was parsed into smaller 10-day group size to better measure the impact of early notification to NCMEC and the establishment of the interactive team, and ensure that the shorter the missing to call (MC) time produced a shorter call to recovery (CR) time in this group. The following analysis represents this smaller group size. The first analysis is the Kruskal-Wallis analysis of the groups parsed into 10-day segments, as shown in Figures 4-22 and 4-23.

To confirm the findings in the 15-day analysis, the Kruskal-Wallis analysis was split to measure each 30-day interval as a stand-alone.



Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1 - 10 Bin CR	4485	27	2586.4	-3.98
11 - 20 Bin CR	518	36	2996.7	5.96
21 - 30 Bin MC	237	25	2444.0	-1.84
Overall	5240		2620.5	

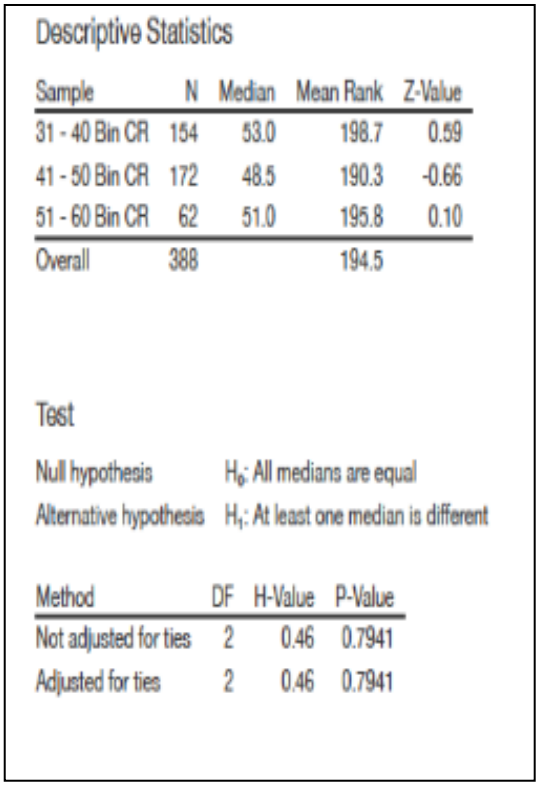
Test

Null hypothesis H_0: All medians are equal

Alternative hypothesis H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	37.53	<0.0001
Adjusted for ties	2	37.54	<0.0001

Figure 4-22: Kruskal-Wallis 10-day Segments 1 – 30 Day Interval



Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
31 - 40 Bin CR	154	53.0	198.7	0.59
41 - 50 Bin CR	172	48.5	190.3	-0.66
51 - 60 Bin CR	62	51.0	195.8	0.10
Overall	388		194.5	

Test

Null hypothesis H_0: All medians are equal

Alternative hypothesis H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	0.46	0.7941
Adjusted for ties	2	0.46	0.7941

Figure 4-23: Kruskal-Wallis 10-day Segments 31 – 60 Day Interval

In the first 30-day interval the three segments, as shown with a p-value of <0.0001 and indicating that it has at least one median that is different. The second interval shows three 10-day segments between 31 and 60 days all have medians that are equal, accepting the null hypothesis with a p value of 0.7941, as discussed in section 2.8.1.

To confirm each of the segments in the first 30-day interval has a different median, a pairwise comparison using the Mann-Whitney test was performed on each pair. All the Mann-Whitney comparisons were performed with the alternative hypotheses $n_1 - n_2 < 0$, and a confidence interval p-value of 0.05. Up to the 30-day segment the alternative hypotheses were accepted, however, after 30 days the segments became statistically equal.

As discussed in section 2.8.1, to determine the median of the other independent

variable (MC), as well as the dependent variable, a Kruskal-Wallis was performed on the 6 segments in these two variables. The medians are contained in that analysis, as shown in Figures 4-24, 4-25, and 4-26. These medians will be used and further explained in chapter 5.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1 - 10 Bin CR	4485	27.0	2687.6	-11.61
11 - 20 Bin CR	518	36.0	3125.3	4.57
21 - 30 Bin CR	237	42.0	3331.1	5.00
31 - 40 Bin CR	154	53.0	3615.4	6.20
41 - 50 Bin CR	172	48.5	3488.3	5.52
51 - 60 Bin CR	62	51.0	3564.2	3.65
Overall	5628		2814.5	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	5	150.46	<0.0001
Adjusted for ties	5	150.49	<0.0001

Figure 4-24: Kruskal-Wallis Analysis 10-Day CR Segments

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1 - 10 Bin MC	4485	3	2243.0	-52.27
11 - 20 Bin MC	518	14	4744.5	28.37
21 - 30 Bin MC	237	25	5122.0	22.34
31 - 40 Bin MC	154	34	5317.5	19.38
41 - 50 Bin MC	172	49	5491.7	21.95
51 - 60 Bin MC	62	55	5566.5	13.41
Overall	5628		2814.5	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	5	2774.02	<0.0001
Adjusted for ties	5	2808.85	<0.0001

Figure 4-25: Kruskal-Wallis Analysis 10-Day MC Segments

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1 - 10 Bin MR	4485	30	2521.9	-26.76
11 - 20 Bin MR	518	51	3489.1	9.92
21 - 30 Bin MR	237	67	4012.6	11.60
31 - 40 Bin MR	154	86	4415.4	12.40
41 - 50 Bin MR	172	99	4629.0	14.88
51 - 60 Bin MR	62	105	4751.1	9.44
Overall	5628		2814.5	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	5	815.65	<0.0001
Adjusted for ties	5	815.76	<0.0001

Figure 4-26: Kruskal-Wallis Analysis 10-Day MR Segments

Analyzing the CR variable there is a statistical difference between at least one of the segments, and the group is confirmed with a p-value of <0.0001. To confirm each of the segments has a different median a pairwise comparison using the Mann-Whitney test was performed on each pair. All the Mann-Whitney comparisons were performed with the alternative hypotheses $n_1 - n_2 < 0$, and a confidence segment p-value of 0.05.

In Figure 4-27, the p-value of <0.0001 indicates the that at least one median is different. This accepts the alternative hypothesis. Additionally, this shows there was a statistical difference within the group that a pair-wise comparison was needed to show which segments in the group are different.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1 - 10 Bin CR	4485	27	2553.1	-7.85
11 - 20 Bin CR	518	36	2960.7	5.39
21 - 30 Bin CR	237	42	3151.4	5.53
Overall	5240		2620.5	

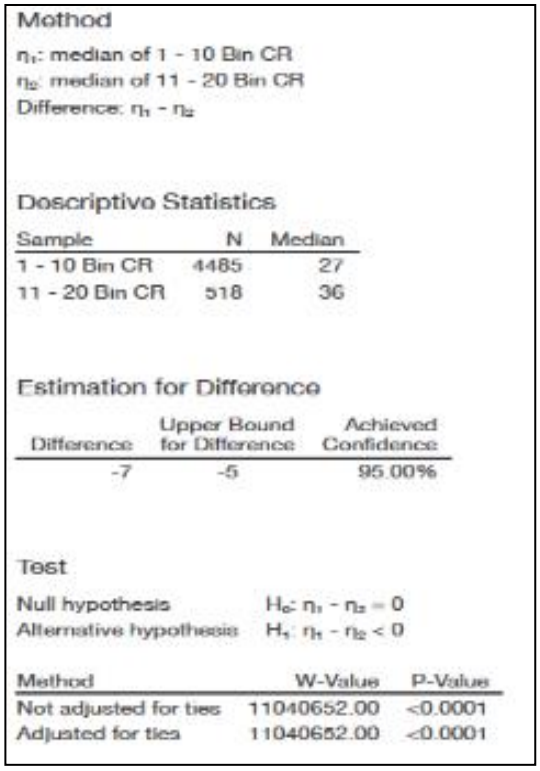
Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	64.28	<0.0001
Adjusted for ties	2	64.30	<0.0001

Figure 4-27: Kruskal-Wallis Analysis 10-Day, 1 to 30 Day CR Segments

The research verifies that all three segments have different medians pairwise. The Mann-Whitney test was conducted on the three segments. The Mann-Whitney tested the null hypothesis of $n_1 - n_2 < 0$, where n_1 was the segment with the lowest mean rank, as shown in Figures 4-28, 4-29, and 4-30.



Method

η_1: median of 1 - 10 Bin CR
η_2: median of 11 - 20 Bin CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
1 - 10 Bin CR	4485	27
11 - 20 Bin CR	518	36

Estimation for Difference

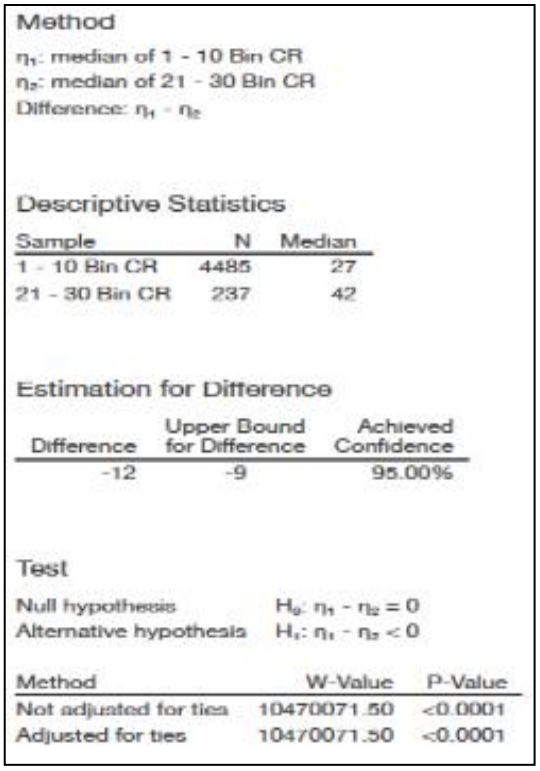
Difference	Upper Bound for Difference	Achieved Confidence
-7	-5	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	11040652.00	<0.0001
Adjusted for ties	11040652.00	<0.0001

Figure 4-28: Mann-Whitney Test of the 10 to 20-Day Segments



Method

η_1: median of 1 - 10 Bin CR
η_2: median of 21 - 30 Bin CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
1 - 10 Bin CR	4485	27
21 - 30 Bin CR	237	42

Estimation for Difference

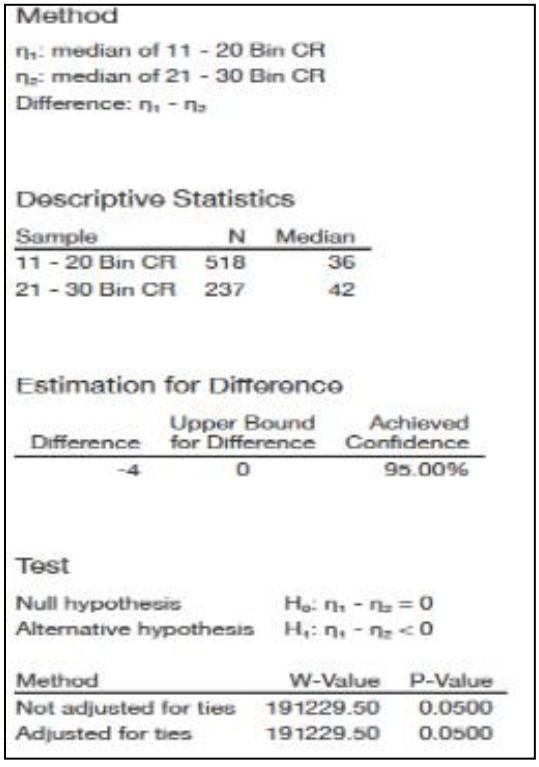
Difference	Upper Bound for Difference	Achieved Confidence
-12	-9	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	10470071.50	<0.0001
Adjusted for ties	10470071.50	<0.0001

Figure 4-29: Mann-Whitney Test of the10 to 30-Day Segments



Method

η_1: median of 11 - 20 Bin CR
η_2: median of 21 - 30 Bin CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
11 - 20 Bin CR	518	36
21 - 30 Bin CR	237	42

