

**A Benchmark Analysis of the Relative Performance and Cost Efficiency
of the Deer Park Silverton Joint Fire District.**

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CERTIFICATION STATEMENT

I hereby certify that the following statements are true:

1. This paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

2. I have affirmed the use of proper spelling and grammar in this document by using the spell and grammar check functions of a word processing software program and correcting the errors as suggested by the program.

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ABSTRACT

The problem this study addressed was the fire administrator's need to assess the effectiveness and cost efficiency of his department based on the objective measurement of actual performance data.

The purpose of this descriptive research paper was to propose and test a method to judge the relative performance of the Deer Park Silverton Joint Fire District as compared to other departments in Hamilton County. Emphasis was placed on the relative response times to emergencies and on the overall costs to run a department as opposed to the number of emergency runs which the department made.

The research questions were:

1. How does the DPSJFD compare to other departments when judged on a "cost-per-run" basis?
2. How effective is the DPSJFD at answering each call promptly and having the resources available to handle the volume of calls received?
3. How is efficiency affected by the staffing of the department, i.e. full time, volunteer, part time, combination, etc.

The procedure used for this paper was to identify and compare twenty nine fire and emergency medical services in Hamilton County, Ohio. In addition to looking at and comparing the DPSJFD to the entire data pool, smaller subsets were created and the DPSJFD was compared to only other departments which were similar in run volumes, geographical coverage area and nighttime population.

Additional comparisons were made based on the staffing make-up of the departments. The results for full time, part time, volunteer and combination departments were compared.

The results of the study show that the chosen parameters were readily available and were able to stratify the performance results of the different departments in Hamilton County. Further, the performance of the Deer Park Silverton Joint Fire District compares extremely favorably with the other departments in the study. The DPSJFD ranked in the top 30% of the responding departments in cost per run, fire response time and EMS response time.

Recommendations include that this sort of benchmarking be repeated on an ongoing basis and that it be expanded to compare different shifts within the organization. The results of these studies can be used to identify “best practices” which can improve the overall performance of the organization. Finally, this report recognized economic advantages of using volunteer staffing and recommended that DPSJFD continue and expand its volunteer staffing.

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INTRODUCTION

Statement of the Problem

How can one evaluate the cost efficiency of the fire and EMS services? Although the National Fire Protection Association (NFPA) has developed standards for criteria such as equipment, personnel training, protective apparel and safety, the fire service has not been very aggressive in evaluating its performance in using the resources which the communities have provided.

The problem this study addressed was the fire administrator's need to assess the effectiveness and cost efficiency of his department based on an objective measurement of actual performance data. The goal was to benchmark the emergency response times and overall costs against other similar neighboring departments using data which are relatively simple and easy to obtain.

There is an old axiom that says fire and EMS services are not budgeted or paid for what they do. Rather, they are budgeted and paid for what firefighters and paramedics may have to do. As a result of attitudes such as this, the industry has been hesitant to look at things such as "cost efficiency" or "cost performance". However, in today's world of tightening budgets, there is a need to find a way to demonstrate that the allotted resources are being used wisely and efficiently.

The research method chosen for this study was descriptive. A survey was used to gather the necessary background information from multiple departments in southwest Ohio.

Purpose of the Study

The purpose of this study was to develop and test a method to determine how the Deer Park Silverton Joint Fire District measures up when compared to other fire and EMS services in southwestern Ohio in order to assess performance and determine potential areas for improvement. The generated data were used to evaluate the relative efficiency and cost performance of the Deer Park Silverton Joint Fire District as compared to other fire and EMS services in southwestern Ohio. To make this comparison, emphasis was placed on relative response times to emergencies and the overall costs to run the department. Ultimately, this information could be presented to the communities' citizens as an accounting of the resources which are currently provided and as justification for additional funding such as the upcoming replacement levy.

With ever increasing demands, tax payers are becoming more and more selective in choosing what levies they should support. Faced with dwindling income, many cities are forced to more deeply investigate where limited resources should be allocated. One of the biggest challenges faced by the fire service is to provide the justification to maintain or increase their current levels of funding. A logical first step would be for the fire departments to demonstrate that they have been using their resources in the most efficient manner possible.

Research Questions

The following questions were addressed in this descriptive research:

1. How does the DPSJFD compare to other departments when judged on a "cost-per-run" basis?

2. How effective is the DPSJFD at answering each call promptly and having the resources available to handle the volume of calls received?
3. How is efficiency affected by the staffing of the department, i.e. full time, volunteer, part time, combination, etc.

BACKGROUND AND SIGNIFICANCE

In 1999, the Deer Park Fire Department and the Silverton Fire Department merged to form the Deer Park Silverton Joint Fire District (DPSJFD). The district was funded with a 6½ mil property tax on all properties in the two cities. With the inception of the new fire district, the department was able to provide significant upgrades in both the fire and EMS services.

The DPSJFD is now staffed with at least 4 people on station 24 hours per day, 7 days per week. Previously, each city had two individuals on station for 8 hours during the daytime, with volunteers providing all services during the other 16 hours of the day.

The Joint District offers a paramedic based Advanced Cardiac Life Support service. Formerly, Deer Park ran with EMT-Intermediates and Silverton ran a strictly Basic Life Support unit.

By combining the capital resources of the two departments, the Joint District was able to sell off excess equipment and still have more resources than either of the two individual departments.

By combining the two departments and combining personnel, the volunteer base for the Joint District was effectively doubled versus that for the individual departments. This means that the mandatory time requirements for the volunteer members were reduced dramatically.

Because of all of the improvements as noted above, the administration of the Deer Park Silverton Joint Fire District has been comfortable in offering a positive overall assessment of the performance of the department. However, all of the upgrades which the joint district offered are now seven years old. In today's "what have you done for me lately?" world, the DPSJFD cannot afford to rest on its laurels from the past.

No organization should ever feel content to maintain the status quo. Any successful organization should constantly be working to improve the product which it provides. This continuous improvement is what leads to sustained success for the organization. For the fire service, this sustained success should result in ongoing support from the community.

The key to improving any organization is to objectively determine how it is presently performing. The best way to do this is to identify key performance parameters and then quantifiably measure the organization's performance in these parameters. The principles of benchmarking then call for an organization to compare its performance against the performance of similar organizations.

Is a response time of four minutes acceptable or unacceptable? Is a cost per run of \$750 something to be proud of or something which a fire department needs to work at improving? These questions can only be answered by benchmarking a department's performance against the performance of other similar departments.

The ultimate goal of benchmarking is the formation of a coalition with other departments which participated in the process and work together to develop "best practices". By comparing policies, procedures and practices with each other, each individual department can refine their own methods of operation and improve their effectiveness and efficiency.

One other benefit of benchmarking is that it can provide fire departments with the tools which are needed to provide performance feedback to their communities. Communities across the United States are looking hard for ways to cut spending and it is becoming more difficult to find increased funding for fire departments. Fire department administrators are being required to show that they are using their funds wisely and that they are providing a service which is worthy of additional funding.

The increased obstacles for maintaining and increasing funding are presently being experienced in southwest Ohio as departments are being asked to justify their budgets and funding. In early 2005, Delhi Township's Fire Department was forced to eliminate the entire part-time staff and close two of their three fire stations due to budget concerns. The City of St. Bernard, Ohio, was forced to lay off four members of its Fire Department. The City of Norwood has been fighting off bankruptcy for the past several years. One of the options being considered in Norwood is the elimination of several positions in the Fire Department.

In fact, the problem is not isolated to southwest Ohio. Barton Deiters (2005) offered that, less than four years after heralding fire departments as heroes to the world, over 1,150 firefighter positions have been eliminated across the United States since September 11, 2001.

Benchmarking information can be presented to the community as a report card on the performance of a fire department. It is much easier to justify a request for additional funding if you can quantitatively show that you are being responsible with the resources that a community is already providing to you. It should be easier to convince a community to support a funding levy if you can quantitatively show the citizens that you are providing a service as good as or better than other departments in the surrounding area.

The challenge, therefore, is to find a way to analyze how efficient individual fire departments have been in utilizing their resources and providing services to their communities. Although the National Fire Protective Association (NFPA) provides some guidelines regarding the basic requirements for response, equipment and safety in the fire service, it does not provide definitive guidelines to judge the efficiency or effectiveness of an emergency service.

The approach of this project will be to benchmark the response performance and cost effectiveness of the Deer Park Silverton Joint Fire District against other suburban departments in

southwest Ohio. The significance of the project is that, if used properly, this benchmarking should give the DPSJFD administrators the tools that they need to judge the performance of their department. Through inter-community cooperation, the results of benchmarking studies such as this can lead to the development and adoption of “best practices” which in turn should lead to better emergency response times and increased cost efficiencies.

LITERATURE REVIEW

Benchmarking is the comparison of an organization's performance to the performance of other similar organizations. In private industry, the value of benchmarking has been well documented and is currently widespread in its use. Although some benchmarking programs are being used in the fire service, none were found which compare both the relative effectiveness and relative cost efficiency for various departments. Further, some of the benchmarking programs presently in place tend to use data which can be difficult to obtain and interpret.

Stephen D. Cassler (1992) defines efficiency as how effectively an organization uses its available resources. Joel Siegel and Jae Shim (2000) define cost efficiency as providing a high benefit-to-cost ratio. Both of these concepts imply that if one wants to measure an organization's cost efficiency performance, one must consider both the associated costs and the provided benefits. Siegel and Shim also offer that the evaluation of an organization's performance should be an appraisal of the organization's results against an objective standard.

John C. Doyle (1996) discussed benchmarking as a method to improve performance in emergency management. Doyle noted that as a monopoly provider, it is easy for fire and EMS departments to become complacent with their performance. However, as benchmarking becomes more and more common in industry, it is only natural for the citizens of a community to want to measure their government with the same tools by which they are measured at their places of employment. Doyle states that benchmarking can provide elected officials with "comprehensive, accurate and reliable information in order to judge performance and make choices about how services can be improved".

After some discussion of the proper process for benchmarking, Doyle summarizes his position by concluding that there is no reason that the fire service should not realize the same advantages of benchmarking as have been seen in the private sector.

Don Frazier (2002) wrote about measuring the cost effectiveness of fire departments. He presented ideas about blending cost efficiency with effective performance. Given an unlimited budget, any fire department would be able to prepare for and respond to almost any emergency situation. However, in today's cost conscious climate, no departments have the luxury of an unlimited budget. On the other hand, problems can also be seen regarding a fire department which operates with a very low budget but which therefore does not have the ability to adequately respond and effectively mitigate emergencies. Frazier argues that when evaluating an emergency service, we need to blend both effectiveness and efficiency. In other words, we need to look at both performance and cost. This relates well with Siegel's definition of cost efficiency as a high benefit-to-cost ratio.

Bruce Moeller (2002) presented several challenges which need to be addressed when conducting comparative performance measurement in emergency services. The concerns addressed by Moeller include:

1. There may be variations in the way different departments determine their run volume. Some departments may count a multi-victim motor vehicle accident as a single incident whereas others may assign a different run number to each patient involved. If an engine company is also sent to assist the EMS crews, yet another run number may be assigned by some departments. For departments which routinely run an engine on all EMS calls, how run numbers are assigned can have a significant impact on the total number of calls reported in a survey.

2. Multiple methods can be used when measuring response time. Although most people agree that the response times end upon the department's arrival at the scene, does the response time start when the dispatch center receives a call or does it start when a response company has been dispatched?

