Performance Audit
Police Computer-Aided Dispatch Data Reliability

August 2007

City Auditor's Office

City of Kansas City, Missouri

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August 30, 2007

Honorable Mayor, Members of the City Council, and Members of the Board of Police Commissioners:

This audit focused on the reliability of information from the Police Department's computer-aided dispatch system (CAD). The CAD supports Police Department operations and provides information on activities such as response time.

The dispatch data are generally reliable. There is an incentive to make sure the data are accurate and complete because dispatchers and police officers use the CAD system daily to do their job. Updated policies and procedures and training help ensure dispatchers and officers enter CAD information consistently and accurately. Automatic data transfer from the 911 system to the CAD assures that the information in the CAD system is complete. Written documentation allows data to be consistent throughout the system. Finally, data testing did not identify any discrepancies.

About half of the priority 1 calls and just under a third of priority 2 calls had missing arrival times or the arrival times were the same as the time the calls were received. While some of these calls are self-initiated by the officer, a majority should have valid arrival times recorded. Officers are supposed to provide arrival time to dispatchers, but they do not always do so. When calculating response times, these calls are excluded resulting in incomplete police response time reports.

In addition, the department still translates the minutes recorded in the CAD system to hundredths of an hour and eliminates the seconds, adversely affecting data precision for each arrival time by up to 83 seconds.

To improve the data accuracy and completeness, the Chief of Police should ensure that the CAD system includes all arrival times and create a new response time program that uses all the current CAD system data.

The Chief of Police's response to the draft is appended. We appreciate the courtesy and cooperation of Police Department staff during the audit. The team for this audit was Vivien Zhi and Mike Eglinski.

Gary White
City Auditor

Police Computer-Aided Dispatch Data Reliability

Table of Contents

List of Exhibits

Introduction

Objectives

We conducted this audit of the Kansas City Police Department computer-aided dispatch (CAD) data reliability under the authority of Article II, Section 216 of the Charter, which establishes the Office of the City Auditor and outlines the city auditor's primary duties. We also conducted the audit under the authority of Chapter 84, section 350 Revised Statutes of Missouri, which authorizes the city auditor to audit the Police Department.

A performance audit systematically examines evidence to independently assess the performance and management of a program against objective criteria. Performance audits provide information to improve program operations and facilitate decision-making.[1]

Our audit focused on the reliability of information from the computer-aided dispatch system. CAD supports Police Department operations and provides information on activities such as response time.

Scope and Methodology

Our review focuses on assessing the reliability of information from the computer-aided dispatch system. As a part of the audit work, we:

- Interviewed Police communication unit staff;
- Reviewed policies and procedures related to the Police communication and the dispatch system user manual;
- Observed 911 calltaking and dispatching operations; and
- Reviewed and tested the reasonableness of a selection of data maintained in CAD from September 15, 2006 through December 15, 2006.

[1] Comptroller General of the United States, *Government Auditing Standards* (Washington, DC: U.S. Government Printing Office 2003), p. 21.

Reviewing the accuracy of all the reports generated from the CAD system is outside of the audit scope. However, we calculated response time frequency distribution for calls from September 15, 2006 through December 15, 2006. Results of this analysis can be found in Appendix A.

We conducted this audit in accordance with generally accepted government auditing standards. No information was omitted from this report because it was deemed privileged or confidential.

Background

CAD System and 911 Calltaking

The 911 system is a regional system operated by the Mid-America Regional Council (MARC). MARC also owns the equipment. All calls are routed to the Kansas City Police Department's communication center through AT&T. Wireless calls are routed through MARC.

The CAD system is a proprietary system. It is used to collect and enter information calltakers receive and to transfer that information to dispatchers. It also helps dispatchers send officers and maintain information on call activities. The Police Department started using the current CAD system at the end of 2004.

Call Flow

Calltakers answer 911 calls. The calltaker decides whether to send the calls to Fire, MAST, or the Police. Calltakers classify calls by type and assign a call code which the CAD system uses to assign call priorities. If it is a Police call, it sends the call to the Police dispatcher via an interface to the CAD. Dispatchers send officers to handle calls requiring a police response using the CAD system. Police Department procedures require officers to advise the dispatcher via radio when they arrive at the scene on all priority 1 and 2 calls, and to use the vehicle MDT (mobile data terminal) to enter the arrival time for all other calls.[2] The CAD system records the arrival time in minutes and seconds.