Estimation for Difference

Difference	Upper Bound for Difference	Achieved Confidence
-4	0	95.00%

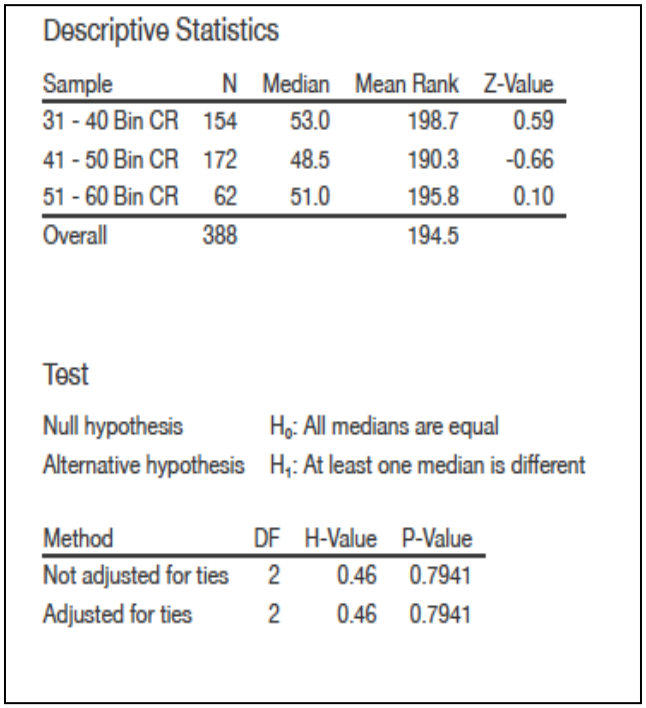
Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	191229.50	0.0500
Adjusted for ties	191229.50	0.0500

Figure 4-30: Mann-Whitney Test of the 20 to 30-Day Segments

Figure 4-31 shows the test of the alternative hypothesis that at least one median was not equal. This alternative was rejected given the p-value of 0.7941. The null hypothesis that all the medians of the 10-day segments within the 31 to 60 day segments are equal was accepted.



Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
31 - 40 Bin CR	154	53.0	198.7	0.59
41 - 50 Bin CR	172	48.5	190.3	-0.66
51 - 60 Bin CR	62	51.0	195.8	0.10
Overall	388		194.5	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	0.46	0.7941
Adjusted for ties	2	0.46	0.7941

Figure 4-31: Kruskal-Wallis CR Equality Test of the 31 to 60 Day Group

Figure 4-32 shows the test of the alternative hypothesis that at least one median was not equal. This alternative was rejected given the p-value of 0.2842. The null hypothesis that all the medians of the 10-day segments within the 61 to 90-day segment are equal was accepted.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
61 - 70 Bin CR	53	49	54.8	-1.23
71 - 80 Bin CR	36	108	66.3	1.54
81 - 90 Bin CR	28	53	57.7	-0.23
Overall	117		59.0	

Test

Null hypothesis H_0: All medians are equal

Alternative hypothesis H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	2.52	0.2843
Adjusted for ties	2	2.52	0.2842

Figure 4-32: Kruskal-Wallis Analysis CR Equality Test of the 61 to 90 Day Group

4.5 State Analysis

To analyze if there was any jurisdictional impact to the analysis above a Kruskal-Wallis test was performed on the 5 states with the largest caseload. These states are identified as numbers 242, 237, 208, 232, and 247. The results of that test are below in Figure 4-33.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
242 CR	1587	27	1625.8	-3.94
237 CR	654	29	1677.5	-0.55
208 CR	541	30	1699.3	0.07
232 CR	315	31	1771.1	1.42
247 CR	295	43	2034.4	6.20
Overall	3392		1696.5	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	4	45.47	<0.0001
Adjusted for ties	4	45.48	<0.0001

Figure 4-33: Kruskal-Wallis Analysis of the 5 States with the Largest Case Load

The analysis accepted the alternative hypothesis that at least one of the medians was different with a p-value of <0.05. To identify which of these five states have statistically equal medians a Mann-Whitney test was performed on the group. The Mann-Whitney tested the null hypothesis of $n_1 - n_2 < 0$, with a confidence segment of 95%, where n_1 is the segment with the lowest mean rank.

The Mann-Whitney test in Figures 4-34 and 4-35 did not accept the null hypothesis with p-values of 0.1288 and 0.1266 respectively. To test for equality a Kruskal-Wallis test was performed between these three states, as shown in Figure 4-36.

Method

η_1: median of State 242 CR
η_2: median of State 237 CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
State 242 CR	1587	27
State 237 CR	654	29

Estimation for Difference

Difference	Upper Bound for Difference	Achieved Confidence
-1	1	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	1763261.00	0.1288
Adjusted for ties	1763261.00	0.1288

Figure 4-34: Mann Whitney Test of States 242 – 237

Method

η_1: median of State 242 CR
η_2: median of State 208 CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
State 242 CR	1587	27
State 208 CR	541	30

Estimation for Difference

Difference	CI for Difference	Achieved Confidence
-2	(-4, 1)	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 \neq 0$

Method	W-Value	P-Value
Not adjusted for ties	1670508.50	0.1266
Adjusted for ties	1670508.50	0.1266

Figure 4-35: Mann Whitney Test of States 242 – 208

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
State 242 CR	1587	27	1369.7	-1.65
State 237 CR	654	29	1412.5	0.77
State 208 CR	541	30	1430.1	1.24
Overall	2782		1391.5	

Test

Null hypothesis H_0: All medians are equal
Alternative hypothesis H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	2.87	0.2386
Adjusted for ties	2	2.87	0.2385

Figure 4-36: Kruskal-Wallis 3 State Equality Test

Confirming the inequality in the remaining states, the following Kruskal-Wallis analysis was performed. Figure 4-37 shows the Kruskal-Wallis analysis of 3 test states.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
State 242 CR	1587	27	1050.1	-5.83
State 232 CR	315	31	1143.3	1.34
State 247 CR	295	43	1314.8	6.28
Overall	2197		1099.0	

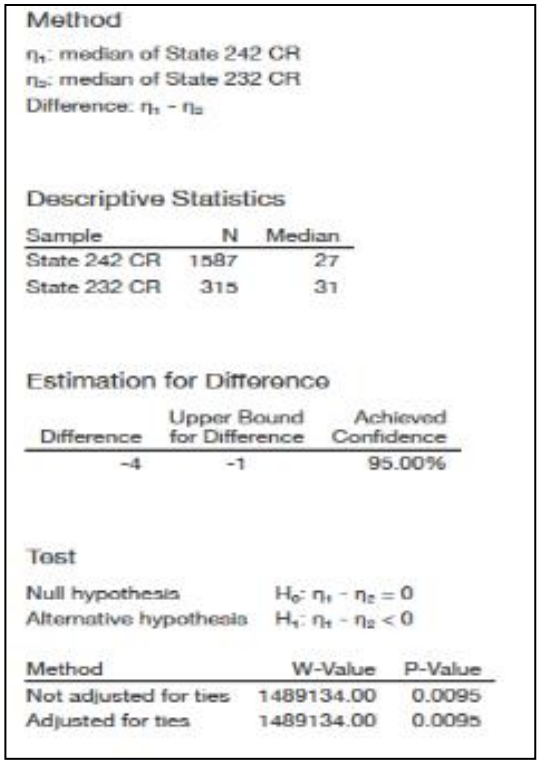
Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	45.10	<0.0001
Adjusted for ties	2	45.11	<0.0001

Figure 4-37: Kruskal-Wallis Analysis of 3 Test States

The Mann-Whitney test of the three remaining states, shown in Figures 4-38, 4-39, and 4-40, accepted the alternative hypothesis of $n_1 - n_2 < 0$, with p-values of 0.0095, <0.0001, and 0.0007 respectively. The result was that state 242's 27-day median was statistically lower than the 31-day median of state 232, and the 43-day median of state 247. Additionally, the 31-day median of state 232 was statistically lower than the 43-day median of state 247.



Method

η_1: median of State 242 CR
η_2: median of State 232 CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
State 242 CR	1587	27
State 232 CR	315	31

Estimation for Difference

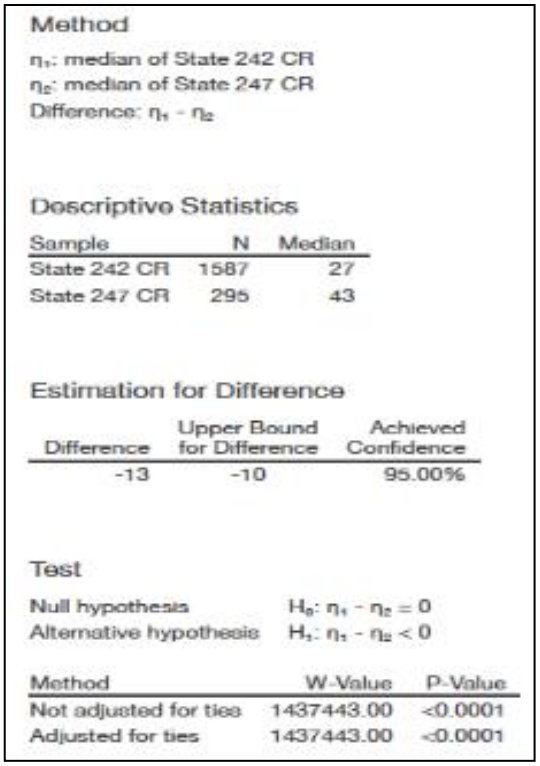
Difference	Upper Bound for Difference	Achieved Confidence
-4	-1	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	1489134.00	0.0095
Adjusted for ties	1489134.00	0.0095

Figure 4-38: Mann-Whitney Test of States 242 – 232



Method

η_1: median of State 242 CR
η_2: median of State 247 CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
State 242 CR	1587	27
State 247 CR	295	43

Estimation for Difference

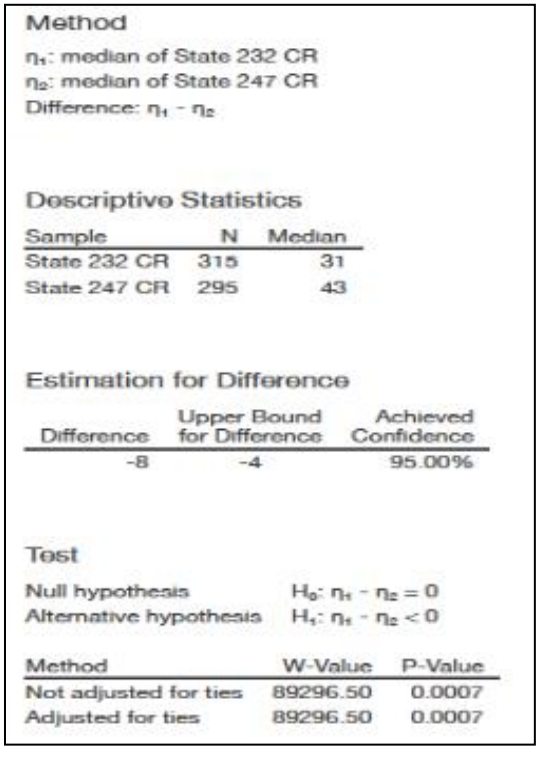
Difference	Upper Bound for Difference	Achieved Confidence
-13	-10	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	1437443.00	<0.0001
Adjusted for ties	1437443.00	<0.0001

Figure 4-39: Mann-Whitney Test of States 242 – 247



Method

η_1: median of State 232 CR
η_2: median of State 247 CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
State 232 CR	315	31
State 247 CR	295	43

Estimation for Difference

Difference	Upper Bound for Difference	Achieved Confidence
-8	-4	95.00%

Test

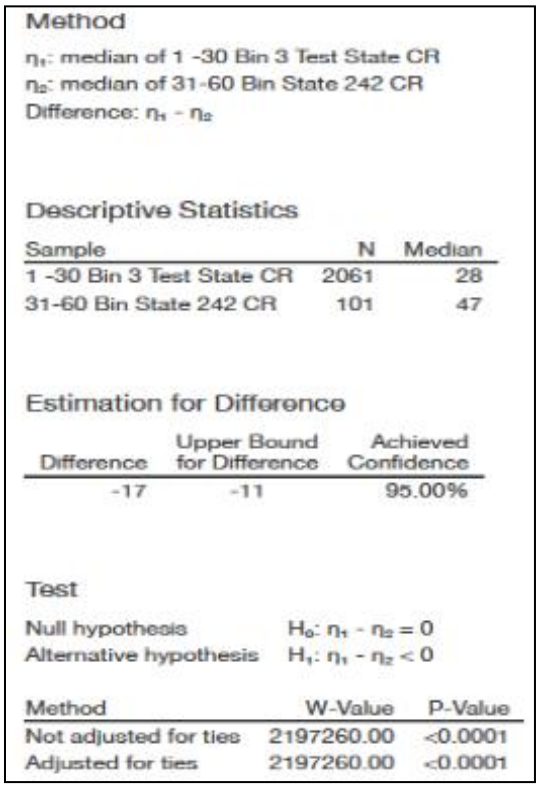
Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	89296.50	0.0007
Adjusted for ties	89296.50	0.0007

Figure 4-40: Mann-Whitney Test of States 232 – 247

The above process selected the three test states to be used in the following analysis. The first step was to verify that there was a difference between the 1 to 30 day segment and the 31to 60 day segment for the three test states.