Moeller also addresses the "Catch-22" often associated with performance comparisons. If the comparisons show shortfalls within your organization, citizens (voters) or government administrators can use this as an excuse to not grant increases or perhaps even to cut budgets. They assume that if you make adjustments to your processes, no additional resources will be needed. On the other hand, if the cost efficiency comparisons show that your department is doing well, this may also present problems. Moeller warns that the voters and/or administrators may be tempted to believe that there is no need to increase budget funding since things are going so well.

Perhaps the most well known benchmarking program in the fire service is the Insurance Services Office, Incorporated's, Public Protection Classification (PPC) survey. The results of this survey form the basis for a fire department's "ISO Rating". However, the PPC survey did not meet the goals of this study for the following reasons:

1. The PPC survey concerns itself almost exclusively with a department's readiness to handle fire emergencies. Instead of looking at actual performance, the PPC survey grades a department's potential ability. The survey looks at dispatching capabilities, equipment and apparatus on hand, staffing and manpower, training, and available water supply. The PPC survey does not adequately consider the effectiveness of the department in actual practice.

2. A large portion (30%-40%) of a department's ISO Rating is based on the available water supply. Although water supply is an important consideration in the fire service, most fire departments in mature communities have very little control over their water supply. This parameter is therefore probably not appropriate for use in comparing different fire services.
3. The PPC survey is administered by personnel from Insurance Services Office, Incorporated. The survey takes two or three days for most suburban departments and is typically repeated only every five to ten years. Because of this, if a department is working towards self-improvement, it may not result in an improvement in their ISO rating for several years or longer.

There is currently an ongoing benchmark program in southwest Ohio. The Southwest Ohio Fire Benchmarking Project is looking at data from 16 different departments. This survey looks at a wide variety of parameters including jurisdiction size and population, department manning levels, overall response times and the times spent on the scene for various types of EMS runs. However, this benchmarking project does not include much information about department budgets or costs per emergency run. Additionally, much of the information which is needed for this benchmarking project is not readily available and can be very difficult to assemble.

With respect to establishing response standards for the fire service, NFPA 1710 from the National Fire Protective Association (NFPA) has set a goal of five minutes for the arrival of the first engine company and nine minutes for the arrival of a complete first alarm complement. For EMS, the goal was established to have a Basic Life Support unit on the scene within five minutes and an Paramedic unit on the scene within nine minutes.

As a side note, the times listed above differ somewhat from those listed in other papers which were seen during the literature search. This is because the NFPA defined their response time as the time which elapses between the vehicles leaving the station and the vehicles arriving on the scene of the emergency. In addition to this “driving time”, NFPA 1710 also allows for a one minute roll-out time or reaction time between the receipt of the alarm and the first vehicle leaving the station. For purposes of this paper, both of the NFPA break-out times have been combined into a single value.

There has been a lot of controversy about this standard and there has been much discussion as to whether it can be practically met. Werner (2002), in a study with the National Fire Academy’s Executive Fire Officer program, used surveys and computer modeling to determine what would be needed to bring Garland, Texas, into compliance with the response guidelines in NFPA 1710. His conclusions were that in order to be in complete compliance, Garland would need to increase their number of stations from 9 to 41, add 417 firefighters to their existing crew of 230 firefighters and buy an additional 28 fire engines. Obviously, this is not a feasible solution and the recommendations could not be taken seriously. Skeptics may choose to use studies such as this as evidence of the impracticality of NFPA 1710.

Gregory A. Brown (2002) used benchmarking to measure the performance of the Colerain Fire and Emergency Medical Services against other similar departments across the country. Brown made separate comparisons in areas such as operating and vehicle cost per capita, population served per station, minimum staffing and response times. The research paper contained excellent information, as Brown used 13 departments across the United States for his benchmark comparison. The scope of this study will be somewhat more focused as it will compare different departments within the same geographical region.

Jay Fitch (2005) presented information regarding target response times for EMS units. Fitch proposed a total response time of 8:59 or less for 90% of all runs. The times proposed by Fitch include the total period from the citizen dialing 9-1-1 until EMS personnel arrive at the side of the patient. This would include the time required for the dispatch center to handle the call and dispatch the EMS service.

John Warden (1996) cited a government standard in England which calls for ambulance services to arrive on the scene within eight minutes of dispatch. The white paper “The Citizen’s Charter – Five Years On” calls for all ambulance services to meet this target at least 75% of the time by 2001, with ongoing improvement thereafter. Warden stated that a British Medical Journal estimated that reducing response time from 14 minutes to 8 minutes could save 3,000 lives per year.

Some references were found where newspapers have tried to make department-to-department comparisons. For example, Ungar (1995) published information where she compared the cost of emergency medical services for Mansfield, Connecticut, with the costs in 11 neighboring departments. Ungar presented her data on a cost-per-person basis, but did not define whether she based her data on daytime population or nighttime population. Neither did she address the effectiveness of any of these departments.

To summarize, there seems to be a lot of agreement that benchmarking can be a positive tool for the fire and emergency medical services. However, many of the benchmarking surveys which currently exist do not adequately address both relative effectiveness and cost efficiency. Additionally, some of the surveys can be time consuming and are based on data which may be rather difficult to assemble. Because of this, there would seem to be a need for a system of comparison which is relatively straightforward and which uses readily available data.

PROCEDURES

This study was essentially a compilation of data which were collected from different departments in southwestern Ohio. Although most of the information requested was officially public record and probably could not be withheld, the potential sensitivity of this project required some special handling.

This author drafted a questionnaire which was distributed to each fire department in Hamilton County. It was be a two part questionnaire. The first part was a listing of the questions, as would typically be seen on a mailed out form. The second part of the survey was a brief explanation of the questions to assist the participating departments in preparing the data needed to complete the form. The goal was that the explanation sheet would also help maintain consistency and minimize any tendency the individual departments may have to “interpret” the meaning of the questions and/or how to respond.

Approximately three or four weeks after the questionnaires were mailed out, the chiefs of the departments which had not yet responded were contacted via phone and/or e-mail to encourage them to provide the requested information. Any lingering questions or concerns were addressed at that time.

After the follow-up contacts were completed, responses were received from 29 of the 37 departments which were asked to participate in the survey. This represents a response rate of nearly 80%.

The data were compiled into a spreadsheet as the survey responses were received back from the various departments. The data were then broken into two categories, descriptive data and performance data. Descriptive data were the information which was used as the basis for determining similarities among departments, and included areas such as a department’s nighttime

population, geographical size, number of emergency runs, and type of personnel being used. Performance data were the information which helped assess the relative performance and cost efficiency of a department. These data included cost per emergency run, average fire response time, and average EMS response time.

Other descriptive and performance data were also considered, but were not pursued for the following reasons:

- a. CPR / Defibrillation Success Rates: This can be extremely dependent upon the demographics of the population served. For example, departments serving an elderly population would be expected to have a lower CPR/Defibrillation success rate than similar departments serving a younger population.
- b. Daytime population: Too many of the responding departments were not able to determine their daytime population.
- c. EMS Level of Care: There are only three recognized levels of care. This is not enough of a range to stratify the different responding departments.
- d. Fire loss: The assigning of fire loss for an emergency run is an extremely subjective process. Typically, the person filling out the fire report makes an opinionated estimate as to the dollar loss involved. This value can vary substantially depending upon who is filling out the report and is not typically verified.
- e. ISO Rating: ISO Ratings were not used as a measurement tool in this study for several reasons. As is previously discussed in the Literature Review section of this report, a department's ISO Rating is more indicative of its potential ability to handle an emergency based on parameters such as staffing, training, and water supply. It does not measure the actual performance of a fire department. Being prepared to

handle emergency situations is extremely important, but the goal of this study was to quantify actual performance, not potential performance.

- f. Levels of Specialized Fire Training: The value of various types of specialized fire training is extremely subjective and may vary based on the specific clientele which are serviced by an individual department.

The received data were compiled and then analyzed. This paper looks at the performance parameters from all of the responding departments as well as examining the data from various subsets based on similarities in the responding departments' descriptive information.

Definition of Terms

ACLS. Advanced Cardiac Life Support

Cost per Run. The total expenditures of a department divided by the total number of emergency runs (both fire and EMS) made by that department.

EMS. Emergency Medical Services

OCP Personnel. “On Call – Paid”. Personnel who respond to emergency runs but who are not paid to stay on station. These personnel are typically paid only when they are actually on an emergency run. This term is used interchangeably with Volunteer personnel.

Response Time. The time which elapses between when a station is alerted to an emergency call and when the first unit from that station arrives on the scene. This includes both roll out time and driving time.

Roll Out Time. The time which elapses between when a station is alerted to an emergency call and when the first unit leaves the station to respond to the emergency call.

Limitations of the Study

The data used for this study were collected via a survey which was sent out to the suburban departments in Hamilton County. It was generally assumed that the information which was provided in response to the survey was accurate. Given the allotted time frame for this research paper, independent verification of all of the provided data was not practical.

The results from one responding department, however, had to be removed from the study. The response times which the Elmwood Fire Department provided were removed from this study

because they were well outside the range of responses which were received from other departments and were not credible.

RESULTS

Table 1 represents the provided descriptive data which were used as a basis for comparing the performance data from the responding departments.

Table 1

Descriptive Data for Departments in Survey

	No. of Stations	Personnel	Service Area (Sq. Mi.)	Nighttime Population
Anderson Twp.	4	F	32	43,800
Blue Ash	2	F, P	7.2	13,500
Cheviot	1	F, P	1.5	9,600
Colerain Twp.	5	F, P	43.5	62,000
Crosby Twp.	2	F, P, V	20.5	4,000
Deer Park Silverton	1	F, P, V	5	11,200
Delhi Twp.	3	F, P	10.5	30,000
Evendale	1	F	5	3,500
Forest Park	2	F, P	7.6	20,000
Golf Manor	1	F, P, V	2	6,000
Green Twp.	4	F, P	28.7	57,300
Greenhills	1	V	4	6,500
Little Miami Fire/Rescue	2	F, P	4	7,400
Lockland	1	P, V	1	3,600

Table 1 (cont.)

Descriptive Data for Departments in Survey

	No. of Stations	Personnel	Service Area (Sq. Mi.)	Nighttime Population
Madeira & Indian Hill	2	F, P	24	14,830
Mariemont	1	F, P	1.5	3,400
Montgomery	1	F, P	5.5	10,000
Mt. Healthy	1	F, P	1.4	7,150
Norwood	1	F	2.1	25,000
Reading	2	F, P, V	3	11,300
Sharonville	3	F, P	10	13,840
Springdale	1	F, P	4.9	10,563
Springfield Twp.	2	F, P	17	38,000
St. Bernard	1	F	1.5	4,980
Sycamore Twp.	2	F, P	9	20,000
Terrace Park	1	V	1	2,273
Woodlawn	1	F, P	4.5	7,000
Wyoming	1	P, V	2.5	8,260

Note: “F” represents Full Time Paid Personnel; “P” represents Part Time Personnel; “V” represents Volunteer or OCP Personnel

Table 2 represents the provided performance data which were used as a basis for comparing the responding departments.

