New Jersey Crash Record Geocoding
Improving the state's crash database to enhance data-driven decisions

FINAL REPORT
June 2010

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Disclaimer Statement

1. Report No. DHTS-RU0405	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle New Jersey Crash Record Geocoding		5. Report Date October 2009
		6. Performing Organization Code CAIT/Rutgers
7. Author(s) Sarah Weissman		8. Performing Organization Report No. DHTS-RU0405
9. Performing Organization Name and Address Center for Advanced Infrastructure and Transportation (CAIT) Rutgers University 100 Brett Road Piscataway, NJ 08854		10. Work Unit No.
		11. Contract or Grant No.
12. Sponsoring Agency Name and Address Department of Highway Traffic Safety, NJ Office 140 East Front Street (PO Box 048) Trenton, NJ 08625-0048 Federal Highway Administration U.S. Department of Transportation Washington, D.C.		13. Type of Report and Period Covered Final Report 10/1/2008 - 9/30/2009
		14. Sponsoring Agency Code NJDHTS
15. Supplementary Notes U.S. Department of Transportation/Research and Innovative Technology Administration 1200 New Jersey Ave, SE Washington, DC 20590-0001		

16. Abstract

The New Jersey Crash Record Geocoding Initiative was designed as a provisional measure to address missing crash locations. The purpose of the initiative was twofold. Primarily, students worked to locate crashes that had no location information after enforcement or review of the New Jersey Department of Transportation. Locating these crashes increased the number of crash locations, thereby improving all analyses. As a result, data-driven decision making stemming from location information was also enhanced. Additionally, database improvements were suggested for implementation. Both efforts improved data accuracy and completeness.

17. Key Words Safety, Crash, Records, Geocoding, NJTR-1		18. Distribution Statement	
19. Security Classification (of this report) Unclassified	20. Security Classification (of this page) Unclassified	21. No. of Pages 12	22. Price

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Abstract

The Transportation Safety Resource Center (TSRC) is a partnership between federal and state transportation agencies, local stakeholders, academic institutions, and the private sector to provide technical and educational services to address transportation safety in New Jersey.

The TSRC has partnered with myriad organizations, agencies, and groups—including the state's Statewide Traffic Records Coordinating Committee (STRCC)—to effect positive change and offer support to the safety professionals in New Jersey. Among other goals, the TSRC seeks to address the shortfalls of the existing crash database to meet the needs of a data-driven approach to safety.

The New Jersey Crash Record Geocoding Initiative was designed as a provisional measure to address missing crash locations. The purpose of the initiative was twofold. Primarily, students worked to locate crashes that had no location information after enforcement or New Jersey Department of Transportation (NJDOT) review. Locating these crashes increased the number of crash locations, thereby improving all analyses. As a result, data-driven decision making stemming from location information was also enhanced. Additionally, database improvements were suggested for implementation. Both efforts improved data accuracy and completeness.

Introduction

The Transportation Safety Resource Center (TSRC) was established in 2003 by Rutgers Center for Advanced Infrastructure and Transportation (CAIT) in response to an acute need for implementation of federally mandated traffic safety measures on local roads, which make up 67% of all roads in the state. Established to function as an extension of the New Jersey Department of Transportation (NJDOT) Division of Traffic Engineering and Safety, the TSRC supports the Division efforts in providing technical assistance and outreach to local agencies.

The TSRC has become a vital link in a collaborative partnership among CAIT, NJDOT, the Federal Highway Administration (FHWA), the New Jersey Division of Highway Traffic Safety (DHTS), the National Highway Traffic Safety Administration (NHTSA), metropolitan planning organizations, and local governments and organizations in providing resources and solutions that address traffic and roadway safety. In line with the National Strategy for Surface Transportation Research, the TSRC advances state-of-the-art knowledge and capabilities in use of crash data to enable data-driven policy making and implementation of projects. Improving roadway safety enhances quality of life for all road users from the standpoint of both safety and mobility.

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The New Jersey Crash Record Geocoding Initiative was designed as a provisional measure to addressing missing crash locations. The purpose of the initiative was twofold. Primarily, students worked to locate crashes that had no location information after enforcement or NJDOT review. Locating these crashes increased the number of crash locations, thereby improving all analyses. As a result, data-driven decision making stemming from location information was also enhanced. Additionally, database improvements were suggested for implementation. Both efforts improved data accuracy and completeness.

Background

New Jersey is one of the few states that have a standardized crash report form (NJTR-1) that is required by state law to be submitted to a central repository. All police who write reports, whether they be state or municipal, must submit their final reports to NJDOT within 30 days unless a criminal investigation is pending. The standardized form and law have been in place for almost a decade since the NJDOT Bureau of Safety Programs (BSP) and STRCC collaborated to develop the state's first universal form. This form was updated and released in 2006, adding many additional data elements such as "cell phone in use."