Figure 4-41 shows that the alternative hypothesis was rejected, $n_1 - n_2 < 0$ because the median of the 1 to 30 day interval was statistically lower than the 31 to 60 day interval with p-value of <0.0001.



Method

η_1: median of 1 -30 Bin 3 Test State CR
η_2: median of 31-60 Bin State 242 CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
1 -30 Bin 3 Test State CR	2061	28
31-60 Bin State 242 CR	101	47

Estimation for Difference

Difference	Upper Bound for Difference	Achieved Confidence
-17	-11	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	2197260.00	<0.0001
Adjusted for ties	2197260.00	<0.0001

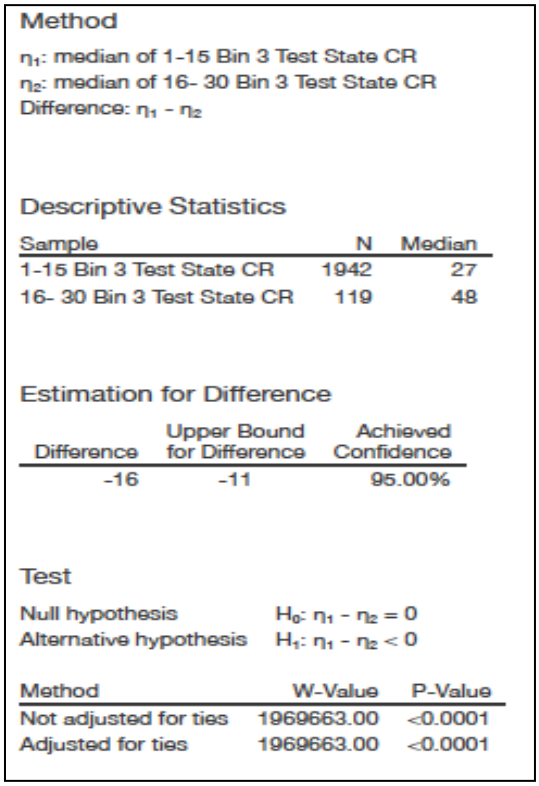
Figure 4-41: Mann-Whitney 3 Test States 30 to 60 day intervals

4.6 3 State 15 and 10-Day Segments

To verify that the findings on the impact of the missing to call (MC) variable to the call to recovery (CR) interval over the first 30 days are not impacted by jurisdictional issues, 3 test states from the top 5 states, were evaluated on 15 and 10-day segments. The

first step was to verify that the top 3 states had an increase in the call to recovery median to the missing to call variable shown in the total data set. The following is a Mann-Whitney test on the caseload from the top 3 test states in 15-day segments. The Mann-Whitney tested the null hypothesis of $n_1 - n_2 < 0$, where n_1 is the segment with the lowest mean rank.

The Mann-Whitney test in Figure 4-42 accepted the alternative hypothesis, $n_1 - n_2 < 0$ with a p-value of <0.0001. This indicates that the call to recovery rate for the top 3 test states increased as the missing to call (MC) time increased in the first 30 days. The top 3 test states total caseloads are not compared 10-day segments.



Method

η_1: median of 1-15 Bin 3 Test State CR
η_2: median of 16- 30 Bin 3 Test State CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
1-15 Bin 3 Test State CR	1942	27
16- 30 Bin 3 Test State CR	119	48

Estimation for Difference

Difference	Upper Bound for Difference	Achieved Confidence
-16	-11	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	1969663.00	<0.0001
Adjusted for ties	1969663.00	<0.0001

Figure 4-42: Mann-Whitney Test of States 15 – 30-Day Segment

Figure 4-43 indicates that the alternative hypothesis was accepted, one median was different than the others with a p-value of <0.0001. The data verifies that all three

segments had different medians pairwise. The Mann-Whitney test was conducted on the three segments to test the null hypothesis of $n_1 - n_2 < 0$, where n_1 is the segment with the lowest mean rank.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
1 -10 Bin 3 Test State CR	1838	27	1004.8	-5.74
11-20- Bin 3 Test State CR	156	36	1191.0	3.49
21- 30 Bin 3 Test State CR	67	61	1377.9	4.85
Overall	2061		1031.0	

Test

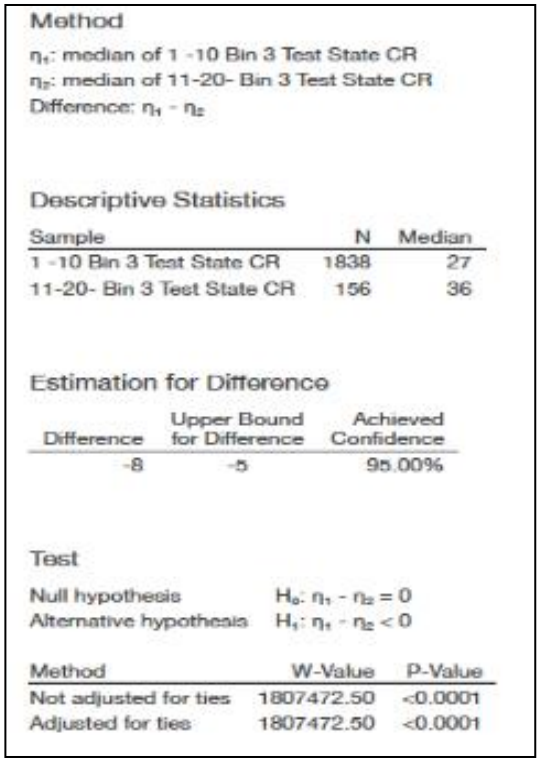
Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	37.60	<0.0001
Adjusted for ties	2	37.61	<0.0001

Figure 4-43: Kruskal-Wallis Analysis of 3 Test States

The three Mann-Whitney tests in Figures 4-44, 4-45, and 4-46 accepted the alternative hypothesis of $n_1 - n_2 < 0$, with p-values of <0.0001, <0.0001, and 0.0139 respectively. The result was that in the three test states, the 1 to 10-day median of 27 days was statistically lower than the 11 to 20 day with a 36-day median. Additionally, the 11 to 20-day median was statistically lower than the 21 to 30-day median.

To validate there was no jurisdictional impact on the case data, the 30-day case load from the three states was compared with the 15 and 10-day segments. The Kruskal-Wallis analysis of 15-day segment produced the following:



Method

η_1: median of 1 -10 Bin 3 Test State CR
η_2: median of 11-20- Bin 3 Test State CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
1 -10 Bin 3 Test State CR	1838	27
11-20- Bin 3 Test State CR	156	36

Estimation for Difference

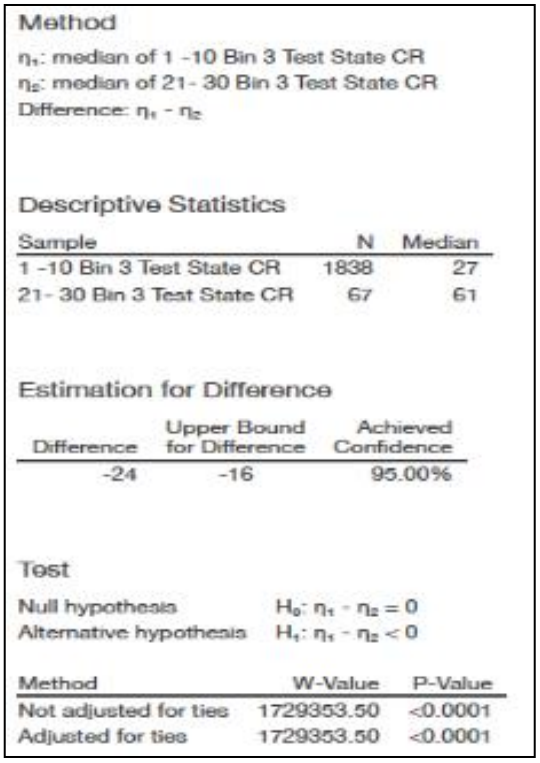
Difference	Upper Bound for Difference	Achieved Confidence
-8	-5	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	1807472.50	<0.0001
Adjusted for ties	1807472.50	<0.0001

Figure 4-44: Mann-Whitney Test of States 10-20 Segment



Method

η_1: median of 1 -10 Bin 3 Test State CR
η_2: median of 21- 30 Bin 3 Test State CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
1 -10 Bin 3 Test State CR	1838	27
21- 30 Bin 3 Test State CR	67	61

Estimation for Difference

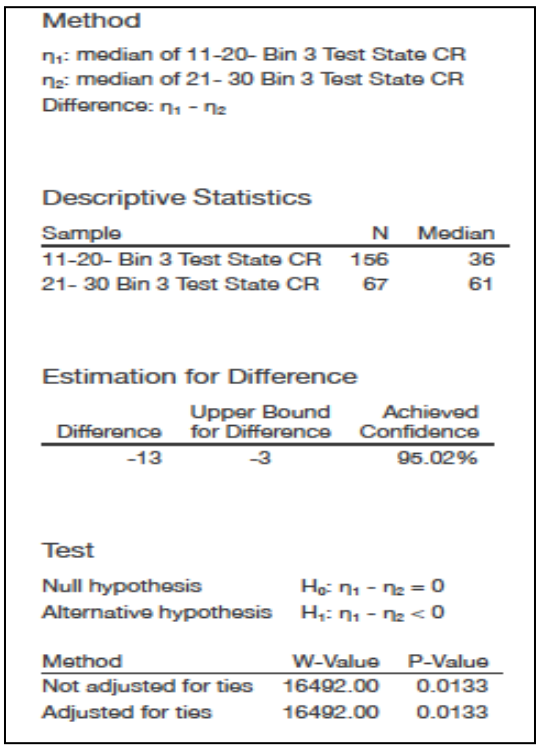
Difference	Upper Bound for Difference	Achieved Confidence
-24	-16	95.00%

Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	1729353.50	<0.0001
Adjusted for ties	1729353.50	<0.0001

Figure 4-45: Mann-Whitney Test of States 10-30 Segment



Method

η_1: median of 11-20- Bin 3 Test State CR
η_2: median of 21- 30 Bin 3 Test State CR
Difference: $\eta_1 - \eta_2$

Descriptive Statistics

Sample	N	Median
11-20- Bin 3 Test State CR	156	36
21- 30 Bin 3 Test State CR	67	61