[2] Kansas City Police Department Procedural Instructions 04-5, p. 3.

Problems Identified with Previous CAD System

We assessed the reliability of the previous computer-aided dispatch system and identified problems with response time reporting in 2004.[3] We found about 39 percent of priority 1 and 44 percent of the priority 2 calls did not have arrival times. We had not audited the current system and proposed doing so to the Board of Police Commissioners in January 2006.[4]

A theme of the Police Department's "Blueprint for the Future" is to use information to make decisions and develop operational plans to achieve objectives.[5] Our audit of CAD will help ensure that data from the system used to make decisions is timely, complete, and accurate.

[3] *Follow-up Audit: Kansas City, Missouri, Police Department Patrol Deployment: Blackout Analysis*, Office of the City Auditor, Kansas City, Missouri, September 2004.
[4] Letter from City Auditor Mark Funkhouser to the Board of Police Commissioners, January 24, 2006.
[5] A consultant, Berkshire, wrote the report to evaluate opportunities to improve the productive use of the Kansas City Police Department's law enforcement and civilian workforce.

Findings and Recommendations

Summary

The raw data in the computer-aided dispatch system is generally reliable. However, arrival times are not recorded for many calls. While some of these calls are initiated by the officer, a majority should have valid arrival times recorded. Officers are supposed to provide arrival times to dispatchers, but they do not always do so. When calculating response times, these calls are excluded and reports for police response times are incomplete.

In addition, the department still converts the minutes recorded in the CAD system to hundredths of an hour and eliminates the seconds. The department uses the old computer program to generate response time reports, adversely affecting data precision for each arrival time by up to 83 seconds.

To improve data reliability, the Chief of Police should ensure that the CAD system includes all arrival times and create a new response time program that uses all the data collected by the current CAD system.

Dispatch Data Are Generally Reliable but Response Time Reports Use Incomplete Information

The dispatch data is generally reliable. There is an incentive to ensure the data is accurate and complete because dispatchers and police officers use the CAD system daily to do their jobs. Updated policies and procedures and training help dispatchers and officers enter CAD information consistently and accurately. Automatic data transfer from the 911 system to the CAD assures the information in the CAD system is complete. Written documentation allows data to be consistent throughout the system. Finally, data testing did not identify any discrepancies.

About half of the priority 1 calls and just under a third of priority 2 calls had missing arrival times or the arrival times were the same as the time the calls were received. Although officers are supposed to provide arrival time to dispatchers, they do not always do so. When calculating response times, these calls are excluded. Because these calls were excluded, reports for police response times are incomplete.

Dispatch Data Are Generally Reliable

The dispatch data are generally reliable. There is an incentive to ensure the data is accurate and complete and updated policies and procedures and training help dispatchers and officers enter CAD information consistently and accurately. Automatic data transfer from the 911 system to the CAD assures that the information in the CAD system is complete, and written documentation allows data to be consistent throughout the system. Finally, data testing did not identify any discrepancies.

Incentives exist to maintain accurate and timely CAD data. The dispatchers rely on the accuracy and timeliness of the data to do their jobs. They use the live data to know which calls to dispatch and the status of officers in the field. Officers also communicate with the dispatchers about their activities, such as location of the cars and calls, times when they are in and out of service, and when the officers arrive at the scene. Because the data are "live" and used by dispatchers and officers to do their job, there is an incentive to make sure the data are accurate and complete.

The Police updated their policies and procedures and provide training. The department updated the procedural instructions on communication in May 2004 and on call prioritization in November 2006. The Police Department provides training to calltakers and dispatchers on the 911 and CAD systems. The department also provides training to police officers on the mobile data terminals in the patrol cars.

The mobile terminals allow the police officers to communicate with the dispatchers more accurately and efficiently because they can enter information directly rather than having to use the radio system. Officers can use function keys on the terminals to update data, such as when they arrive at the scene. The updated policies and procedures and training help dispatchers and officers enter CAD information consistently and accurately.