Table 2

Performance Data for Departments in Survey

	Total 2005 Expenditures	Total No. of Runs	Total Cost per Run	Average Response	
				Fire	EMS
Anderson Twp.	\$8,000,000	6,290	\$1,272	4:52	4:14
Blue Ash	\$3,931,950	2,172	\$1,810	4:03	4:00
Cheviot	\$684,400	1,063	\$644	2:30	2:30
Colerain Twp.	\$10,259,000	8,395	\$1,222	4:50	5:30
Crosby Twp.	\$424,000	429	\$988	5:26	7:29
Deer Park Silverton	\$1,400,000	2,068	\$677	4:04	3:32
Delhi Twp.	\$2,561,000	2,570	\$996	5:20	4:40
Evendale	\$2,800,000	1,297	\$2,159	4:21	3:31
Forest Park	\$3,424,763	3,865	\$886	4:07	4:07
Golf Manor	\$852,418	1,059	\$805	4:22	3:20
Green Twp.	\$5,400,000	5,587	\$967	5:22	5:11
Greenhills	\$222,314	820	\$271	6:00	6:00
Little Miami Fire & Rescue	\$1,643,000	927	\$1,772	4:40	4:20
Lockland	\$424,000	1,285	\$330	5:00	5:00
Madeira & Indian Hill	\$2,140,242	1,496	\$1,431	4:48	4:36

Table 2 (cont.)

Performance Data for Departments in Survey

	Total 2005	Total No.	Total Cost	Average Response	
	Expenditures	of Runs	per Run	Fire	EMS
Mariemont	\$800,000	530	\$1,509	3:00	3:00
Montgomery	\$1,977,491	1,328	\$1,489	5:09	3:45
Mt. Healthy	\$457,666	1,291	\$355	4:45	4:27
Norwood	\$4,000,000	3,694	\$1,083	2:53	
Reading	\$1,739,000	1,616	\$1,076	5:03	3:45
Sharonville	\$6,790,000	2,863	\$2,372	4:29	4:58
Springdale	\$2,664,998	3,034	\$878	4:05	4:30
Springfield Twp.	\$4,200,000	4,523	\$929	5:19	7:24
St. Bernard	\$2,400,000	1,146	\$2,094	4:48	3:30
Sycamore Twp.	\$3,700,000	3,329	\$1,111	4:00	6:00
Terrace Park	\$40,000	30	\$1,333	5:00	N/A
Woodlawn	\$1,200,000	1,568	\$765	3:34	3:06
Wyoming	\$475,000	1,654	\$287	4:43	3:22

In order to facilitate the viewing of the data, the following pages provide graphic representations for the number of runs, cost per run, fire response times and EMS response times for the departments which participated in the survey.