Estimation for Difference

Difference	Upper Bound for Difference	Achieved Confidence
-13	-3	95.02%

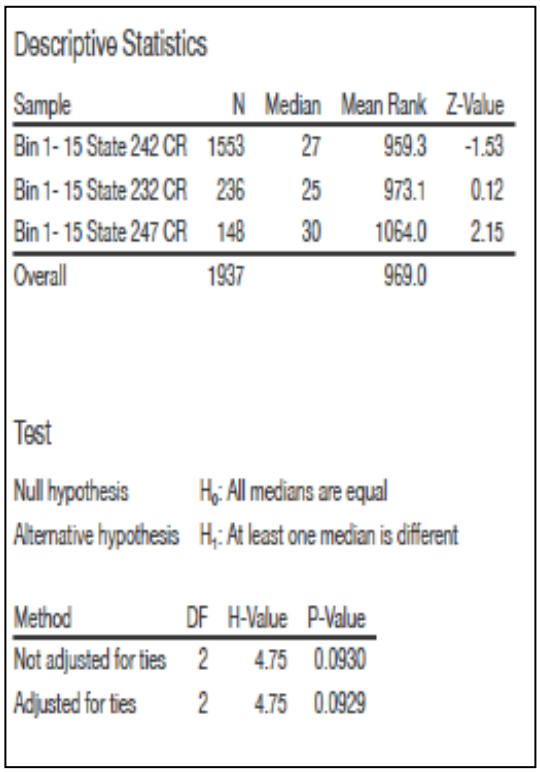
Test

Null hypothesis H_0: $\eta_1 - \eta_2 = 0$
Alternative hypothesis H_1: $\eta_1 - \eta_2 < 0$

Method	W-Value	P-Value
Not adjusted for ties	16492.00	0.0133
Adjusted for ties	16492.00	0.0133

Figure 4-46: Mann-Whitney Test of States 20-30 Segment

The Kruskal-Wallis analysis in Figures 4-47 and 4-48 rejected the alternative hypothesis that at least one of the medians was different with p-values of 0.0930, and .5850 respectively. The result in the null hypothesis was that the medians in both tests were statistically equal, which is accepted.



Descriptive Statistics

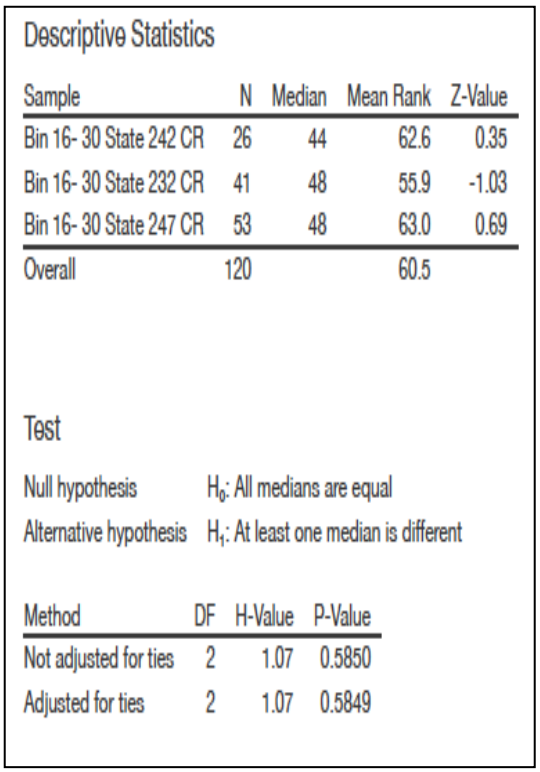
Sample	N	Median	Mean Rank	Z-Value
Bin 1- 15 State 242 CR	1553	27	959.3	-1.53
Bin 1- 15 State 232 CR	236	25	973.1	0.12
Bin 1- 15 State 247 CR	148	30	1064.0	2.15
Overall	1937		969.0	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	4.75	0.0930
Adjusted for ties	2	4.75	0.0929

Figure 4-47: Kruskal-Wallis 3 Test States 1-15-Day Segment



Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
Bin 16- 30 State 242 CR	26	44	62.6	0.35
Bin 16- 30 State 232 CR	41	48	55.9	-1.03
Bin 16- 30 State 247 CR	53	48	63.0	0.69
Overall	120		60.5	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	1.07	0.5850
Adjusted for ties	2	1.07	0.5849

Figure 4-48: Kruskal-Wallis 3 Test States 16-30-Day Segment

When analyzing the top 3 states, the 30-day intervals on a day 10 segment produced the following data in Figures 49, 50, and 51.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
Bin 1-10 State 242 CR	1505	26.0	912.8	-1.07
Bin 1-10 State 232 CR	214	25.0	910.1	-0.26
Bin 1-10 State 247 CR	118	32.5	1014.6	2.02
Overall	1837		919.0	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	4.10	0.1289
Adjusted for ties	2	4.10	0.1289

Figure 4-49: Kruskal-Wallis 3 Test States 1-10 Day Segment

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
Bin 11- 20 State 242 CR	61	36	78.0	-0.12
Bin 11- 20 State 232 CR	41	35	79.5	0.17
Bin 11- 20 State 247 CR	54	36	78.3	-0.04
Overall	156		78.5	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	0.03	0.9850
Adjusted for ties	2	0.03	0.9850

Figure 4-50: Kruskal-Wallis 3 Test States 11-20 Day Segment

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
Bin 21-30 State 242 CR	13	62	38.8	0.87
Bin 21- 30 State 232 CR	27	48	30.7	-1.27
Bin 21-30 State 247 CR	28	65	36.1	0.57
Overall	68		34.5	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	2	1.78	0.4117
Adjusted for ties	2	1.78	0.4115

Figure 4-51: Kruskal-Wallis 3 Test States 21-30 Day Segment

Figures 4-49, 4-50, and 4-51, all rejected the alternative hypothesis that at least one of the medians was different, with p-values of 0.1289, 0.9850, and 0.4117 respectively. The conclusions will be discussed in chapter 5, table 5-4.

Chapter 5. Findings

5.1 Data Correlation

The correlation analysis in chapter 4 shows a very high correlation (.95) between the independent variable call to recovery (CR) and missing to recovery (MR). This is not surprising since the CR variable is the largest component of the dependent variable. In the study, the missing to call (MC) variable has a range between 1 day and 90 days, while the call to recovery (CR) variable has a range of 1 day to 365 days.

The significance of the correlation shown in Figures 4.1 and 4.2, is that there is a low relationship, .161875, between the missing to call (MC) variable and the missing to recovery (MR) variable. Also, there is a low relationship, .365133, between the missing to call (MC) variable and the call to recovery (CR) variables respectively. Shown in Figure 4-3, there was a stronger correlation with call to recovery (CR) and missing to call (MC), 0.949151.

This research analyzes the relationship between the call to recovery (CR) and the missing to call (MC) variables. If there were a direct correlation between the time to call NCMEC and the recovery, no further analysis would be needed to support the hypotheses. However, after the lack of correlation was found, further research showed that a call to NCMEC (MC) within a smaller range of days produced a recovery in an earlier range of days. Data cannot support an exact equation for number of days to call that will result in the number of days to recover, but rather data is supported a call to NCMEC in a range of days will produce a recovery within a range of days. The Spearman Rho analysis, conducted in section 4.1 of this praxis, was used for the correlation due to the skewed data. The following analysis uses the missing to call (MC)

data sorted into groups with ranges of 30, 15, and 10 days.

5.2 Findings from the 30-Day Interval

As discussed in section 4.2, the first step was to split the data from the MC variable into thee (3) groups of 30-day intervals. A Kruskal-Wallis analysis was performed on the CR variable to confirm that at least one of the three groups had a median different than the others. This was confirmed when the Kruskal-Wallis returned a p-value of < 0.0001, which is lower than the confidence level of 0.05. The median value and mean rank of each variable from the Kruskal-Wallis analysis of the 30-day MC variable is presented in the table below. As shown in Table 5-1, the missing to call (MC) has a median of 4.0, meaning the median time for NCMEC to be called was 4 days. The call to recovery (CR) has a median of 28 days, and the missing to recovery (MR) is 34 days. The 1-30 interval is the lowest timeframe, in comparison to the 31-60 interval, and the 61-90 interval.

Table 5-1: Kruskal-Wallis 30 Day Interval Results

MC Interval	MC Median	CR Median	MR Median
1-30 Interval	4.0	28.0	34.0
31-60 Interval	41.0	50.5	93.0
61-90 Interval	72.0	74.0	148.0
MC Interval	MC Mean Rank	CR Mean Rank	MR Mean Rank
1-30 Interval	2620.5	2773.0	2686.7
31-60 Interval	5403.5	3576.2	4534.0
61-90 Interval	5624.0	3882.5	5071.5

The Mann Whitney pairwise comparisons in chapter 4 confirm the CR recovery time for the 1-30 day group is lower than the other two groups with p-values of <0.0001 for both and the 31-60 day group is lower than the 61-90 day group with a p-value of

<0.0140. The relationship between the MC variable and the CR variables are shown in Figure 5-1. As shown, there is a clear positive trend between all three intervals.

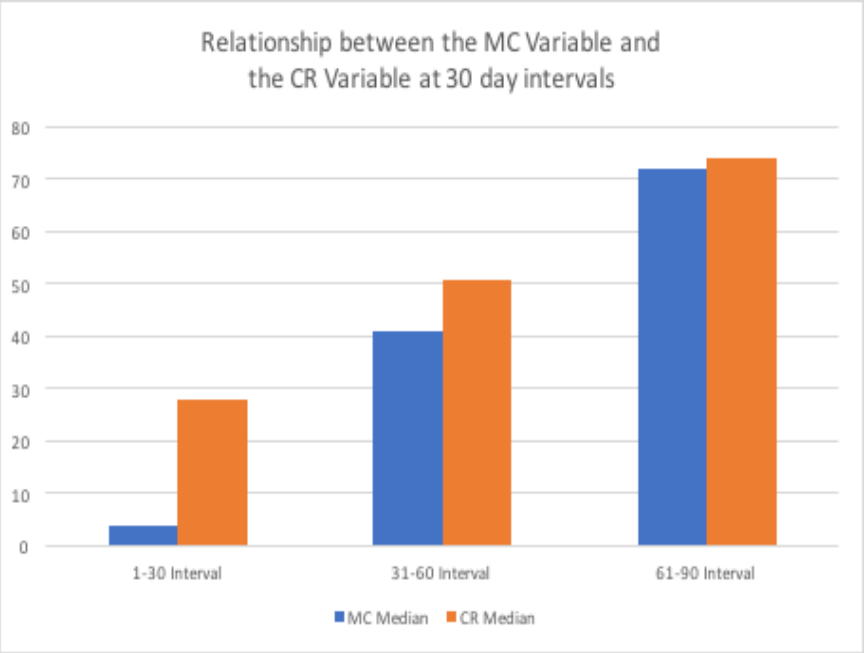


Figure 5-1: MC and CR variables at the 30-Day Intervals

The graphic in Figure 5-1 shows that calls to NCMEC (MC) and the establishment of the interactive teams made in the first interval result in shorter call to recovery times (CR). The following graphic, Figure 5-2, shows the relationship of the shorter call interval and the total recovery time. Within this figure, the MC and CR data are displayed in a stacked format to show the total median times from both variables.