The NJTR-1 crash report serves as the most credible "eyewitness" to all crash events in New Jersey. From these crash reports, a total 144 data elements exist and are painstakingly organized into a five-category catalog: driver (all data pertaining to the driver, including gender and age), vehicle (vehicle type, year, make, and model), occupant (all data pertaining to the vehicle passengers), pedestrian (data pertaining to any pedestrians involved), and crash (type, intoxication level, location, date, and time).

Before the updated NJTR-1 form was released in 2006, the TSRC collaborated with the NJDOT Division of Traffic Engineering and Safety to create an ambitious software program—named Plan4Safety – that would provide safety-conscious engineers, planners, and police officers the tools necessary to make data-driven decisions. Plan4Safety allows users to search for crash incidents, analyze crash sites, and see crashes plotted on a GIS map. As a result, users can identify crash "hot spots"—areas where pedestrian crashes or frequent fatalities need to be addressed—by milepost and roadway.

However, the utility of Plan4Safety is limited by insufficient location data. Although submission of the NJTR-1 is mandated by state law, the full completion of all 144 data elements is not. As a result, many crash report forms are submitted with missing fields, including the location information. The importance of crash location is such that analysis is virtually worthless without this information. Even if a police officer spends the time to input 143/144 data elements, without location, meaningful safety programs cannot be generated.

Figure 1 shows the percentage trend of crashes that included locations sufficient for mapping from 2003 through 2009. Although high-severity crashes have always contained location information, the trend has been to ignore this input for other crashes, which severely hinders the safety community's ability to make data-driven decisions.
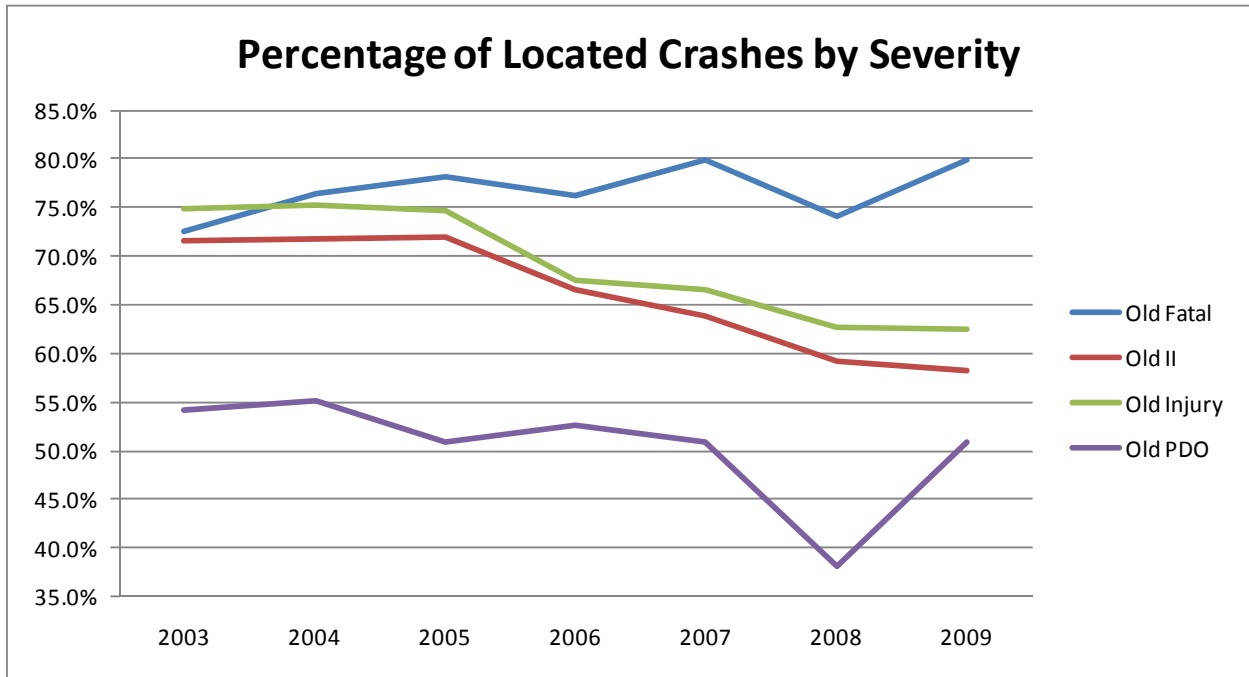
Figure 1: Percentage of Crashes Located by Occupant Physical Condition. II = Incapacitating Injury; PDO = Property Damage Only.