Figure A: Number of Emergency Runs

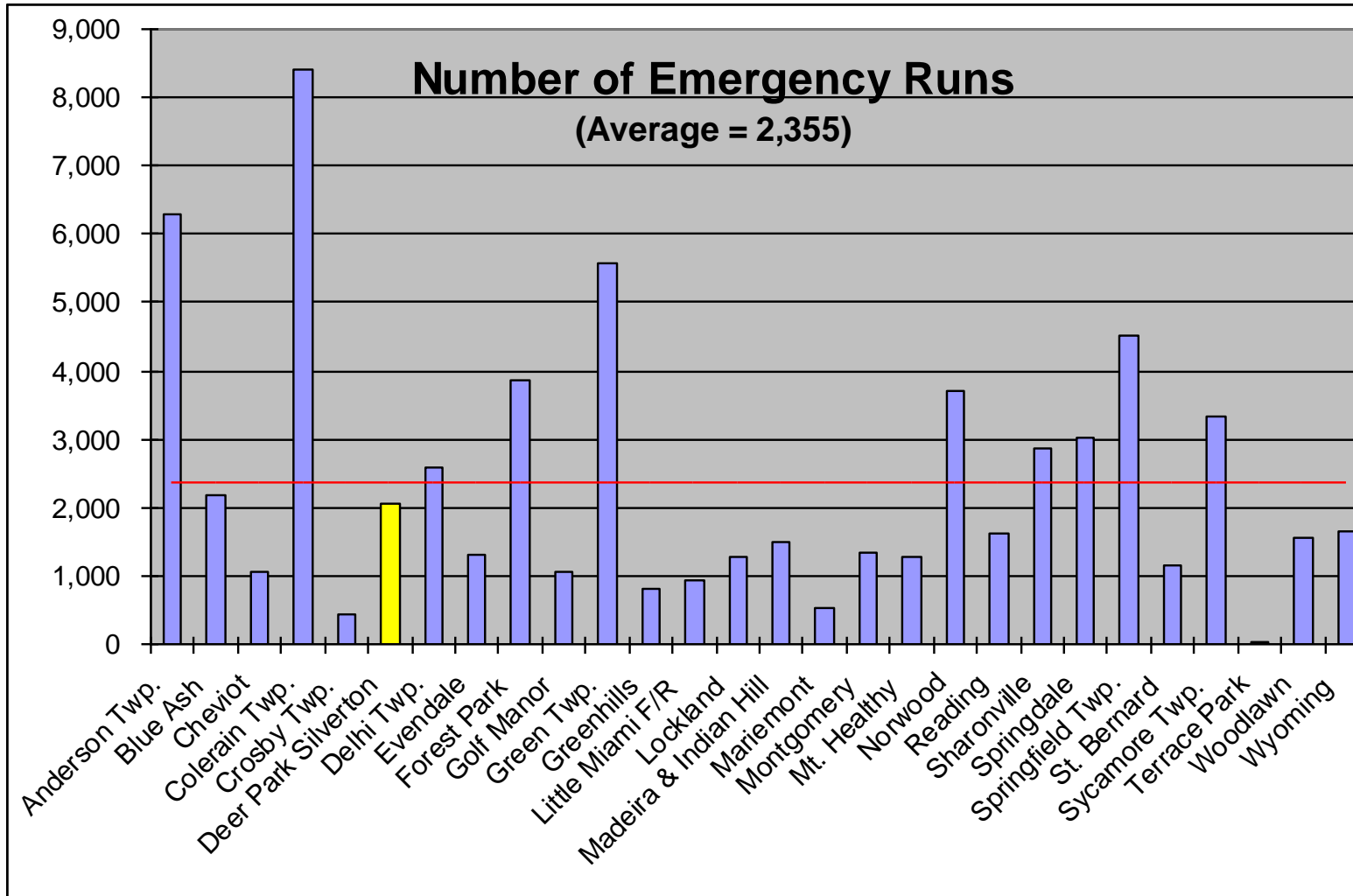


Figure B: Cost per Run

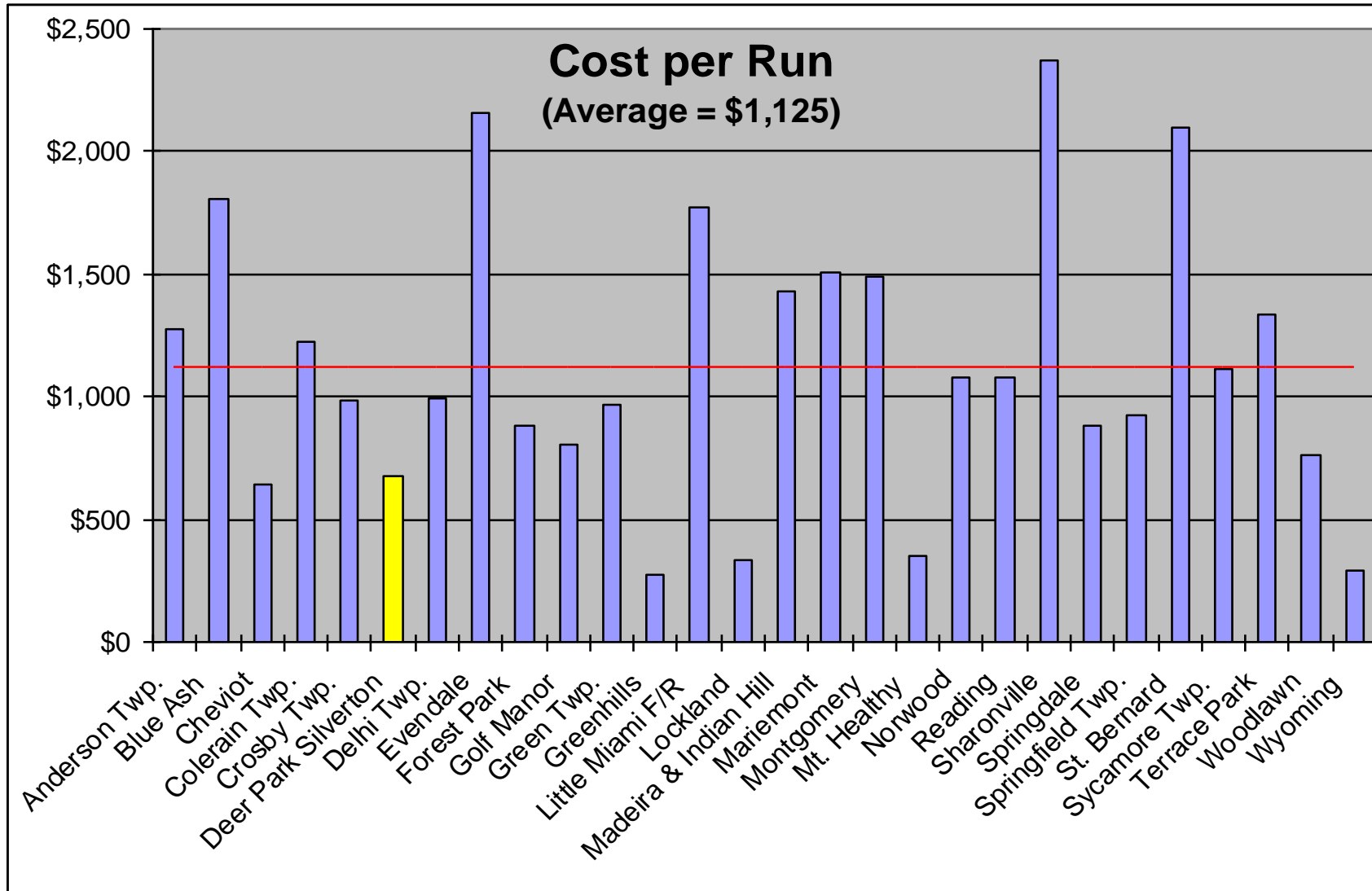


Figure C: Fire Response Times

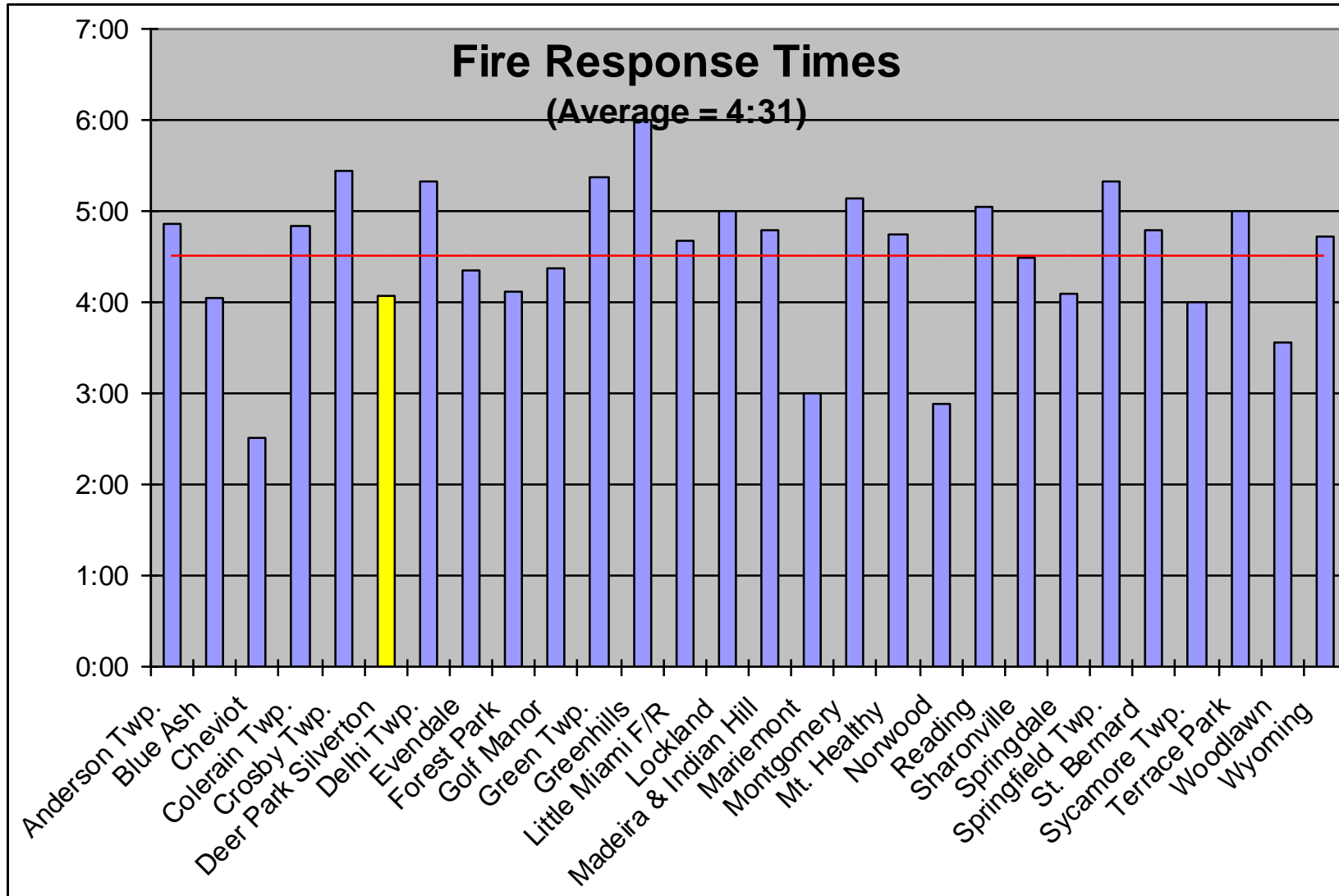
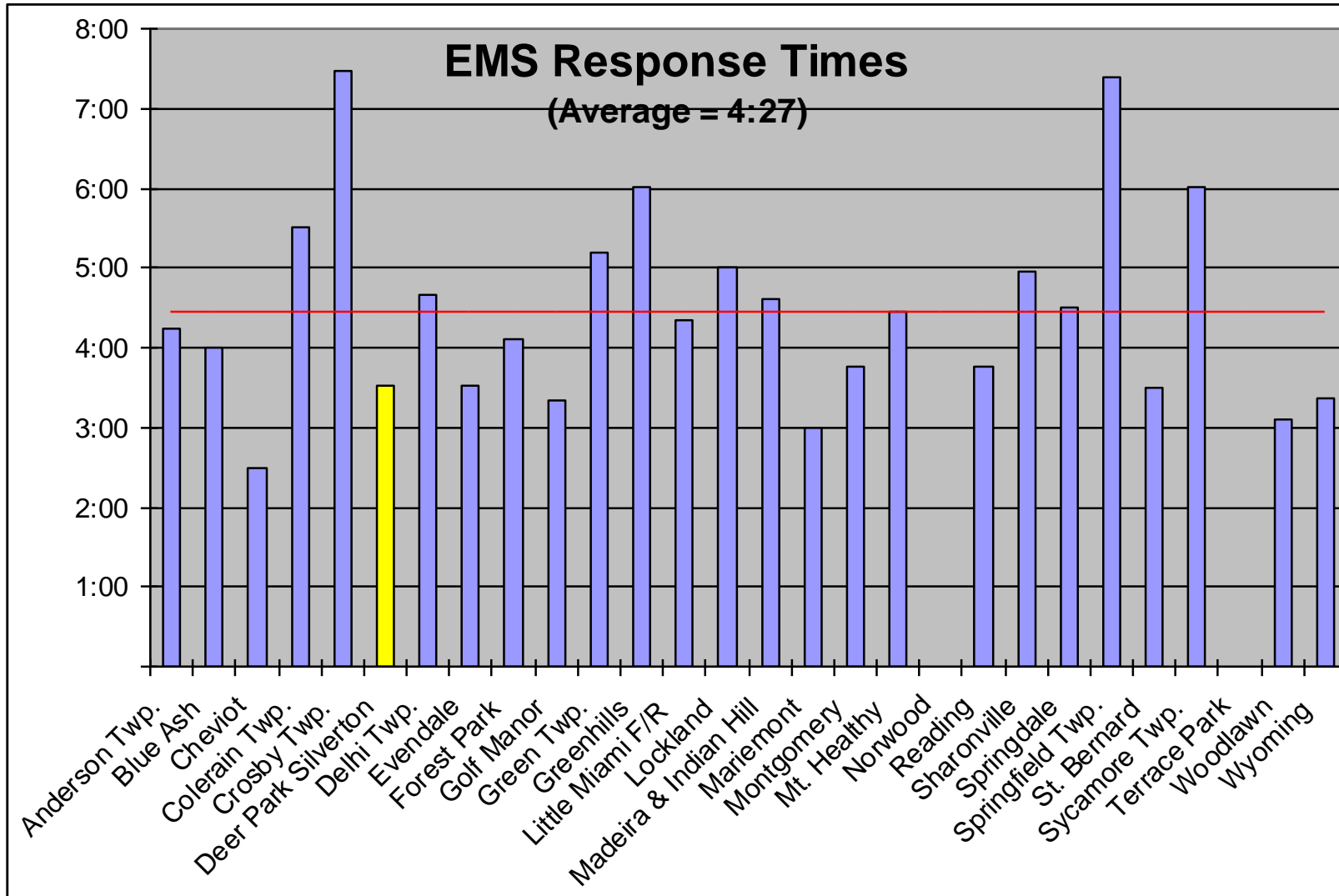


Figure D: EMS Response Times



When the responses from all of the responding departments were compiled (Tables 1 & 2), a wide range was seen in each of the three selected key performance parameters, cost per run, average fire response time and average EMS response time. These wide ranges provided a useful tool as we tried to assess the relative performances of different departments.

For the parameter of cost per run (Figure B), the results ranged from a high of \$2,372 (Sharonville) to a low of \$271 (Greenhills). The overall average for the responding departments was \$1,154. At \$677 per run, the DPSJFD had the fifth lowest cost per run among the respondents. This is over 40% less than the average for the responding departments.

With respect to the average fire response time (Figure C), the overall values ranged from 2:30 (Cheviot) to 6:00 (Greenhills). The survey-wide average was 4:30. The DPSJFD ranked seventh in average fire response time and with a time of 4:04, beat the survey-wide average response time by nearly 10%.

The average EMS response times (Figure D) ranged even more than did the average fire response times. For this parameter, the range went from a low of 2:30 (Cheviot) up to a high of 7:29 (Crosby Township). The survey-wide average was 4:27. At 3:32, the DPSJFD ranked eighth in average EMS response time, 20% better than the survey-wide average.

To summarize, the DPSJFD ranked in the top 30% among the responding departments in all three key performance criteria, and was in the top 20% of the responding departments for the economic indicator, cost per run.

Data Subset A - Departments with Similar Run Volumes

As was discussed in the Procedure section of this report, the compiled data were then re-sorted on different criteria in an effort to compare the results of the Deer Park Silverton Joint Fire District with other similar departments. For these comparisons, the data from DPSJFD are presented side-by-side to the data from the 10 departments most similar to the DPSJFD in each selected criterion.

The first sub-grouping of the responding departments was based on emergency run volume. In 2005, the DPSJFD made a combined total of 2,068 fire and EMS runs. The departments in the overall data pool ranged from 30 runs to 8,395 runs. The 2,068 runs ranked the DPSJFD 10th among the responding departments.

For this comparison, the responding departments were sorted based on their combined fire and EMS run volume and the performance data of the DPSJFD were compared to the performance data of the five departments immediately above and the five departments immediately below the DPSJFD (Table 3). The ten departments which were segregated for comparison ranged from 1,328 runs to 3,329 runs.

These data is presented in Table 3 and Figures E, F & G.

Table 3

Surveyed departments with similar run volumes

	Total no.	Total cost	Response times	
	of runs	per run	Fire	EMS
Sycamore Twp.	3,329	\$1,111	4:00	6:00
Springdale	3,034	\$878	4:05	4:30
Sharonville	2,863	\$2,372	4:29	4:58
Delhi Twp.	2,570	\$996	5:20	4:40
Blue Ash	2,172	\$1,810	4:03	4:00
Deer Park Silverton	2,068	\$677	4:04	3:32
Wyoming	1,654	\$287	4:43	3:22
Reading	1,616	\$1,076	5:03	3:45
Woodlawn	1,568	\$765	3:34	3:06
Madeira & Indian Hill	1,496	\$1,431	4:48	4:36
Montgomery	1,328	\$1,489	5:09	3:45