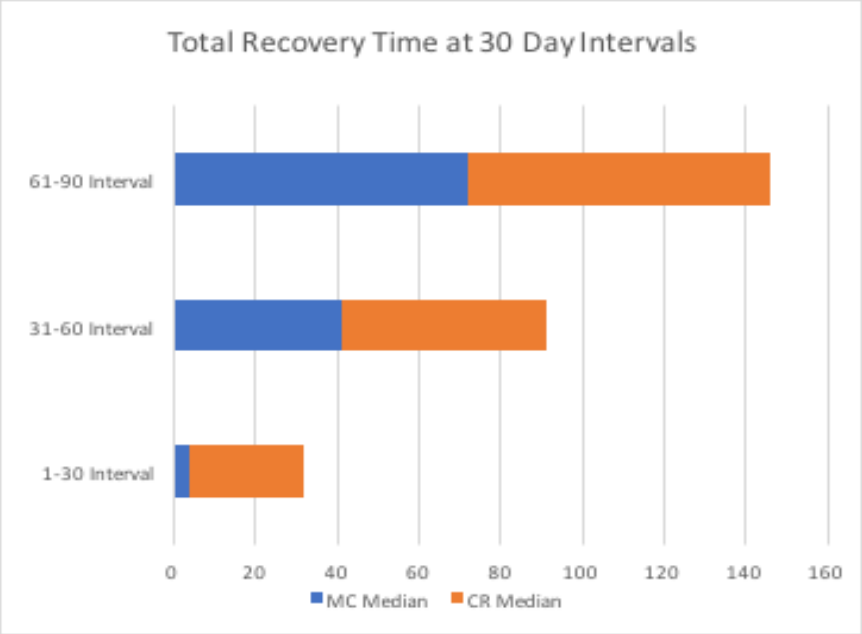


Figure 5-2: Total Recovery Time 30-Day Intervals

The data in Figures 5-1 and 5-2 show that earlier intervention of the system of teams produces better results across the board on the large scale of 30-day intervals.

5.3 Findings from the 15-Day Segments

To increase the data analysis focus, the following analysis uses 15-day groups. The table below shows the results of the Kruskal-Wallis analysis of the call to recovery (CR) variable by 15 day missing to call (MC) segments. As shown in Table 5-2, the missing to call (MC) for the 1-15 day interval has a median of 4.0, meaning the median time for NCMEC to be called was 4 days. The call to recovery (CR) has a median of 27 days, and the missing to recovery (MR) is 32 days. The 1-15 day interval is the lowest timeframe, in comparison to the 16-30, 31-45, 46-60, 61-75, and 76-90 day intervals. As shown within previous data analysis, the earlier the teams are established (MC), the lower the overall missing to recovery (MR).

Table 5-2: Kruskal-Wallis 15-Day Segment Results

MC Interval	MC Median	CR Median	MR Median
1-15 Interval	4.0	27.0	32.0
16-30 Interval	21.0	41.0	62.0
31-45 Interval	36.0	52.0	89.0
46-60 Interval	51.0	48.0	100.0
61-75 Interval	68.0	80.5	151.5
76-90 Interval	81.0	59.0	141.0
MC Interval	MC Mean Rank	CR Mean Rank	MR Mean Rank
1-15 Interval	2403.0	2729.3	2582.3
16-30 Interval	5023.0	3255.7	3840.1
31-45 Interval	5344.0	3651.6	4469.2
46-60 Interval	5504.0	3402.3	4646.9
61-75 Interval	5602.5	3909.0	5028.3
76-90 Interval	5660.0	3838.1	5143.8

The analysis indicates there is a downward trend, where the trend line becomes more negative, in the call to recovery time after the 61 to 75 day segment. This can be seen clearly in Figure 5-3, specifically after the start of the 61-75 day segment through the 76-90 day segment. Although there are various reasons, this is most likely because the missing child has become more acclimated to his/her environment and easier to locate. Further case-specific research would need to be conducted to identity the reasons why the flattening occurred.

As shown in Figure 5-3, there is a clear positive trend between 1-60 day intervals and a downward trend, specifically within the CR, between 61-90 day intervals.

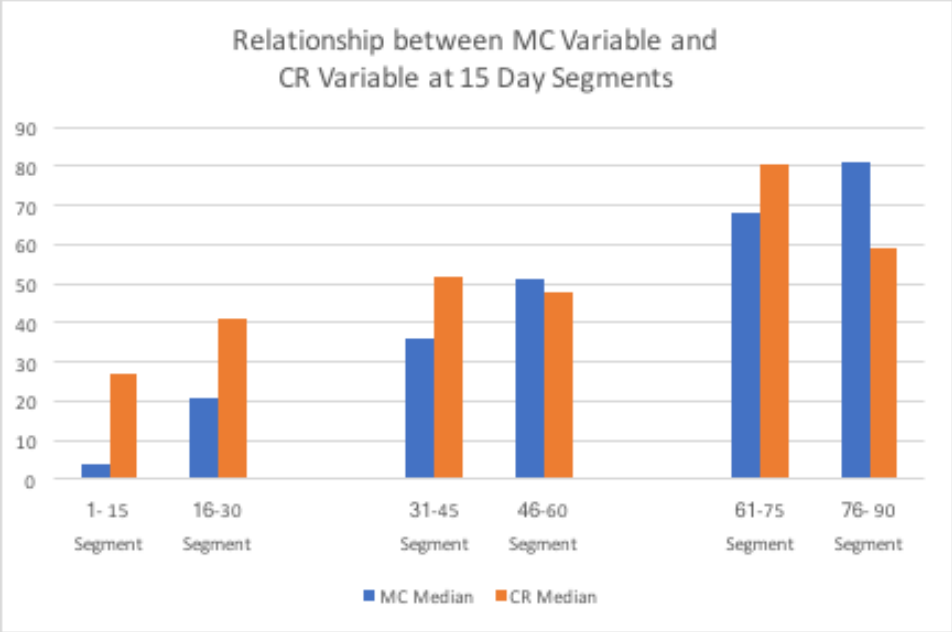


Figure 5-3: MC and CR variables at the 15-Day Segments

The data represented in Figure 5-4 shows that calls to NCMEC (MC), and the establishment of the interactive teams made in the first interval result in shorter call to recovery times (CR). This analysis holds true up till the 76-90 day segments where a downward trend is noticed. As illustrated in Table 5-3, there is a 10-day reduction in the median for overall missing to recovered (MR) cases from 151 days for the 61-75 day segment, to 141 days for the 76-90 day segment.

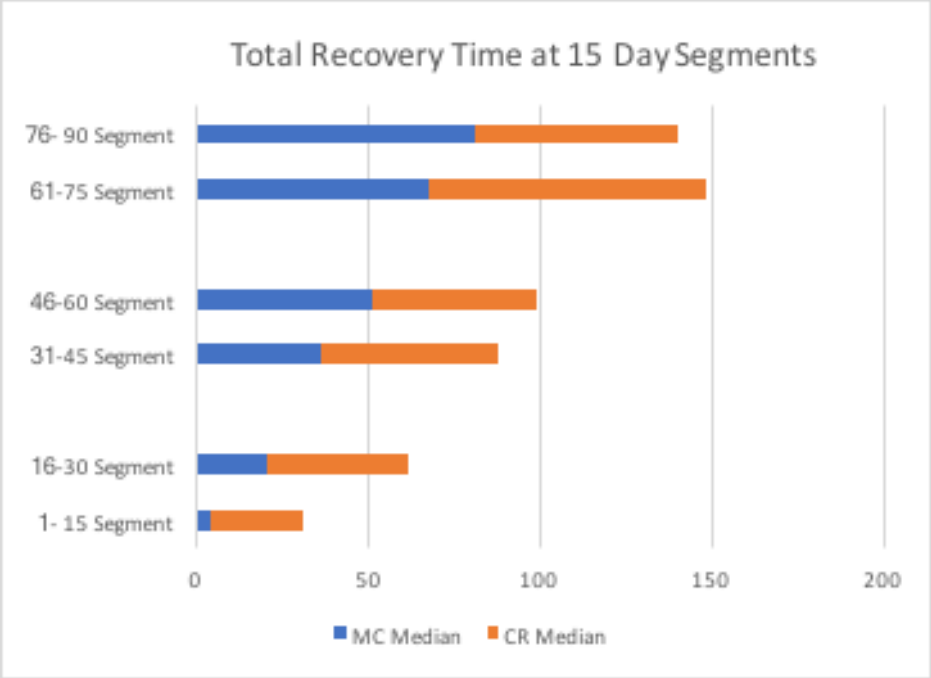


Figure 5-4: Total Recovery Time 15-Day Segments

To identify whether the delay in recovery is impacted at the shorter segments, as discussed above, an analysis of the 60-day segments was performed at 10-day segments.

5.4 Findings from the 10-Day Segments

For the following analysis, the 1-60-day interval was divided into six 10-day segments. As shown in Table 5-3, the missing to call (MC) for the 1-10-day interval has a median of 3.0, meaning the median time for NCMEC to be called was 3 days. The call to recovery (CR) has a median of 27 days, and the missing to recovery (MR) is 30 days. The 1-10 interval is the lowest timeframe, in comparison to the 11-20, 21-30, 31-40, 41-50, and 51-60 day intervals. As shown within previous data analysis, the earlier the teams are established (MC), the lower the overall missing to recovery (MR).

Table 5-3: Kruskal-Wallis 10-Day Segment Results

MC Interval	MC Median	CR Median	MR Median
1- 10 Interval	3.0	27.0	30.0
11-20 Interval	14.0	36.0	51.0
21-30 Interval	25.0	42.0	67.0
31-40 Interval	34.0	53.0	86.0
41-50 Interval	49.0	48.5	99.0
51-60 Interval	55.0	51.0	105.0
MC Interval	MC Mean Rank	CR Mean Rank	MR Mean Rank
1- 10 Interval	2243.0	2687.6	2521.9
11-20 Interval	4744.5	3125.3	3489.1
21-30 Interval	5122.0	3331.1	4012.6
31-40 Interval	5317.5	3615.4	4415.4
41-50 Interval	5491.7	3488.3	4629.0
51-60 Interval	5566.5	3464.2	4751.1

The 10-day analysis repeats the findings of the 15-day segment analysis, showing that the time from call to recovery (CR) statistically increases as the time from missing to call (MC) increases over the first 30 days, but the increases become statistically non-significant. The results of the 10-day segment data are shown in Figures 5-5 and 5-6.

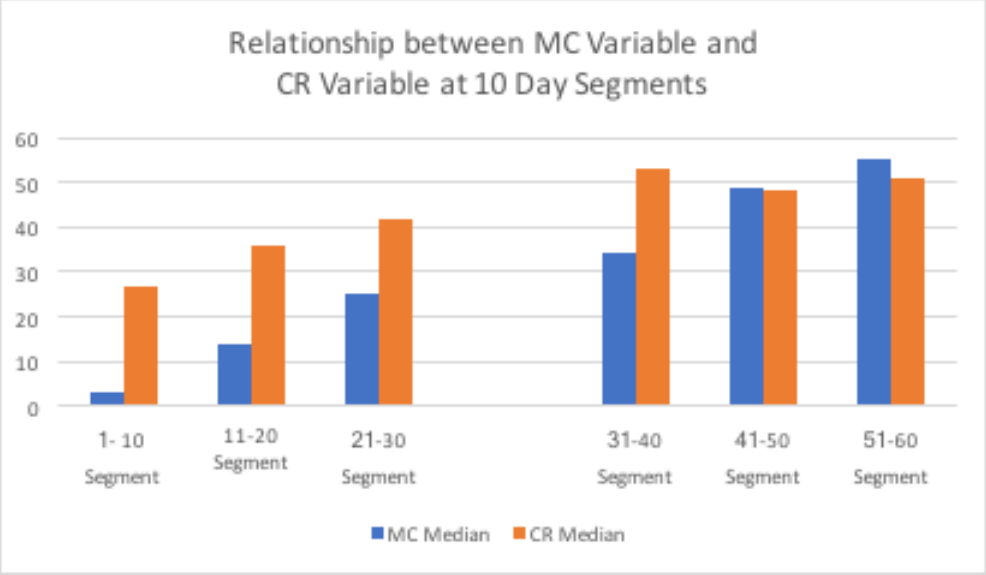


Figure 5-5: MC and CR Variables at the 10-Day Segments

The data represented in the Figure 5-6 shows that calls to NCMEC (MC), and the establishment of the interactive teams made in the first interval, 1-10, result in shorter call to recovery times (CR). This analysis holds true throughout all the remaining segments shown within this figure as a clear positive trend.