Automatic dispatch data transfers ensure completeness. Call data are transferred to the CAD system automatically from the 911 system via an interface. Just by hitting the "enter" key, all the information related to the calls are sent to the dispatcher, including callers' names, addresses, nature of the calls and descriptions. Automatic data transfer makes sure that all the information entered in the system are transferred.

Extensive written documentation ensures data consistency. A data dictionary lists seven tables and their descriptions in the dispatch system.

It also defines all the data elements in these tables, including column name, description, and data type. Extensive written documentation allows the data to be consistent throughout the system.

Data testing did not identify any discrepancies. We tested the reasonableness of the CAD data and did not find any discrepancies. For example, we looked at call distribution by priority. Almost all the calls have valid priority codes and the distribution seemed reasonable. We also did other reasonableness tests and concluded that the data in the system are generally reliable.

Response Time Reports Are Based on Incomplete Information

About half of the priority 1 calls and just under a third of priority 2 calls had missing arrival times or the arrival times were the same as the time the calls were received. While some of these calls are self-initiated, a majority should have arrival times provided by the officer. When calculating response times, these calls are excluded resulting in reports for police response times being incomplete. In addition, the program used to generate the response time reports adversely affects the precision of these reports.

Arrival times for some priority calls are missing. About half of the priority 1 calls and just under a third of priority 2 calls had missing arrival times or the arrival times were the same as the time the calls were received. While certain types of calls do not have an arrival time, such as officer initiated calls, officers who are supposed to provide arrival time to dispatchers do not always do so. In these cases, arrival times are either recorded as zero or equal the time the calls were received. When calculating response times, these calls are excluded. As a result, police response time reports are incomplete.

We looked at the priority 1 and 2 calls that had missing arrival times. Over 2,000 (20%) of these calls are disturbance in progress calls. (See Exhibit 1.) All of these calls should have arrival times so the response time reports would more comprehensively reflect the overall police response performance.

Exhibit 1. Top Ten High Priority Call Types with Zero or Missing Arrival Times.

Call Type	# of Calls	% of Calls
Disturbance in Progress	2,332	22.5%
Disturbance Outside (in Progress)	1,743	16.8%
Meet the Officer	835	8.0%
Injury Accident	624	6.0%
Prowler in Progress	436	4.2%
Ambulance Enroute	405	3.9%
Burglary in Progress	180	1.7%
Investigate Need for Ambulance	176	1.7%
Suspicious Person	145	1.4%
Domestic Violence Assault (In Progress)	128	1.2%

Sources: KCPD CAD Data and CAO Analysis

We found similar problems in our audit of patrol deployment in 2004.[6] Response time measures how quickly police can respond to emergencies, a popular measure of police patrol effectiveness. The Police Department reports response time to the Board of Police Commissioners monthly. To ensure response time reporting is complete, the police chief should ensure that all arrival times are recorded in the CAD system.

Police should develop mechanisms to determine police response times using all CAD system data. During our 2004 audit, we also reviewed the manner in which response time reports are generated. According to Police staff, these methods are still used today. The methods used could cause the loss of some dispatch data.

A computer program converts the minutes recorded in the new CAD system to hundredths of an hour and drops the seconds. The response time program then runs on these converted data. This translation adversely affects the precision of response time calculations, as individual response times can be off by up to 83 seconds in either direction. Average response time information would be accurate only if the start and stop times are normally distributed. To ensure the data accuracy, the Chief of Police should develop a response time reporting program that does not require the translation and uses all the available CAD dispatch data to develop the response time reports.

[6] *Follow-up Audit Kansas City, Missouri, Police Department Patrol Deployment: Blackout Analysis*, September 2004.

Recommendations

1. The Chief of Police should ensure that the CAD system includes all arrival times.

2. The Chief of Police should develop a new response time program that does not require the translation and uses all the available CAD dispatch data.

Appendix A

Response Time Frequency Distribution

Response Time Frequency Distribution

We analyzed the CAD data from September 15, 2006 through December 15, 2006. We defined response time as the elapsed time from when a call is received to when the police officer arrives at the scene for that call.

Priority 1 calls include danger to human life or an assist the officer call. Examples include shootings, ambulance enroute, armed robbery in progress, natural disasters, etc. The average response time for a priority 1 call was 10 minutes and 4 seconds. About 47 percent of the priority 1 calls had 0 minute response time or missing arrival times.