The lack of proper crash location information led to the New Jersey Crash Geocoding Program, which has worked to locate previously un-located crashes.

Methodology

In year one of the project, a simple program was developed that would assign to TSRC students "un-located" crashes and then track student efforts to locate those crashes. Each student had a user account that assigned un-located crashes to locate. The student used available information, Google Maps, and the state's street GIS map to find the location of the assigned crash. If a location could be found based on the information recorded, the student updated the location information and continued onto the next crash. If a crash could not be found through the recorded information or supplemental resources, the student recorded that in the program.

This procedure allowed the research team to track both the number of crashes that were attempted and the number actually found. In year two of the project, 150,292 crashes were attempted and 117,482 were found.[1] Table 1 displays all the crashes found by year and severity.

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[1] Year two is designated by Division of Highway Traffic Safety as October 1, 2008, to September 30, 2009.

Geocoded	Fatal	Incapacitating	Injury	PDO	All
2003	-	-	-	79	*79*
2004	-	-	-	3,693	*3,693*
2005	-	-	-	42,259	*42,259*
2006	-	-	5	27,062	*27,067*
2007	-	18	10,709	32,566	*43,293*
2008	51	208	727	105	*1,091*
All years	*51*	*226*	*11,441*	*105,764*	*117,482*

Table 1: Crashes Found by Year and Severity in Year Two of Project. II = Incapacitating Injury; PDO = Property Damage Only.

This procedure was designed to serve as a last effort; after both the police department and the NJDOT BSP had completed the crash report, TSRC students would attempt to locate the crashes manually.

Location Improvements

This initiative has improved the accuracy, completeness, and usability of Plan4Safety. Figure 2 displays the improvements that have been made by the geocoding program. The dotted values show the percentage of crashes with locations before the geocoding program. The solid values show the percentage of crashes with locations after the geocoding program.
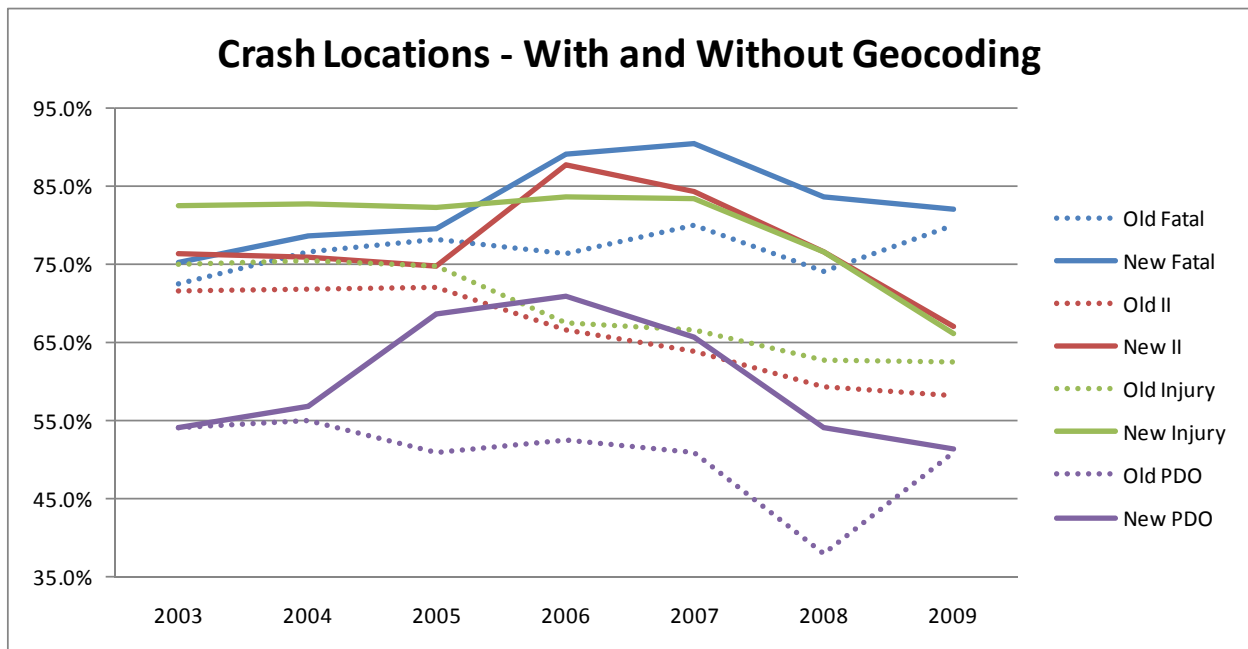

Figure 2: Crash Location Comparison With and Without the Geocoding Effort. II = Incapacitating Injury; PDO = Property Damage Only.