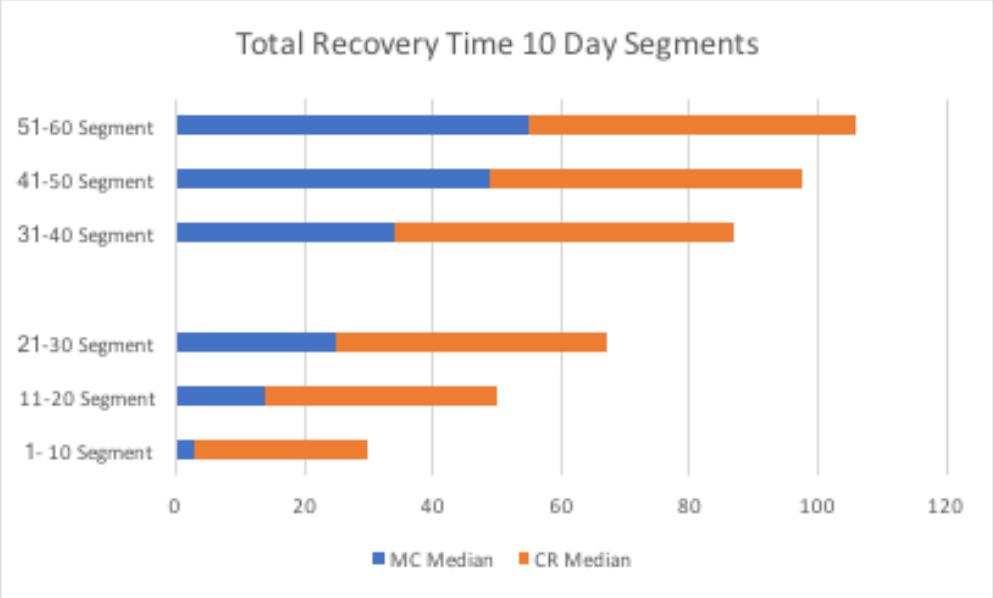


Figure 5-6: Total Recovery Time 10-Day Segments

5.5 State Analysis

The above analysis presents a clear picture of the impact that engaging the system of teams within the first 30, 15, and 10-day groups has. One question that arises is whether this outcome may be influenced by the jurisdictions involved. Could the results be more influenced by the internal process of the states than the system of teams itself? To investigate this, the five states with the largest caseloads were examined. The Kruskal-Wallis analysis of the total case indicates that at least one median is different with a p-value of <0.001 as shown in Figure 5-7.

Descriptive Statistics

Sample	N	Median	Mean Rank	Z-Value
242 CR	1587	27	1625.8	-3.94
237 CR	654	29	1677.5	-0.55
208 CR	541	30	1699.3	0.07
232 CR	315	31	1771.1	1.42
247 CR	295	43	2034.4	6.20
Overall	3392		1696.5	

Test

Null hypothesis	H_0: All medians are equal
Alternative hypothesis	H_1: At least one median is different

Method	DF	H-Value	P-Value
Not adjusted for ties	4	45.47	<0.0001
Adjusted for ties	4	45.48	<0.0001

Figure 5-7: Kruskal-Wallis 5 State Analysis

As shown in figures 4-47, 4-48, and 4-49, three of these states were found to have no significant difference in their medians in all three of the variables. States numbered, 242, 237, and 208 were found to have equal call to recovery medians with a Kruskal-Wallis p-value of <0.001. Only one of the three was used for the remainder of the analysis. State #242 was selected as the base, because it has the lowest Mean Rank (1625.8) and Z-Value (-3.94).

The next step was to perform a pairwise analysis of the total caseload between state 242 and the three remaining states. All the Mann-Whitney comparisons were performed with the alternative hypotheses $n_1 - n_2 < 0$ and a confidence segment p-value of 0.05. The first test confirms that the 1-30 day interval has a median call to recovery time that is less than the 31 - 60 day intervals with a p-value of <0.0001 for the alternative hypothesis n_1 -

$n_2 < 0$.

Testing within the two intervals for 15 and 10 day segments. A pairwise Mann-Whitney test on the caseload from the top 3 test states for both the 15-day and 10-day segments were completed which tested the e null hypothesis of $n_1 - n_2 < 0$, where n_1 is the segment with the lowest mean rank, with a p-value of 0.0500. The 1-30 day interval divided into two fifteen segments accepted the null hypothesis the first segment had a lower median value with a p-value of <0.0001.

A Kruskal-Wallis analysis of the cases of the three states in the 1- 30 day interval, accepted the null hypothesis that all the medians were equal by rejecting the null with a p-value of 0.1289, while the total caseloads were not equal.

Testing of the 10-day segments found the 1-10 day segment was lower than the 11-21 segment which accepted the null hypothesis $n_1 - n_2 < 0$ with a p-value of <0.0001 and the 21-30 segments with a p-value of 0.0133. This analysis repeats the findings from the 15-day segment test that the shorter the time from missing to call will result in a shorter call to recovery time. In addition, since the results are similar to the 15-day segment, the outcomes are not found to be influenced by any one jurisdiction.

5.6 Summary

In summary, the findings conclude that if the system of teams is initiated within the first 30 days, the recovery time from the call is reduced. If the system is imitated after 30 days, there is not statistical impact on the recovery time from the call to recovery (CR). A summary of the statistical analysis is shown in Table 5-4, which highlights each timeframe interval tested, the hypotheses, p-values, and decisions to accept or reject.

Table 5-4: Summary of Statistical Analysis

MC Interval	Hypothesis	p-value	Decision
1-30 to 31-60	$n_1 - n_2 < 0$	>0.0001	Accept
31-61 to 61-90	$n_1 - n_2 < 0$	0.0140	Accept
Within the 1-30 MC Interval			
1-15 to 1-30	$n_1 - n_2 < 0$	<0.0001	Accept
1-10 to 11-20	$n_1 - n_2 < 0$	<0.0001	Accept
11-20 to 21-30	$n_1 - n_2 < 0$	<0.0500	Accept
Within the 31-60 MC Interval			
31-45 to 46-60	n1 - n2 < 0	0.8870	Reject
31-45 to 46-60	n1 - n2 ≠ 0	0.2264	Accept
31-40 to 40-50			
31-40 to 40-51	At leas one median	0.7941	Reject
41-50 to 51=60	is different		
Within the 61-90 MC Interval			
61 -75 to 76-90	n1 - n2 ≠ 0	0.5345	Reject
61 -75 to 76-90	n1 - n2 ≠ 0	0.9355	Accept
61-70 to 71-80			
61-70 to 71-81	At leas one median	0.2843	Reject
71-80 to 91-90	is different		

The possibility that the findings were influenced by different procedures within the states was investigated. As shown in Table 5-5, the findings were not influenced by different state procedures.

Table 5-5: Summary of State Statistical Analysis

Total Case Load	Hypothesis	p-value	Decision
242 to 232	$n_1 - n_2 < 0$	0.0095	Accept
232 to 247	$n_1 - n_2 < 0$	<0.0001	Accept
15 Day Segments Within the 1-30 MC Interval			
1-15 to 16-30	$n_1 - n_2 < 0$	<0.0001	Accept
11-20 to 21-30	$n_1 - n_2 < 0$	0.0133	Accept
10 Day Segments Within the 1-30 MC Interval			
1-10 to 11-20	$n1 - n2 < 0$	<0.0001	Accept
11-20 to 26-30	$n1 - n2 \neq 0$	0.0133	Accept

5.6.1 Results: Tested Hypotheses

- Ho1 – Time to organize team structure will have no impact on the performance of teams.
- Ha1 – Time to organize team structure will have an impact on the performance of teams.

Alternative Hypotheses (Ha1) is accepted

- Ho2 – Organizational structure within the states will have an impact on the performance of the system of teams.
- Ha2 – Organizational structure within the states will have no impact on the performance of the system of teams.

Alternative Hypotheses (Ha2) is accepted

- Ho3 – Total recovery time of missing children is not affected by the time it takes to initiate a system of teams.
- Ha3 – Total recovery time of missing children is affected by the time it takes to initiate a system of teams.

Alternative Hypotheses (Ha3) is accepted

- Ho4 – Recovery time of missing children from the initiation of a system of teams is not dependent on the time it takes to initiate the system of teams.
- Ha4 – Recovery time of missing children from the initiation of a system of teams is dependent on the time it takes to initiate the system of teams.

Alternative Hypotheses (Ha4) is accepted

5.6.2 Analysis of each Alternate Hypothesis (Ha):

- Ha1 – Time to organize team structure will have an impact on the performance of teams.

The alternative hypothesis was accepted. The migration from the silo team to a system of teams produced a statistically significant improvement in the recovery time from the initiation of the team and subsequently a statistically significant improvement in the total recovery time when measured in 30-day intervals. The 1-30 day interval has a statistically significant shorter recovery time with the implementation of the system of teams than the 31-60 day interval, and the 31-60 day interval has a statistically shorter recovery time than the 61-90 day interval.

When measured in segments within the intervals there was a statistically significant improvement within the first 30-day segment, but not within the 30-60 day segment or

the 60-90 day intervals. There was statically significant improvement from the 1-15 day segment and the 1-10, 11-20, and 21-30 day segments within the 1-30 day interval but the internal segmenting of the other two intervals indicated a statistically equal result across the interval. This does not diminish the finding that implementation of the system of teams within the first 30 days will result in a statistically significant improvement in the desired results.

- Ha2 – Organizational structure within the states will have no impact will have an impact on the performance of the system of teams.

This alternative hypothesis was accepted. This hypothesis was tested by taking three states that have statistically significant differences in their recovery medians within their total case load, and comparing the recovery rates when the system of teams is initiated within the first 30 days.

In the analysis, all three states had statistically equal recovery times within the first 1-30 day interval. This analysis included the state with the overall lowest performance on total caseload and the state with the highest overall performance. However, when the first 30 days are analyzed, they have equal performance.

There are two independent variables that make up the total missing to recovery (MR) time. Given the call to recovery is statistically equal in the 1 to 30-day interval, it can be concluded that the only difference between the states is the time it takes to initiate the system of teams. The organizations within the states have no impact when the system of team is initialized in the first 30 days.

- Ha3 – Total recovery time of missing children is affected by the time it takes to initiate a system of teams.

This hypothesis was accepted. There are two independent variables that make up the total time from missing to recovery. If there were no statically difference between the initiation of the system of teams and the recovery, then the time it takes to initiate the team would have little impact. However, since there is a statistically significant difference in the time it takes to recover from the time the systems of teams is initiated, then there is a double impact when the time to instate is delayed. Delaying the initiation of teams has an impact on the total positive outcome.

- Ha4 - Recovery time of missing children from the initiation of a system of teams is dependent on the time it takes to initiate the system of teams.

This hypothesis was accepted. The analysis showed there is a dependency on the Call to Recovery variable on the Missing to Call variable within the first 40 days. After 40 days, there are too many other variables affecting the outcome. The longer the missing to call time, the longer the call to recovery time within the first 40 days.

Chapter 6. Conclusions

Through the use of quantitative analysis techniques, this research studied the establishment of teams for a national issue: children missing from state care. As discussed in the literature review, the primary teams researched were social service agencies, law enforcement, and NCMEC. Through data gathered from missing child posters and reports of children missing from state care, methodologies were applied to answer the hypotheses and research question of this praxis.

6.1 Effectiveness of a System of Teams

The research question: Can it be shown that, by quickly establishing the appropriate interactive teams to search for a child missing from state care (i.e., social service, law enforcement, and the National Center for Missing & Exploited Children®), will that reduce the overall missing child recovery time? As shown in the analysis and findings, when the system of teams is initiated the success rate is improved. There is a statistically significant reduction in the time from the initiation to recovery of the missing child incident. For many reasons not researched and out of the scope of this praxis, organizations often work internally too long before coordinating with external teams. This limitation can involve any of the primary teams discussed in this research. This study showed evidence that the implementation of a system of teams earlier in the process is more effective than a silo team approach. This study used state organizations with missing child data, but the findings are applicable to any function that can utilize inter-organizational teams. With similar results as General McChrystal, as noted in the literature review, teams of teams, or human systems of systems, are more effective when they communicate earlier in the process. As shown in Figure 6-1 and discussed throughout this research, the more quickly

a team is established, the better the results.