Response Time Frequency Distribution For Priority 1 Calls

Response Time	Frequency	Percentage
Under 5 Min	761	9.0%
5 to 10 Minutes	2,143	25.2%
10 to 15 Minutes	994	11.7%
15 to 20 Minutes	332	3.9%
20 to 25 Minutes	115	1.4%
25 to 30 Minutes	49	0.6%
More than 30 Minutes	89	1.0%
0 Minutes	2,397	28.2%
Missing Arrival Time	1,613	19.0%
Total Calls	8,493	

Sources: KCPD CAD Data and CAO Analysis

Priority 2 calls are calls where the potential for injuries to occur exists, but have not yet happened. Examples include prowlers, burglaries in progress, disturbances, bomb threats, etc. The average response time for priority 2 calls was 12 minutes and 40 seconds. About 30 percent of the priority 2 calls had 0 minute response times or missing arrival times.

Response Time Frequency Distribution for Priority 2 Calls

Response Time	Frequency	Percentage
Under 5 Min	1,078	5.1%
5 to 10 Minutes	5,294	25.1%
10 to 15 Minutes	4,531	21.4%
15 to 20 Minutes	2,169	10.3%
20 to 25 Minutes	907	4.3%
25 to 30 Minutes	349	1.7%
More than 30 Minutes	429	2.0%
0 Minutes	1,047	5.0%
Missing Arrival Time	5,321	25.2%
Total Calls	21,125	

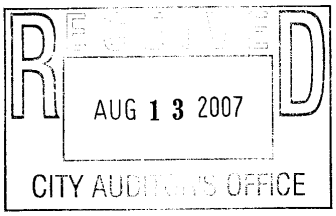
Sources: KCPD CAD Data and CAO Analysis

Appendix B

Chief of Police's Response

Police
KC/MO

James D. Corwin
Chief of Police



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August 10, 2007

Mr. Gary White
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Dear Mr. White,

I have reviewed the City Auditor's findings and recommendations for the *Police Computer-Aided Dispatch Data Reliability Audit.* I am in agreement with the content of the audit and the recommendations. In regard to the two specific recommendations I offer the following responses:

Recommendation 1: The Chief of Police should ensure that the CAD system includes all arrival times.

Response: This recommendation deals with how we currently measure our response times for Priority I and Priority II calls for service. The program that is designed to produce the monthly response times report needs three data elements: the time the call was received by the call-taker; the time an officer was dispatched; and the time the officer arrived on the scene (i.e., 10-23). When this information is complete the program computes an average response time by call type for each patrol division based on the total number of calls with complete data. If there is any missing data for a call, that particular call is not used to compute the average. We know, through our in-house monitoring efforts, that arrival times are not recorded for at least half of the priority I and priority II calls (this varies from month to month). It is department policy that officers are to go 10-23 with the dispatcher upon their arrival at the scene. It is also true that on these types of calls, which generally involve some type of an emergency situation, our officers are becoming quickly engaged in the situation and appear to forget to go 10-23 with the dispatcher due to the immediate demands they are faced with on the scene. However, I agree with the recommendation and will continue to expect our officers to go 10-23 on all Priority I and II calls. I fully support the need for complete and accurate data to help measure our effectiveness as a department.

Recommendation 2: The Chief of Police should develop a new response time program that does not require translation and uses all the available CAD dispatch data.

Response: This recommendation deals with the translation of Tiburon CAD response time data into the Legacy CAD data base from which the response time reports are generated. The Legacy CAD does not record seconds whereas the Tiburon CAD does. This means that during the translation process the seconds that are recorded in Tiburon CAD response time data are not carried over to Legacy CAD. The loss of the seconds adversely affects the calculation of the response time averages and decreases the accuracy. I agree with the audit recommendation. We are in a transition process from using the old system, Legacy CAD, to ultimately using the Tiburon CAD exclusively. At the conclusion of this transition period the accuracy of our response time data will be improved.

This audit coincides well with our efforts to build our *Blueprint for the Future*. I have long been an advocate of the need for timely and reliable information to assist in the decision making process. This audit further emphasizes the need for accurate information in our systems.

I appreciate the work completed by you and your staff on this audit, and look forward to working with you on future projects.

Sincerely,

James D. Corwin
Chief of Police