Figure E: Cost per run for departments with similar run volumes

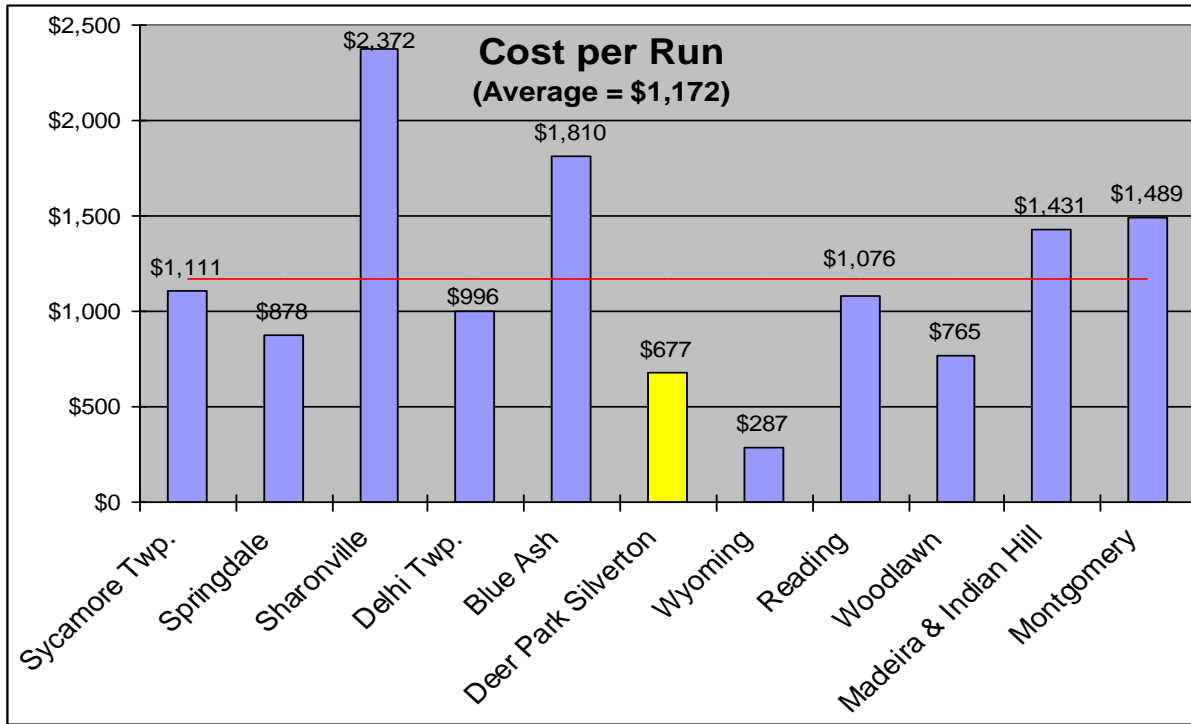


Figure F: Fire response times for departments with similar run volumes

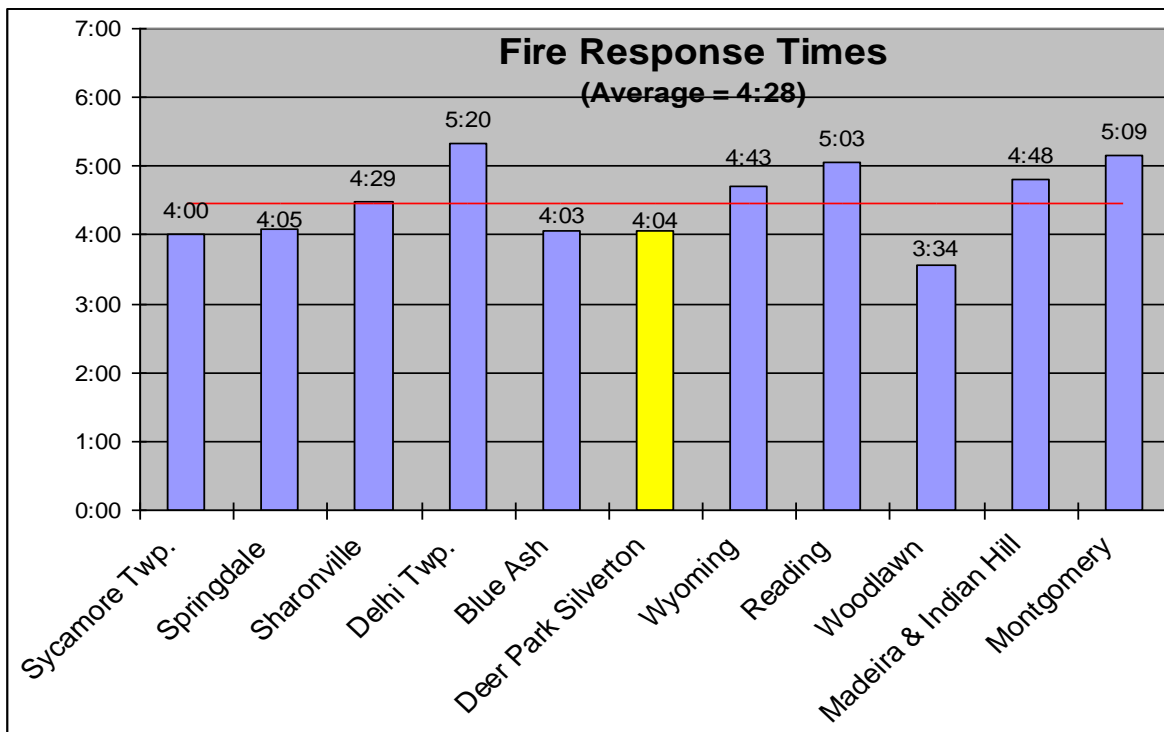
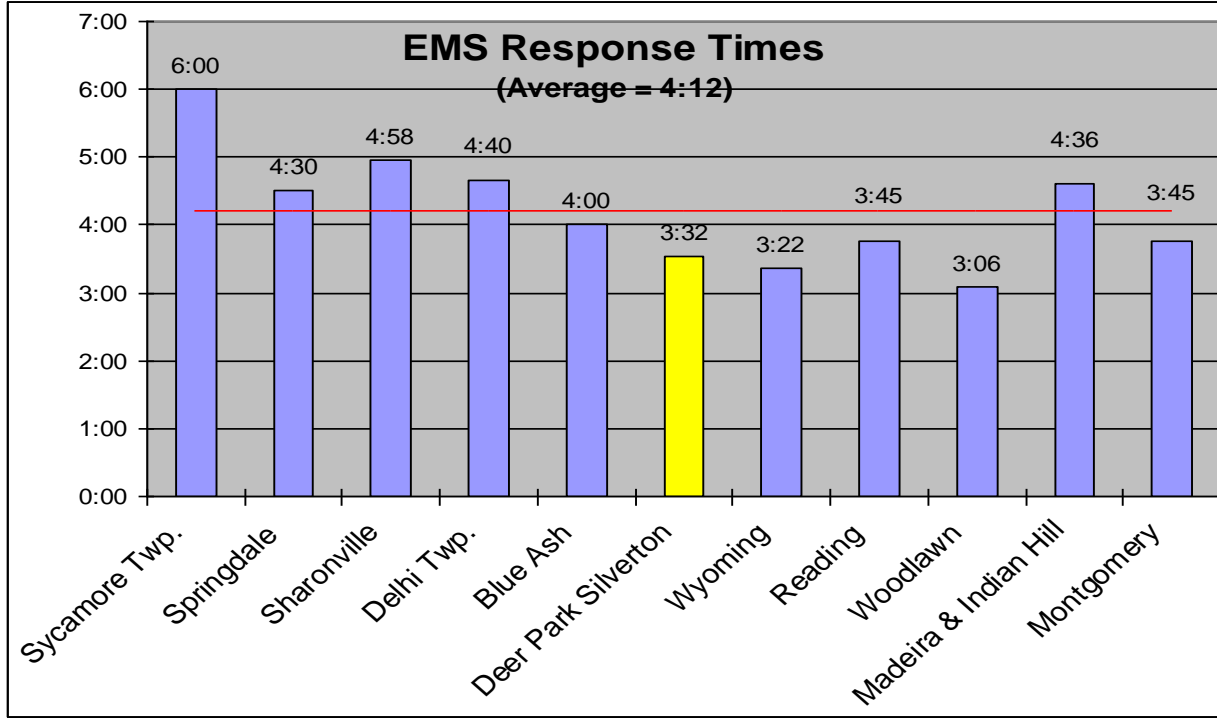


Figure G: EMS response times for departments with similar run volumes



Within this subset, the DPSJFD ranked second in cost per run (\$677), fourth in fire response time (4:04) and third in EMS response time (3:32). Further, when looking at the fire response times, the difference between the second department and the fifth department was a total of five seconds. Essentially, these five departments can be considered to rank equally for their fire response times. Only one department (Woodlawn, 3:34) provides a significantly quicker fire response time than does the DPSJFD.

Data Subset B - Departments with Similar Run Volumes per Station

Of the nine responding departments which made more runs than did the DPSJFD, eight made these runs from multiple stations. It was therefore decided to also look at a breakout of data based on run volumes per station. Among the respondents, the run volume per station ranged from a high of 3,694 (Norwood) to a low of 30 (Terrace Park). The average was 1,330 runs per station. The DPSJFD made 2,068 runs out of a single station, thus ranking fourth of the 28 responding departments.

Because only three departments made more runs per station than did the DPSJFD, when defining this subgroup of departments similar to the DPSJFD, it was not possible to isolate the five departments above and below the DPSJFD. The ten departments in this grouping therefore consist of the three departments above and the six departments immediately below the DPSJFD.

These data are presented in Table 4 and Figures H, I & J.

Table 4

Surveyed departments with similar run volumes per station

	Total no. of	Total cost	Response times	
	Runs / station	per run	Fire	EMS
Norwood	3,694	\$1,083	2:53	N/A
Springdale	3,034	\$878	4:05	4:30
Springfield Twp.	2,262	\$929	5:19	7:24
Deer Park Silverton	2,068	\$677	4:04	3:32
Forest Park	1,933	\$886	4:07	4:07
Colerain Twp.	1,679	\$1,222	4:50	5:30
Sycamore Twp.	1,665	\$1,111	4:00	6:00
Wyoming	1,654	\$287	4:43	3:22
Anderson Twp.	1,573	\$1,272	4:52	4:14
Woodlawn	1,568	\$765	3:34	3:06