Tables 2 through 5 show the number of crashes and associated location percentages with and without the geocoding program. Improvements for each year are also shown.

Fatal						
	Crashes	Original GC	With TSRC	Old Fatal	New Fatal	Percent Change
2003	689	*500*	518	*72.6%*	75.2%	⬆ 2.6%
2004	680	*520*	534	*76.5%*	78.5%	⬆ 2.1%
2005	696	*544*	553	*78.2%*	79.5%	⬆ 1.3%
2006	691	*527*	615	*76.3%*	89.0%	⬆ 12.7%
2007	661	*528*	597	*79.9%*	90.3%	⬆ 10.4%
2008	580	*430*	485	*74.1%*	83.6%	⬆ 9.5%
2009	546	*436*	448	*79.9%*	82.1%	⬆ 2.2%

Table 2: Number of Fatal Crashes With and Without the Geocoding Effort. GC = Geocoding.

Incapacitating Injury						
	Crashes	Original GC	With TSRC	Old II	New II	Percent Change
2003	1,877	*1,343*	1,431	*71.6%*	76.2%	⬆ 4.7%
2004	1,816	*1,302*	1,378	*71.7%*	75.9%	⬆ 4.2%
2005	1,634	*1,176*	1,222	*72.0%*	74.8%	⬆ 2.8%
2006	1,446	*962*	1,267	*66.5%*	87.6%	⬆ 21.1%
2007	1,396	*891*	1,176	*63.8%*	84.2%	⬆ 20.4%
2008	1,282	*759*	981	*59.2%*	76.5%	⬆ 17.3%
2009	1,191	*694*	797	*58.3%*	66.9%	⬆ 8.6%

Table 3: Number of Incapacitating Injury Crashes With and Without the Geocoding Effort. GC = Geocoding; II = Incapacitating Injury.

Injury						
	Crashes	Original GC	With TSRC	Old Injury	New Injury	Percent Change
2003	77,333	*57,933*	63,827	*74.9%*	82.5%	⬆ 7.6%
2004	76,667	*57,737*	63,380	*75.3%*	82.7%	⬆ 7.4%
2005	73,029	*54,595*	59,973	*74.8%*	82.1%	⬆ 7.4%
2006	68,253	*46,105*	56,991	*67.6%*	83.5%	⬆ 15.9%
2007	67,277	*44,778*	56,025	*66.6%*	83.3%	⬆ 16.7%
2008	66,514	*41,717*	50,916	*62.7%*	76.5%	⬆ 13.8%
2009	65,868	*41,225*	43,501	*62.6%*	66.0%	⬆ 3.5%

Table 4: Number of Injury Crashes With and Without the Geocoding Effort. GC = Geocoding.

Property Damage Only							
	Crashes	Original GC	With TSRC	Old PDO	New PDO		Percent Change
2003	243,578	*131,922*	132,006	*54.2%*	54.2%	⬆	0.0%
2004	243,743	*134,291*	138,208	*55.1%*	56.7%	⬆	1.6%
2005	239,589	*121,937*	164,196	*50.9%*	68.5%	⬆	17.6%
2006	224,857	*118,184*	159,177	*52.6%*	70.8%	⬆	18.2%
2007	237,349	*120,624*	155,672	*50.8%*	65.6%	⬆	14.8%
2008	233,488	*88,946*	126,308	*38.1%*	54.1%	⬆	16.0%
2009	233,280	*118,716*	119,984	*50.9%*	51.4%	⬆	0.5%

Table 5: Number of Property Damage Only Crashes With and Without the Geocoding Effort. GC = Geocoding; PDO = Property Damage Only.

Supplemental Improvements

In addition to improving the state's crash database through geocoding, the TSRC team has also helped the BSP to find errors in the data so that enhancements could be made. One such improvement is the addition of street address conversion to x and y coordinates through the daily program run at the BSP. Before, crashes that gave street addresses would be listed as un-located, even though they were easily located during the geocoding process. Now that the BSP has the capability to convert street addresses to GIS locations, the geocoding process only receives crashes that are more difficult to find.

Conclusion

The New Jersey Crash Record Geocoding Initiative was designed as a provisional measure to address missing crash locations. The purpose of the initiative was twofold. Primarily, students worked to locate crashes that had no location after NJDOT enforcement or review. Locating these crashes increased the number of crash locations, thereby improving all analyses. As a result, data-driven decision making stemming from location information is also enhanced. Additionally, database improvements were suggested for implementation. Both efforts improve data accuracy and completeness.

This project has proven to be a simple and effective program to enhance the state crash database until permanent changes can be made that would no longer require manual processes.

Acknowledgments