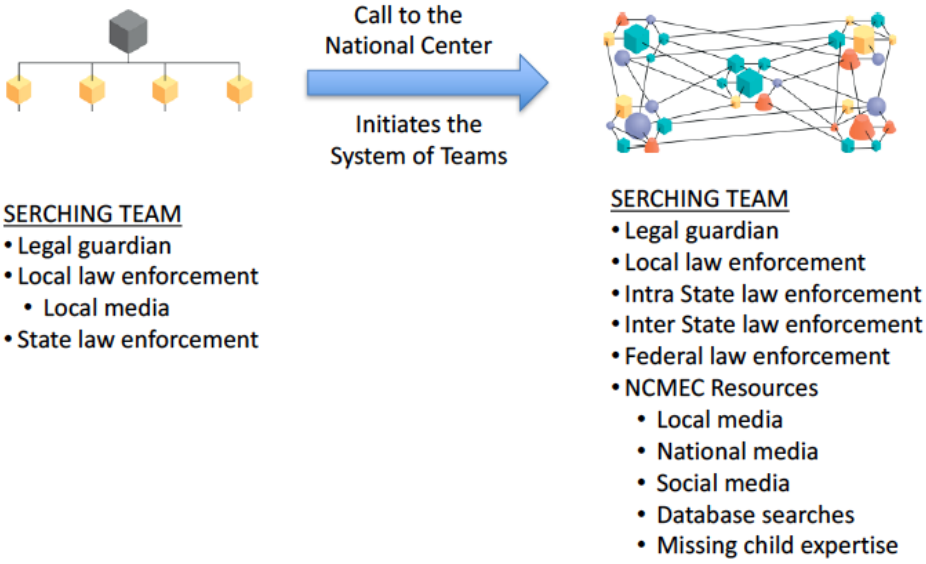


Figure 6-1: Establishing a Human System of Systems

6.2 Areas for Future Study

This study investigated the impact of initializing a system of teams to locate children missing from state care, as defined by being under the guardianship of state social service agencies. Similar research should be conducted using the data created by either children taken by family members or by non-family members. The information driven from these types of studies could highlight different collaborative opportunities for law enforcement, families, and NCMEC.

Another area for potential future study, as illustrated within chapters 4 and 5, is to analyze the flattening in the call to recovery time within the later segments. Flattening is defined as a plateau where the trend line becomes more horizontal in the dataset as the timeline continues. This is shown within the 15-day analysis, specifically the 61-75 day

segment. This is also shown in the 10-day analysis within the 41-50 day segment. It is unclear what exactly is causing this flattening. Further case-specific research could be conducted to identify the reasons why the flattening occurred later in the report and recovery phase.

An additional area for study could compare similarly sized law enforcement systems with different sized law enforcement systems, and their involvement in the case, as well as the speed of recovery. For example, the local team effectiveness compared to the effectiveness when a full state or national system is initiated. A comparison of the federal interagency effectiveness before and after the implementation of the Department of Homeland Security would also be appropriate to test the effectiveness of a system of human teams.

Lastly, as this study analyzed the impact of initializing a system of teams, a future study could look at the effectiveness of knowledge transfer once the team is established. This would be an excellent complement to this research to analyze the most effective states and least effective states to compare the differences in knowledge sharing between local, state, federal agencies, family members, and non-profits.

6.3 Conclusion

Threats against children missing from state care today are more challenging than ever before. The advancements in technology, social media, human trafficking, gang violence, etc. have a negative impact on the overall volume of children missing from state care. Additionally, law enforcement and legal guardians face their own challenges in searching for the child. Ongoing research and analysis into the best methods and resources to find missing children is essential. A child missing from state care is a social

issue and a legal issue, historically falling within the educational realm of the administration of justice, psychology, sociology, etc. However, as shown within the document, engineering concepts and techniques can and should be applied to better analyze data, highlight the need for best practices, and validate direction that will positively impact this national issue.

To address the ever-present question; how quickly should a child missing from state care be reported to effectively establish the primary teams and have the best recovery times? The social answer is, as quickly as possible. The legal answer, according to P.L. 113-183 and discussed in the literature review is, within the first 24 hours. Based on the research within this praxis, the answer is 3 days, but no later than the first 10 days.

Although it is not yet known if the newly signed Preventing Sex Trafficking and Strengthening Families Act, P.L.113-183, will have any substantial positive affect on recovery rates, this praxis adds validation to the reporting time requirement of this new law. The more quickly a team is established, the more positive the effect on recovery rate. Through this research and illustration of effectively establishing the primary teams, the intention is to encourage more state agencies to comply with this new law and report children missing from care as soon as possible.

References

109th U.S. Congress. 2006. *Adam Walsh Act*. Senate and House. https://www.justice.gov/archive/olp/pdf/adam_walsh_act.pdf.

113th U.S. Congress. 2014. *H.R.4058 - 113th Congress (2013-2014): Preventing Sex Trafficking and Improving Opportunities for Youth in Foster Care Act*. Washington, D.C. . https://www.congress.gov/bill/113th-congress/house-bill/4058.

AFCEA Intelligence Committee. 2007. "The Need to Share; The U.S. Intelligence Community and Law Enforcement." Washington, D.C. http://www.afcea.org/mission/intel/documents/SpringIntel07whitepaper_000.pdf.

AFL-CIO. 2016. "SOCIAL SERVICE WORKERS: AN OCCUPATIONAL OVERVIEW," 7. http://dpeaflcio.org/wp-content/uploads/Social-Service-Workers-2016.pdf.

Banks, Duren, Joshua Hendrix, Matthew Hickman, and Tracey Kyckelhahn. 2016. "National Sources of Law Enforcement Employment Data." https://www.bjs.gov/content/pub/pdf/nsleed.pdf.

Blindenbach-Driessen, Floortje. 2015. "The (In)Effectiveness of Cross-Functional Innovation Teams: The Moderating Role of Organizational Context." *IEEE Transactions on Engineering Management* 62 (1): 29–38. doi:10.1109/TEM.2014.2361623.

BLS. 2015. "Social Workers : Occupational Outlook Handbook: : U.S. Bureau of Labor Statistics." *U.S. Bureau of Labor Statistics*. https://www.bls.gov/ooh/Community-and-Social-Service/Social-workers.htm#tab-6.

Broaddus, Mary. 2015. "Valassis' Have You Seen Me? Program Marks 30th Anniversary | Business Wire." *Business Wire*. http://www.businesswire.com/news/home/20150526005682/en/Valassis'-Program-Marks-30th-Anniversary.

Chan, Y, and R P Walmsley. 1997. "Learning and Understanding the Kruskal-Wallis One-Way Analysis-of-Variance-by-Ranks Test for Differences among Three or More Independent Groups." *Physical Therapy* 77 (12): 1755–62. http://www.ncbi.nlm.nih.gov/pubmed/9413454.

Congress, 113th United States. 2014. *Preventing Sex Trafficking and Strengthening Families Act*. Vol. 29.

Congress, United States. 2011. *§ 5772. "'Missing Child'" and "'Administrator'" Defined*. http://docs.uscode.justia.com/1994/title42/USCODE-1994-title42/pdf/USCODE-1994-title42-chap72-subchapIV-sec5772.pdf.

Coughlan, Tom. 2016. "Structured for Success: How the Structure of Today's Professional Organizations Are Changing." *Journal of Management and Innovation* 2 (21).

CWLA. 2015. "Child Welfare and Human Trafficking." https://www.childwelfare.gov/pubPDFs/trafficking.pdf.

FBI. 2017. "National Crime Information Center."

Feir, Betty J, and Larry Toothaker. 1974. "The ANOVA F-Test versus the Kruskal-Wallis Test." *American Educational Research Association* 59. http://files.eric.ed.gov/fulltext/ED091423.pdf.

Gold, Adam. 2017. "Understanding the Mann-Whitney Test." *Journal of Property Tax*

Assessment & Administration @BULLET 4 (3). Accessed May 28. https://professional.sauder.ubc.ca/re_creditprogram/course_resources/courses/content/344/gold-mannwhitney.pdf.
HHS, and CB. 2015. "The AFCARS Report." http://www.acf.hhs.gov/programs/cb.
LexisNexis. 2004. "National Center for Missing & Exploited Children Aligns With LexisNexis to Help Find Missing." *PR Newswire*. http://www.prnewswire.com/news-releases/national-center-for-missing--exploited-children-aligns-with-lexisnexis-to-help-find-missing-children-71762242.html.
Lowery, Robert. 2016. *Long-Term Missing Child Guide for Law Enforcement: Strategies for Finding Long-Term Missing Children*. Edited by Robert Lowery and Robert Hoever. 1sted. Alexandria, Virginia: National Center for Missing & Exploited Children. http://www.missingkids.org/en_US/publications/NCMEC_LongTermMissingGuide_2016.pdf.
McChrystal, Stanley A., Tantum Collins, David (David Kaye) Silverman, and Chris Fussell. n.d. *Team of Teams : New Rules of Engagement for a Complex World*.
Michael, Jennifer. 2016. "Child Welfare League of America." *How Should Agencies Respond?* http://www.cwla.org/how-should-agencies-respond/.
Minitab Inc. 2016. "Interpret the Key Results for Mann-Whitney Test." http://support.minitab.com/en-us/minitab-express/1/help-and-how-to/basic-statistics/inference/how-to/two-samples/mann-whitney-test/interpret-the-results/key-results/.
Minitab Inc., and State College Penn. 2017. "Methods and Formulas for Kruskal-Wallis Test." http://support.minitab.com/en-us/minitab-express/1/help-and-how-to/modeling-statistics/anova/how-to/kruskal-wallis-test/methods-and-formulas/methods-and-formulas/.
Mitch Smith. 2015. "A New Effort to Rescue Runaways in Chicago - The New York Times." *NY Times*. http://www.nytimes.com/2015/03/19/us/in-chicago-a-new-effort-to-rescue-runaways.html?_r=0.
National Institute of Standards and Technology. 2013. "Mann Whitney U Statistic." *U.S. Commerce Department*. http://www.itl.nist.gov/div898/software/dataplot/refman2/auxillar/mannwhit.htm.
———. 2015. "Kruskal-Wallis Test." *U.S. Commerce Department*. http://www.itl.nist.gov/div898/software/dataplot/refman1/auxillar/kruskwal.htm.
NCMEC. 2017a. "Key Facts." *Key Facts*.
———. 2017b. "Missing Children - NCMEC." *National Center for Missing & Exploited Children*. http://www.missingkids.com/Missing.
New Jersey Legislature. 2016. *New Jersey Revised Statutes § 52:17b-215 - Information Provided To Person Making Report Or Family Member. - New Jersey Attorney Resources - New Jersey Laws*. 4. http://law.onecle.com/new-jersey/title-52/52-17b-215.html.
New York State Executive Law. 2015. *New York State Executive Law 837-F*. New York: Executive. http://www.criminaljustice.ny.gov/missing/graphics/meccexecutivelawnonycrr.pdf.
Omar, Syed, Sharifuddin Syed-Ikhsan, and Fytton Rowland. 2004. "Knowledge Management in a Public Organization: A Study on the Relationship between