Figure H: Cost per run for departments with similar runs per station

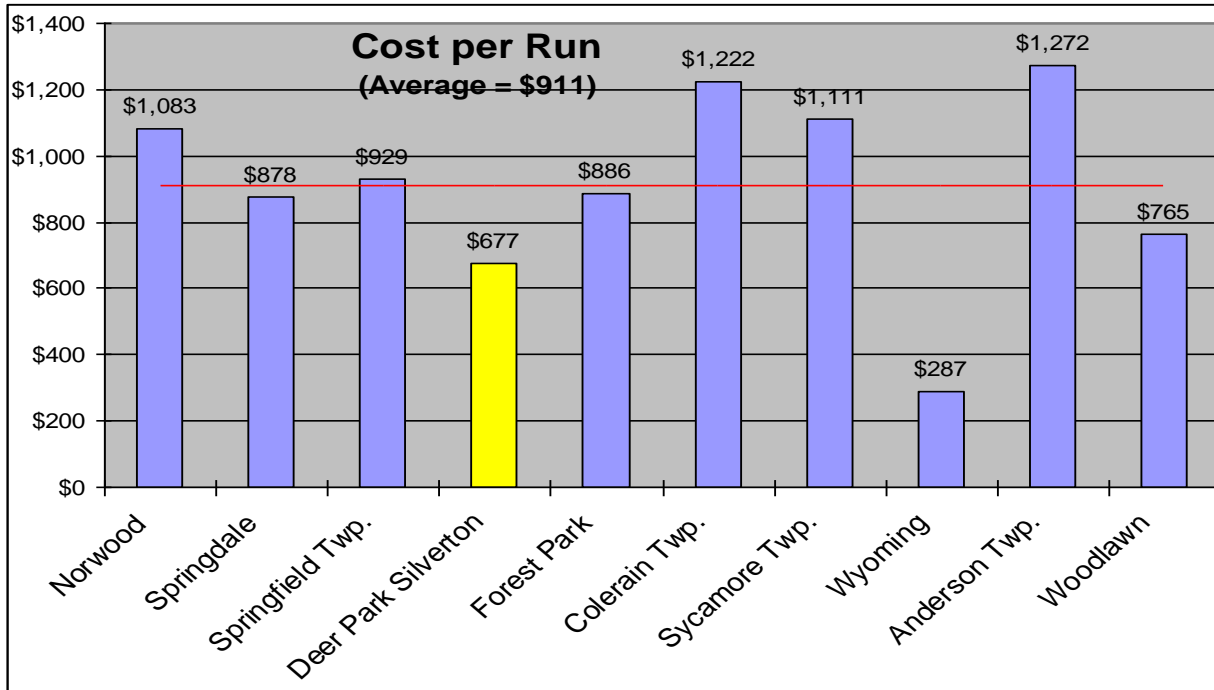


Figure I: Fire response times for departments with similar runs per station

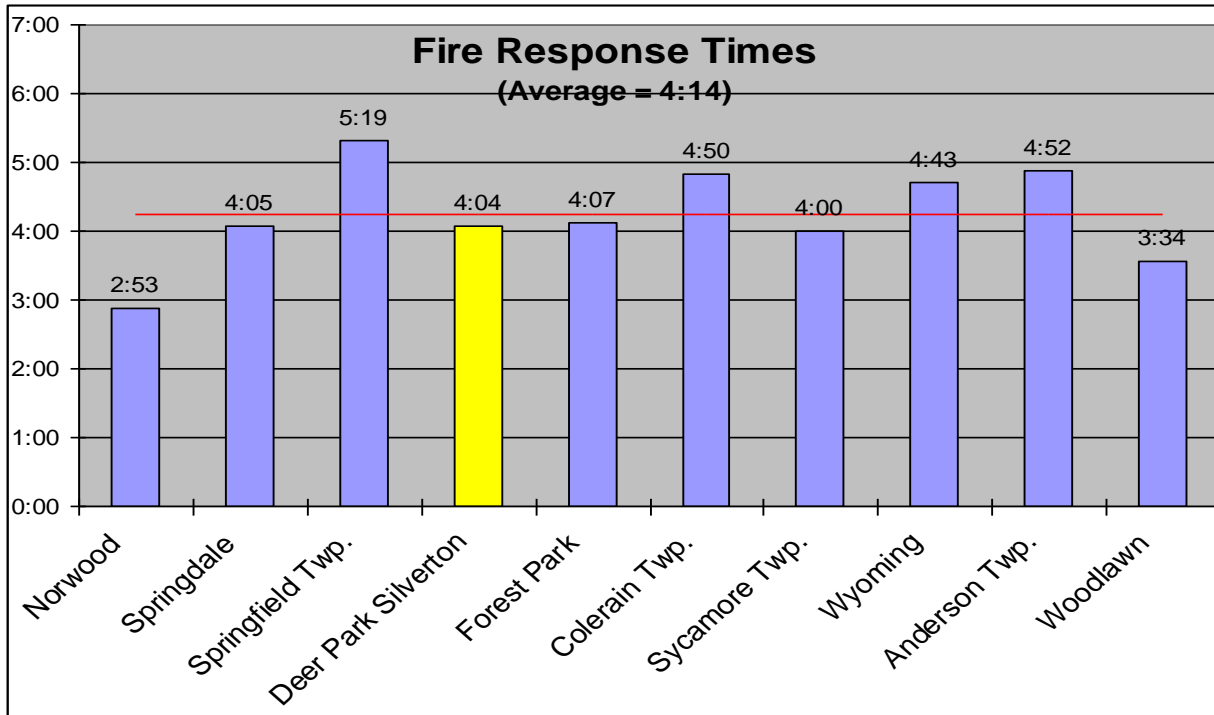
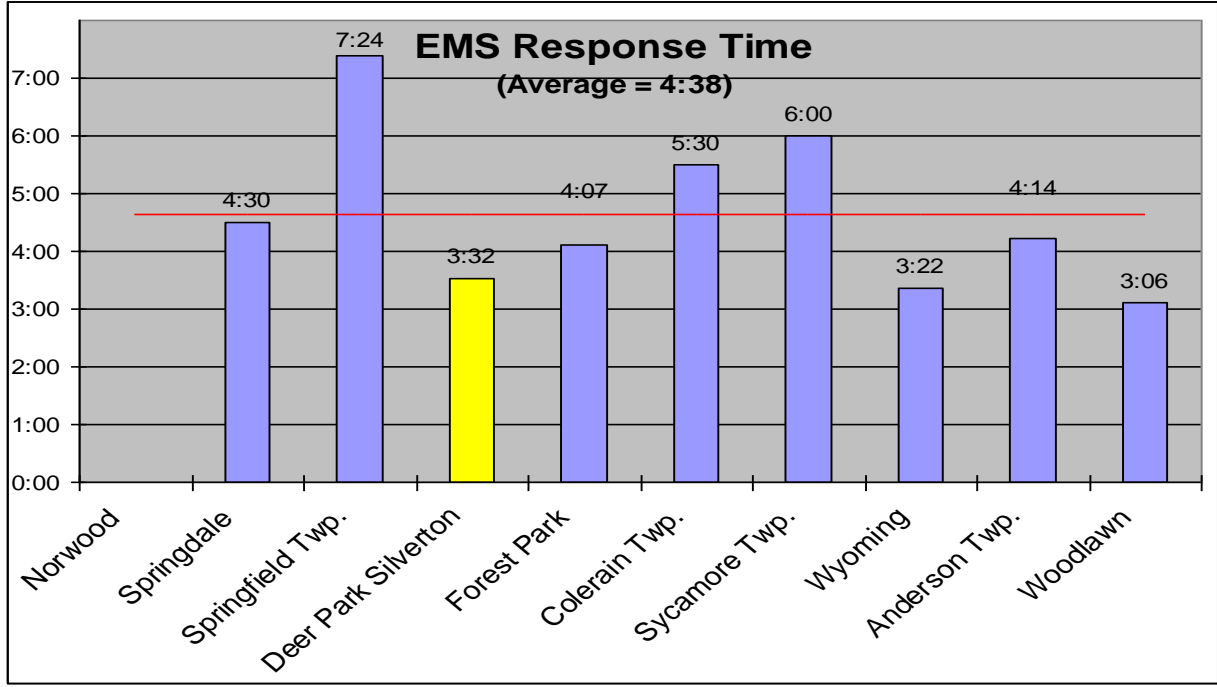


Figure J: EMS response times for departments with similar runs per station



Within this subgroup, the DPSJFD had the second lowest cost per run (\$677), again behind Wyoming (\$287). They ranked fourth in fire response time and third in EMS response time. Similar to the previous subgroup, the third, fourth, fifth and sixth departments as ranked by fire response times were separated by only seven seconds. In effect, only two departments, Norwood and Woodlawn) provided significantly quicker fire response times than did the DPSJFD.

Data Subset C - Departments with Similar Geographical Size

The response time to an emergency call can obviously be greatly influenced by the distance which must be covered to arrive at the scene. A department can work to improve the time between notification and rollout. However, short of adding or moving stations, little can be done to safely reduce the actual drive times to emergency scenes. This is the basis for the third comparison group which was established. In this group, the DPSJFD was compared to other departments with similar sized service areas per station.

As listed in Table 1, among the responding departments the service area covered ranged from 1.0 square mile (Lockland, Terrace Park) up to 43.5 square miles (Colerain). After the data were broken down to square miles per station, the resulting data ranged from 1.0 square miles per station (several departments) up to 12.0 square miles per station (Madeira Indian Hill). The average was 3.4 square miles per station. The DPSJFD, with 5.0 square miles per station, ranked eighth of the 28 responding departments.

In order to find departments with similar sized response areas, the data were resorted based on service area per station. Comparisons were then made with the five departments immediately above and the five departments immediately below the DPSJFD.

These data are represented in Table 5 and Figures K, L and M.

Table 5

Surveyed departments with similar service areas per station

	Total service	Total cost	Response times	
	area / station	per run	Fire	EMS
Colerain Twp.	8.7	\$1,222	4:50	5:30
Springfield Twp.	8.5	\$929	5:19	7:24
Anderson Twp.	8.0	\$1,272	4:52	4:14
Green Twp.	7.2	\$967	5:22	5:11
Montgomery	5.5	\$1,489	5:09	3:45
Deer Park Silverton	5.0	\$677	4:04	3:32
Evendale	5.0	\$2,159	4:21	3:31
Springdale	4.9	\$878	4:05	4:30
Sycamore Twp.	4.5	\$1,111	4:00	6:00
Woodlawn	4.5	\$765	3:34	3:06
Greenhills	4.0	\$271	6:00	6:00

Figure K: Cost per run for departments with similar service areas per station

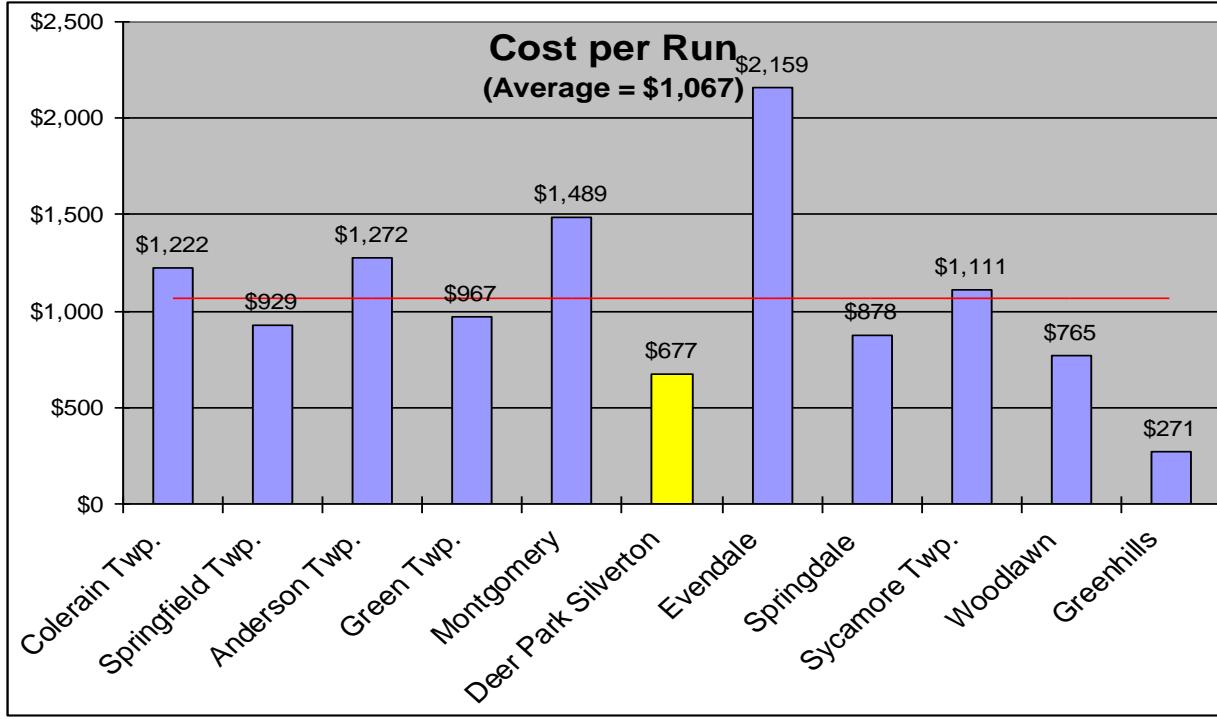


Figure L: Fire response times for departments with similar service areas per station

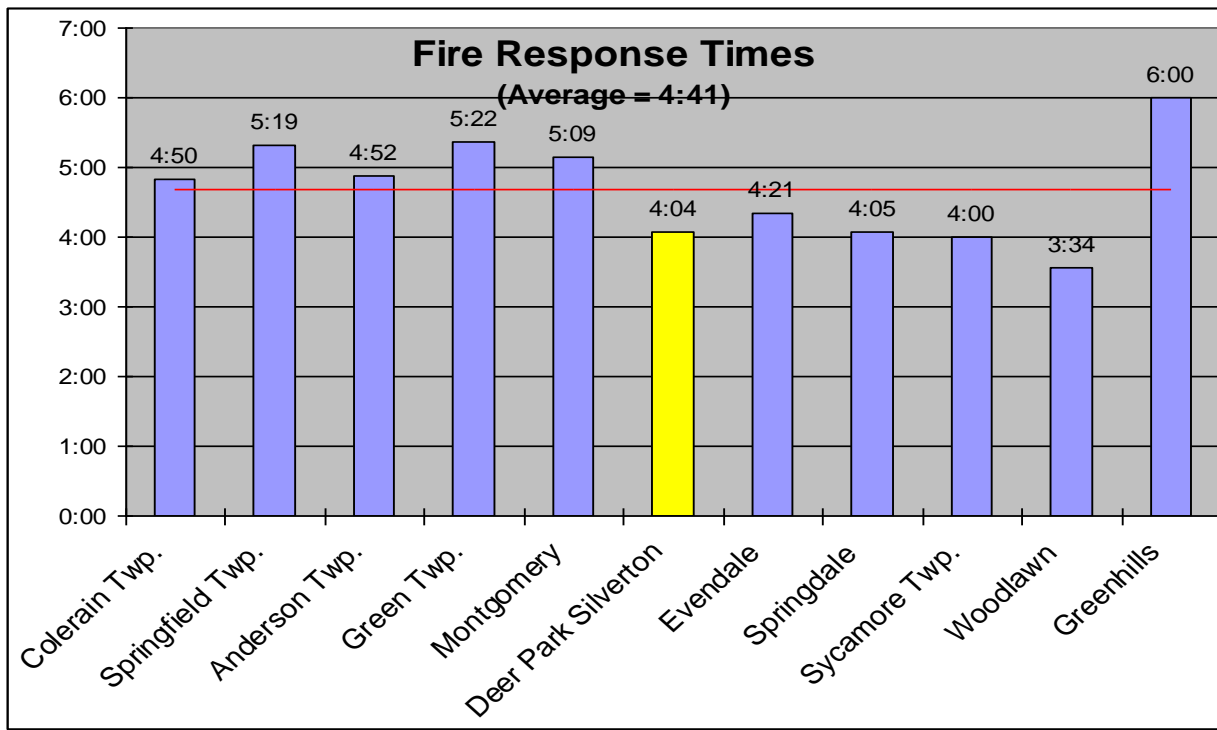
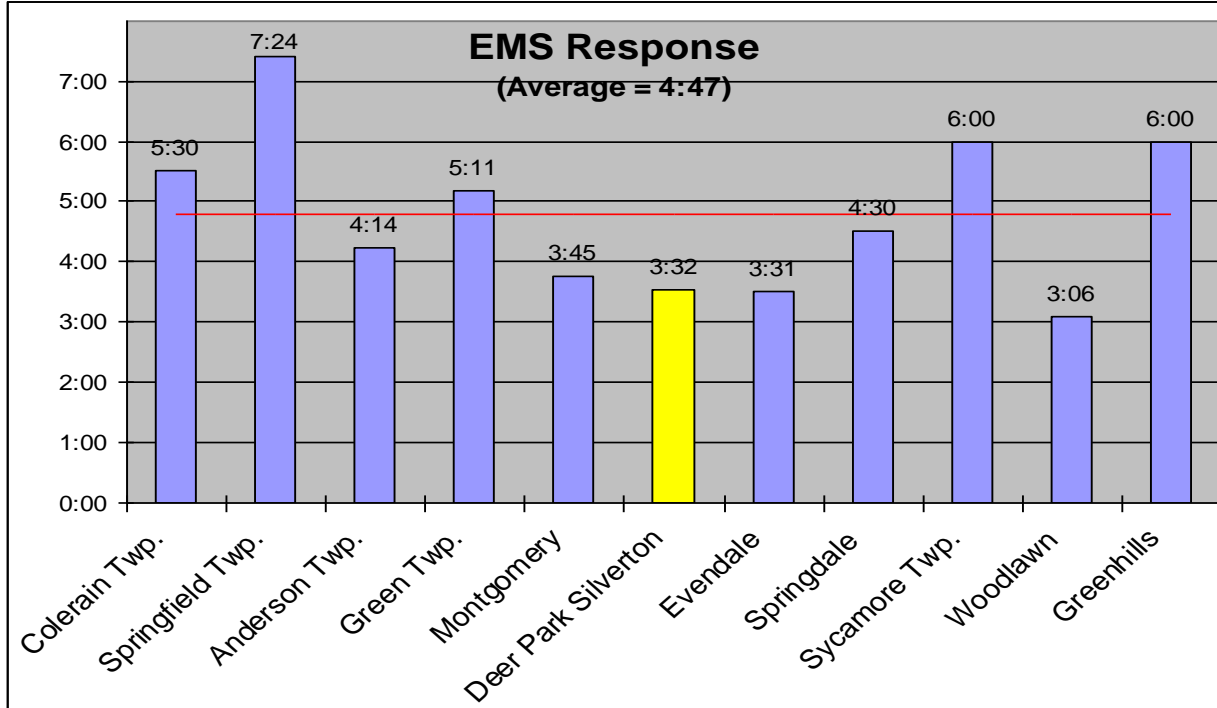


Figure M: EMS response times for departments with similar runs per station



Within this subgroup, the DPSJFD had the second lowest cost per run, trailing only Greenhills, a department which has no on-station personnel and is staffed completely with members responding from their homes. The fire response time and EMS response time for the DPSJFD both ranked third, with only one department in each parameter providing a significantly quicker response.

Data Subset D - Departments with Similar Nighttime Population

The final grouping in the search for similar departments was based on nighttime populations. Daytime populations were also considered, but four of the responding departments were unable to provide this information and several others indicated that they were not sure of the figures provided and stated that the provided values were approximations at best. Again, since one of the original goals of this project was to use data which were readily available, daytime population was not used for any data analysis.

The nighttime populations for the responding departments ranged from 2,273 people (Terrace Park) up to 62,000 people (Colerain Township), with an average nighttime population of 16,250 people. The DPSJFD, with a nighttime population of 11,200 people, ranked 13th of the 28 responding departments.

Similar to the previous comparisons, the data was again resorted, this time based on nighttime population. Comparisons were made to the five departments immediately above and the five departments immediately below the DPSJFD.

These data are presented in Table 6 and Figures N, O and P.

Table 6

Surveyed departments with similar nighttime populations

	Nighttime	Total cost	Response times	
	population	per run	Fire	EMS
Sycamore Twp.	20,000	\$1,111	4:00	6:00
Madeira & Indian Hill	14,830	\$1,431	4:48	4:36
Sharonville	13,840	\$2,372	4:29	4:58
Blue Ash	13,500	\$1,810	4:03	4:00
Reading	11,300	\$1,076	5:03	3:45
Deer Park Silverton	11,200	\$677	4:04	3:32
Springdale	10,563	\$878	4:05	4:30
Montgomery	10,000	\$1,489	5:09	3:45
Cheviot	9,600	\$644	2:30	2:30
Wyoming	8,260	\$287	4:43	3:22
Little Miami F/R	7,400	\$1,772	4:40	4:20