Organizational Elements and the Performance of Knowledge Transfer." *Journal of Knowledge Management* 8 (2): 95–111. doi:10.1108/13673270410529145.
Reaves, Brian A, and Bjs Statistician. 2011. "Census of State and Local Law Enforcement Agencies, 2008." https://www.bjs.gov/content/pub/pdf/csllea08.pdf.
———. 2012. "Hiring and Retention of State and Local Law Enforcement Officers, 2008 – Statistical Tables." https://www.bjs.gov/content/pub/pdf/hrslleo08st.pdf.
Sage, Melanie Dawn. 2010. "Child Welfare Workforce Turnover: Frontline Workers' Experiences with Organizational Culture and Climate, and Implications for Organizational Practice." doi:10.15760/etd.365.
Sedlak, Andrea J, David Finkelhor, Heather Hammer, Dana J Schultz, J Robert Flores, and Ojjdp Administrator. 2002. "National Estimates of Missing Children: An Overview National Incidence Studies of Missing, Abducted, Runaway, and Thrownaway Children."
Sheng, Yuea, and Yuan Chun. 2002. "The Influence of Serial Correlation on the Mann–Whitney Test for Detecting a Shift in Median." *Advances in Water Resources* 25 (3). Elsevier: 325–33. doi:10.1016/S0309-1708(01)00049-5.
Smith, Thomas, Kennith Buniak, Lee Condon, and Lee Reed. 2005. "Children Missing From Care: The Law-Enforcement Response." Alexandria, Virginia. http://www.missingkids.com/en_US/publications/NC162.pdf.
Suppiah, Visvalingam, and Manjit Singh Sandhu. 2011. "Organisational Culture's Influence on Tacit Knowledge- sharing Behaviour." *Journal of Knowledge Management* 15 (3): 462–77. doi:10.1108/13673271111137439.
Thamhain, H.J. 2011. "The Role of Team Collaboration in Complex Product Developments." In *Technology Management in the Energy Smart World (PICMET), 2011*, Por:1. Portland, OR: IEEE.
Thamhain, Hans. 2006. "Managing Cross-Functional Integration of Complex Developments." In *2006 Technology Management for the Global Future - PICMET 2006 Conference*, 2598–2606. IEEE. doi:10.1109/PICMET.2006.296858.
Thamhain, Hans J., and David L. Wilemon. 1987. "Building High Performing Engineering Project Teams." *IEEE Transactions on Engineering Management* EM-34 (3): 130–37. doi:10.1109/TEM.1987.6498873.
U.S. Congress. 2011. *United States Code, 2006 Edition, Supplement 4, Title 42 - THE PUBLIC HEALTH AND WELFARE*. Vol. section 57. https://www.gpo.gov/fdsys/granule/USCODE-2010-title42/USCODE-2010-title42-chap72-subchapIV-sec5779.
Urdan, Timothy C. 2016. *Statistics in Plain English, Fourth Edition*. 4th Editio. New York: Taylor & Francis Group.
USMS. 2006. "United States Marshals Service." https://www.usmarshals.gov/district/ma/taskforces/soib.htm.
Utah Legislation. 2016. *Criminal Identification, Title 53 Chapter 10 Part 2 Section 202*. Salt Lake City, UT: Executive. http://le.utah.gov/xcode/Title53/Chapter10/53-10-S202.html.
Villalon, Jose Calvo-Manzano, Gonzalo Cuevas Agustin, Tomas San Feliu Gilabert, and Jose de Jesus Jimenez Puello. 2015. "A Taxonomy for Software Testing Projects." In *2015 10th Iberian Conference on Information Systems and Technologies (CISTI)*, 1–6. IEEE. doi:10.1109/CISTI.2015.7170545.

Wild, Chris. 1997. “The Wilcoxon Rank-Sum Test.” Department of Statistics, University of Auckland. https://www.stat.auckland.ac.nz/~wild/ChanceEnc/Ch10.wilcoxon.pdf.
Zanos, T.P., S.H. Courellis, T.W. Berger, R.E. Hampson, S.A. Deadwyler, and V.Z. Marmarelis. 2008. “Nonlinear Modeling of Causal Interrelationships in Neuronal Ensembles.” *IEEE Transactions on Neural Systems and Rehabilitation Engineering* 16 (4): 336–52. doi:10.1109/TNSRE.2008.926716.

Appendix 1: Case Data by Jurisdiction

State IB	Number of Cases	MC Variable Mean	CR Variable Mean	MR Variable Mean	MC Variable Median	CR Variable Median	MR Variable Median
201	1	14	179	193	14	179	193
202	0	0	0	0	0	0	0
203	44	16	63	79	12	36	58
204	114	14	44	59	6	25	44
205	1	1	3	4	1	3	4
206	73	6	49	55	3	21	28
207	10	31	101	132	36	95	133
208	541	10	50	60	4	30	40
209	67	9	41	67	2	27	64
210	0	0	0	0	0	0	0
211	107	9	72	81	3	39	48
212	0	0	0	0	0	0	0
213	116	13	49	62	4	34	46
214	29	16	68	84	8	39	62
215	153	15	55	70	7	36	48
216	229	8	47	55	3	30	38
217	156	13	36	48	6	21	32
218	154	9	51	60	5	28	35
219	34	8	38	46	4	22	29
220	28	10	38	48	8	30	40
221	1	2	36	38	2	36	38
222	45	8	42	50	3	29	39
223	13	5	33	38	3	23	30
224	53	9	44	53	4	30	40
225	1	43	117	160	43	117	160
226	12	31	63	94	22	52	86

Source: National Center for Missing & Exploited Children

State IB	Number of Cases	MC Variable Mean	CR Variable Mean	MR Variable Mean	MC Variable Median	CR Variable Median	MR Variable Median
227	57	8	47	55	3	29	34
228	60	10	38	48	5	21	32
229	103	10	53	63	5	37	44
230	2	18	17	35	18	17	35
231	32	10	51	61	4	25	28
232	315	12	56	67	6	31	41
233	122	5	53	58	3	32	36
234	19	7	64	71	3%	42	51
235	16	19	44	63	9	17	44
236	64	15	51	65	7	25	37
237	654	7	48	55	4	29	36
238	27	6	34	40	3	13	27
239	2	10	27	37	10	17	37
240	1	7	24	31	7	23	31
241	142	11	69	80	5	41	55
242	1587	5	45	50	4	27	32
243	9	14	47	61	4	30	42
244	7	9	17	26	7	8	20
245	7	26	63	89	21	32	66
246	147	9	50	59	3	31	41
247	295	22	70	92	15	43	70
248	11	21	46	67	15	21	44
249	3	26	42	67	25	41	66
250	16	14	71	84	9	52	71
251	1	7	21	28	7	21	28

Source: National Center for Missing & Exploited Children

Appendix 2: Dataset Example

Record #	Date of Call	State ID	Missing Date	Recovery Date	Base 50 State MC	Base 50 State CR	Base 50 State MR
1	10/1/2014	204	9/12/14	11/14/14	20	43	63
2	10/1/2014	233	9/29/14	10/16/14	3	14	17
3	10/1/2014	237	9/28/14	10/22/14	4	20	24
4	10/1/2014	215	9/22/14	12/17/14	10	76	86
5	10/2/2014	242	9/28/14	1/16/15	4	106	110
6	10/2/2014	242	9/30/14	11/20/14	2	49	51
7	10/2/2014	242	9/29/14	10/20/14	3	18	21
8	10/2/2014	241	9/26/14	10/18/14	6	16	22
9	10/2/2014	247	9/30/14	12/8/14	3	66	69
10	10/2/2014	233	9/30/14	12/11/14	3	69	72
11	10/2/2014	242	9/25/14	12/4/14	8	62	70
12	10/2/2014	242	9/30/14	10/24/14	3	21	24
13	10/2/2014	242	9/29/14	1/9/15	4	98	102
14	10/2/2014	242	9/27/14	10/13/14	6	10	16
15	10/2/2014	242	9/27/14	10/13/14	6	10	16
16	10/2/2014	242	9/30/14	1/14/15	3	103	106
17	10/3/2014	247	10/2/14	11/6/14	2	33	35
18	10/3/2014	247	10/2/14	11/6/14	2	33	35
19	10/4/2014	242	10/3/14	10/17/14	1	13	14
20	10/4/2014	242	10/1/14	10/22/14	3	18	21
5662	11/12/2016	217	11/3/16	11/21/16	10	8	18
5663	11/14/2016	227	11/10/16	11/22/16	4	8	12
5664	11/14/2016	209	9/18/16	12/6/16	57	22	79
5665	11/14/2016	242	11/12/16	11/29/16	3	14	17
5666	11/15/2016	242	11/2/16	12/8/16	13	23	36
5667	11/15/2016	242	11/2/16	12/8/16	13	23	36
5668	11/15/2016	242	11/11/16	11/23/16	4	8	12
5669	11/15/2016	232	11/11/16	11/22/16	5	6	11
5670	11/16/2016	216	11/15/16	11/19/16	1	3	4
5671	11/16/2016	216	11/15/16	11/28/16	1	12	13
5672	11/17/2016	215	11/9/16	11/29/16	8	12	20
5673	11/17/2016	217	11/12/16	11/29/16	5	12	17
5674	11/17/2016	217	11/11/16	12/10/16	6	23	29
5675	11/18/2016	242	11/16/16	11/30/16	2	12	14
5676	11/18/2016	232	11/17/16	11/29/16	2	10	12
5677	11/22/2016	242	11/18/16	12/5/16	4	13	17
5678	11/22/2016	242	11/17/16	11/30/16	5	8	13
5679	11/22/2016	213	11/1/16	11/29/16	22	6	28
5680	11/23/2016	209	11/22/16	11/30/16	2	6	8
5681	11/29/2016	233	11/28/16	11/30/16	1	1	2

Source: National Center for Missing & Exploited Children

Appendix 3: NCMEC Featured Stories

The National Center for Missing & Exploited Children recovery stories of children who were missing from state care.

Social Worker's Concern Leads to Recovery of Teen Trafficked by Boyfriend
NCMEC was contacted by a concerned social worker regarding a teen she suspected of being a victim of child sex trafficking. The youth had been previously listed with NCMEC and safely located after being missing for a few months. At the time, the juvenile courts had allowed the youth to be placed in the custody of her boyfriend. After the recovery and placement, the youth's social worker became suspicious of the boyfriend and was worried that she was being offered commercially for sexual purposes. Upon receiving this information, NCMEC's Case Management Team immediately began coordinating resources between NCMEC's Child Sex Trafficking Team analysts and law enforcement. NCMEC's CSTT Program Specialist immediately began providing technical assistance and resources in the local area for the social worker. The teen was safely recovered by officers and placed in a shelter from where her social worker picked her up. The youth disclosed to agents the activities of the past two months, while separately her boyfriend confessed to being involved in sexual trafficking the teen.

NCMEC's Analytical Support Assists in Locating Teen Missing from Foster Home
A youth went missing from his foster home after he had been under the custody of the state for many years. His mother's parental rights had been terminated due to issues of neglect. It was strongly believed by social services that the child's step-father had picked him up and taken him to an unknown location to live with his mother. NCMEC's Case Management Team worked with social services and law enforcement to determine the best action for the case. New information was developed with the NCMEC analyst and provided to law enforcement which was able to locate the missing teen.

NCMEC Poster Helps Find Teen Missing from Group Home
A youth ran away from her group home. Both NCMEC and law enforcement were familiar with the youth from prior reports listing her as missing. Upon receiving the case, NCMEC's Case Management Team began coordinating services with law enforcement and the youth's social worker, which included the creation and distribution of the youth's poster. NCMEC's Call Center later received a tip from an individual who recognized the youth from a missing flyer. The case manager was immediately notified of the lead and forwarded the information to the investigating officer. The following day, the teen was successfully found by police at the address provided in the lead and safely returned to her group home.

NCMEC Poster and Walmart Customer Help Locate Teen Missing from Group Home in Mexico

A youth went missing from her group home. NCMEC and the police were familiar with the youth since she had been previously listed with both agencies. The teen had recently been located by authorities attempting to enter the US from Mexico at an international border crossing. Upon discovering that she had gone missing again, police detectives and NCMEC's Case Management Team immediately suspected that the youth had returned to Mexico, where it was believed she was being commercially sexually exploited. NCMEC received a lead from a caller who recognized the youth from a NCMEC poster featured at the local Walmart store. The caller had seen her the previous week while visiting a small resort town in Mexico. Upon receiving the tip, Case Management Team coordinated with law enforcement. Within days of receiving the lead, NCMEC received confirmation that the teen had been safely located and recovered by Mexican officials thanks to the lead information provided by NCMEC.

Source: National Center for Missing & Exploited Children