Figure N: Cost per run for departments with similar nighttime populations

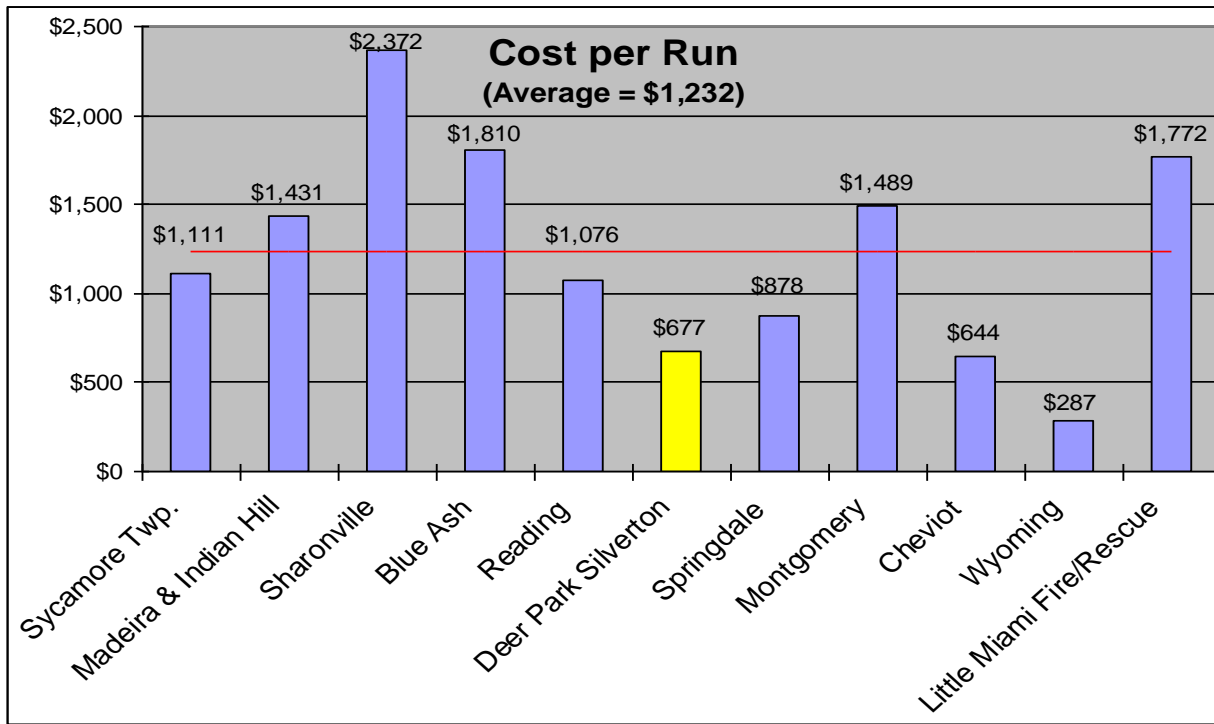


Figure O: Fire response times for departments with similar nighttime populations

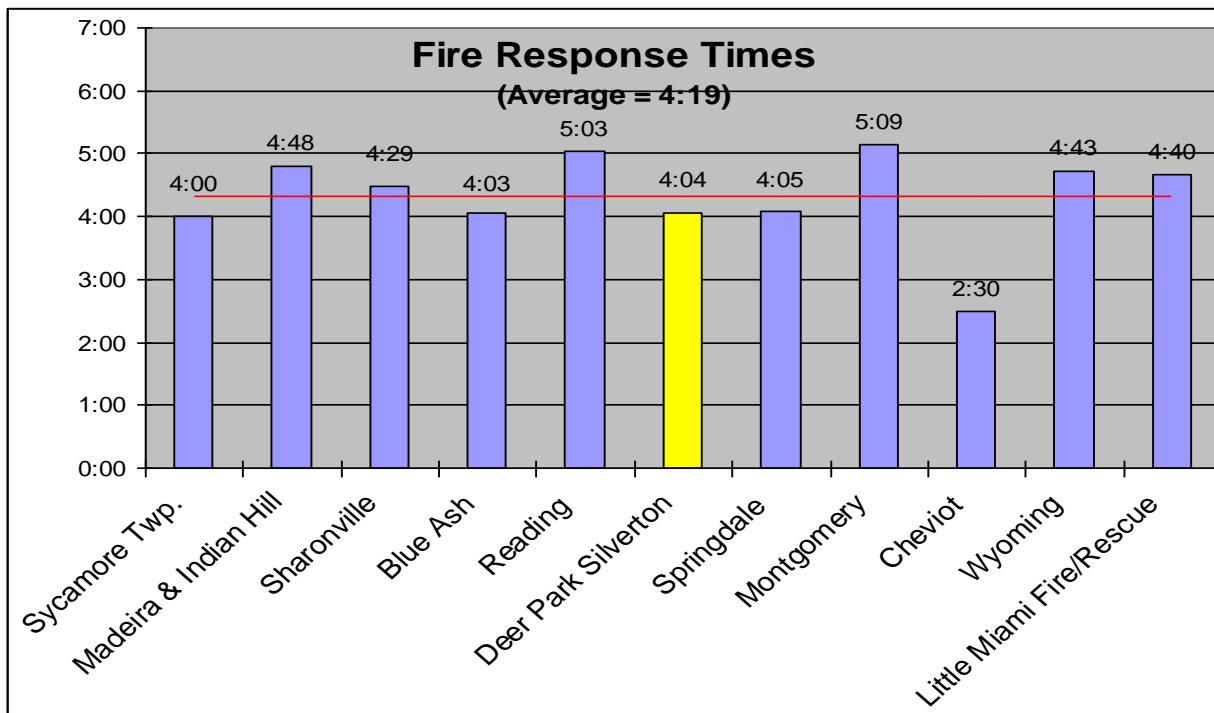
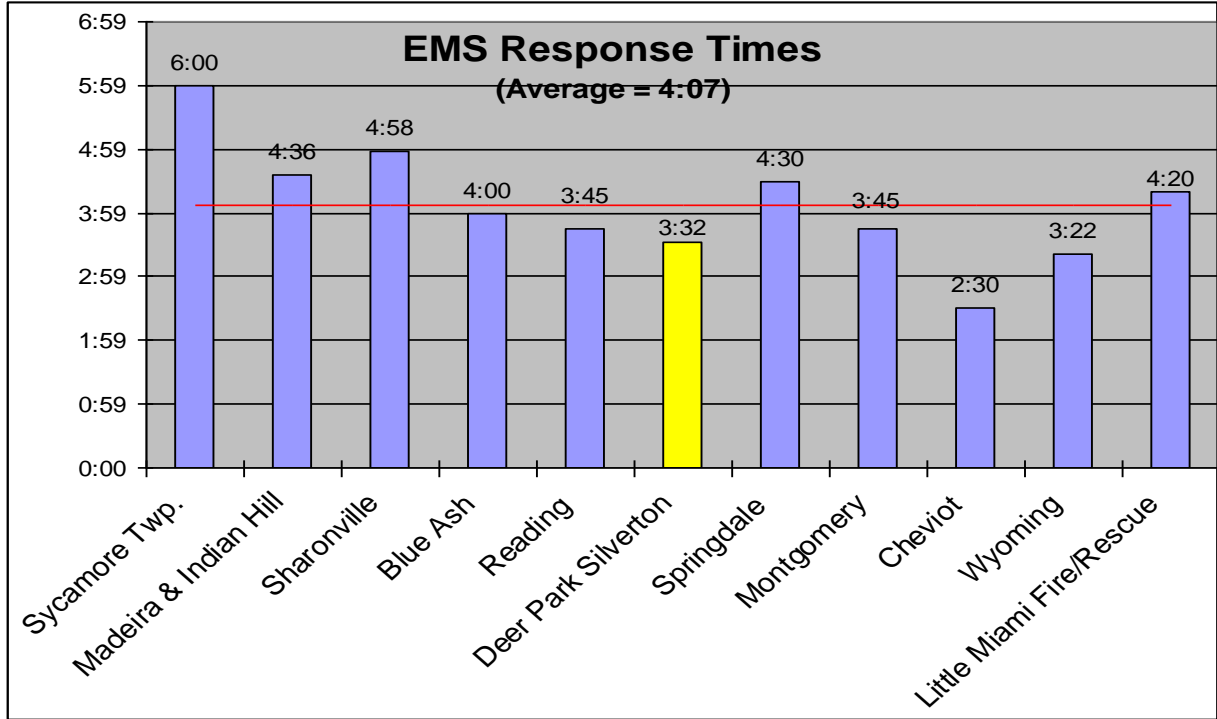


Figure P: EMS response times for departments with similar nighttime populations



Within this subgroup, the DPSJFD had the fourth lowest cost per run (\$677), with results very similar to the third ranked department (Cheviot, \$644). In regards to fire response times, the DPSJFD (4:04) ranked fourth, with only one department (Cheviot, 2:30) providing a significantly quicker response. For EMS response times, the DPSJFD (3:32) ranked third in the subgroup.

Data Subset E – Comparisons Based on Personnel Make-Up

The final research question to be addressed by this paper relates to the personnel make-up of a department and how that personnel make-up affects the performance parameters of the department. To address that question, all of the responding departments were classified into one of the following classifications:

100% full time personnel

Combination full time and part time personnel

Combination full time, part time and volunteer personnel

Combination part time and volunteer personnel

100% volunteer personnel

The averages for number of runs, cost per run, fire response time and EMS response time were then calculated for each of these personnel classifications, and the information is presented in Table 7 and Figures Q & R.

Table 7

Personnel make-up of departments

	No. of	Average	Cost per	Response Times	
	Depts.	No. of Runs	Run	Fire	EMS
Full Time	4	3,107	\$1,652	4:13	3:45
Full Time & Part Time	15	2,899	\$1,233	4:30	4:38
Full Time, Part Time & Volunteer	5	1,247	\$ 838	4:17	4:07
Part Time & Volunteer	3	1,030	\$ 404	3:54	3:27
Volunteer	2	425	\$ 802	5:30	6:00

Figure Q: Number of runs and cost per run by personnel make-up

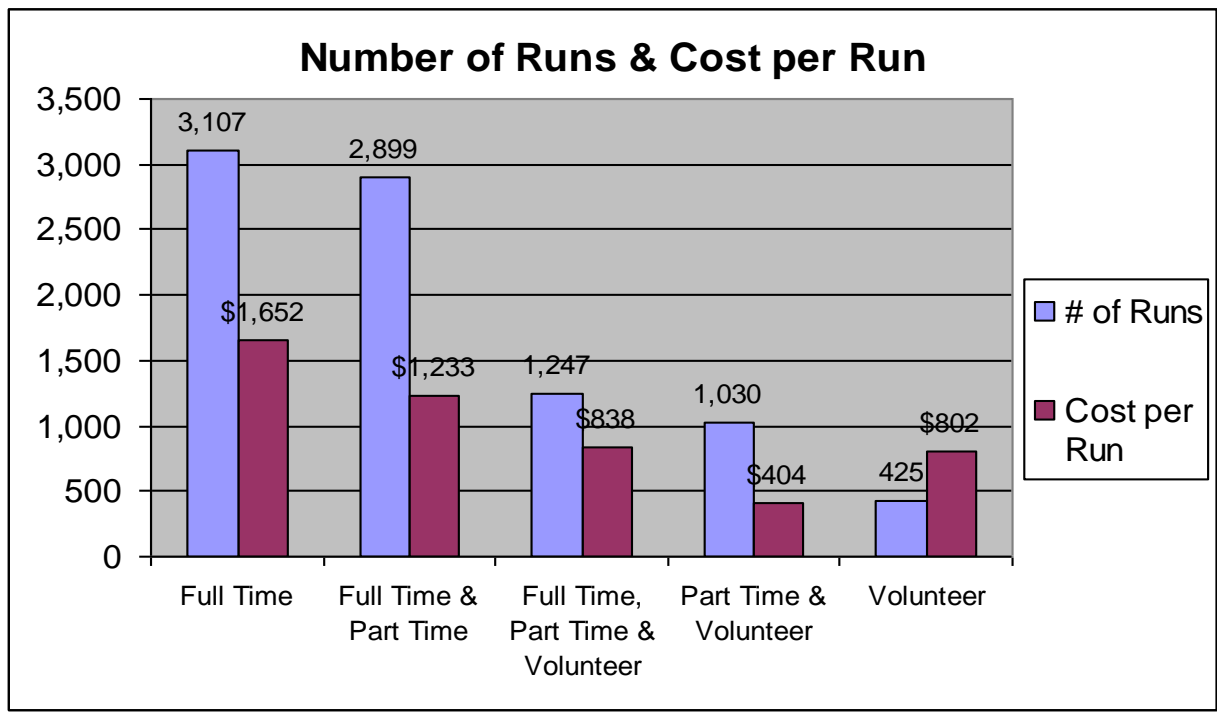
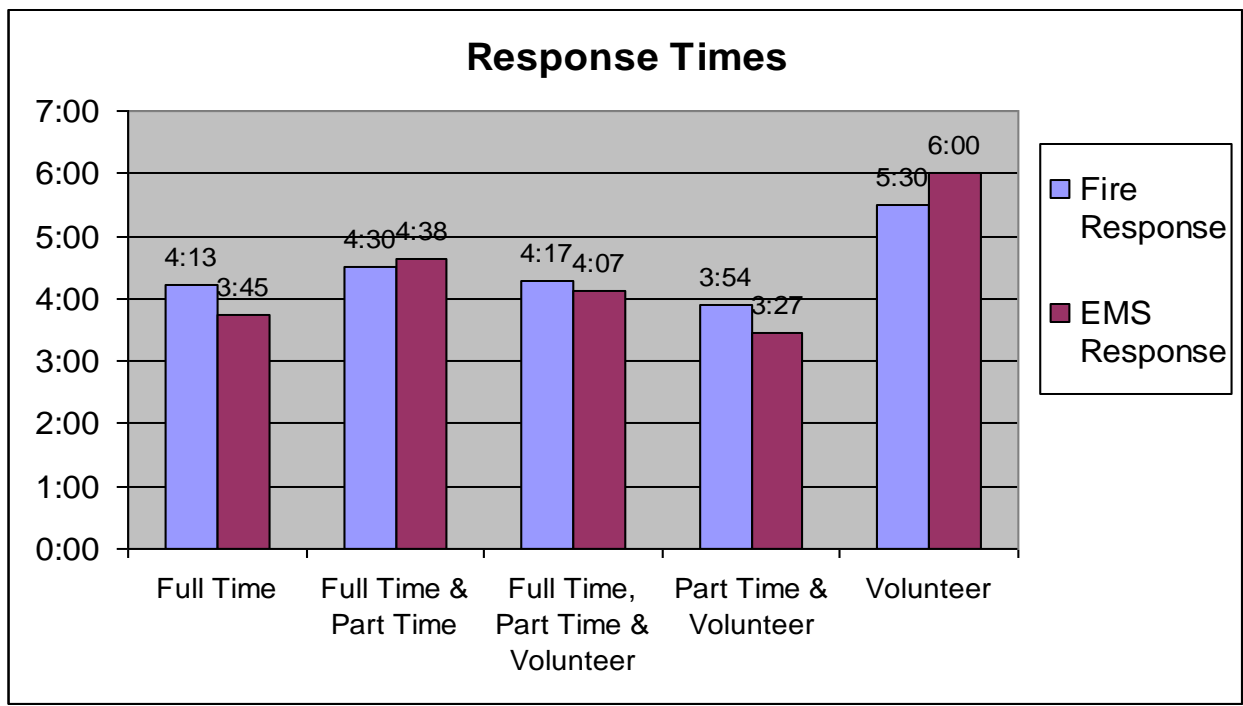


Figure R: Response times by personnel make-up



When looking at this data, several interesting observations became apparent. Although some individual departments may have deviated from the trend, there is an obvious correlation between the average number of runs and the personnel make-up of the department (Figure Q). Specifically, although volunteer members are still an important component of many of the responding departments, as the run load becomes greater you see a definite shift away from volunteer members and a greater reliance on paid personnel. As the department size (by run volume) increases, there is a definite trend from strictly volunteer to combination paid/volunteer to strictly paid personnel. In fact, on the average, the departments which are staffed with only full time personnel are the departments with the highest run volumes.

There is a corresponding relationship seen when looking at the average cost per run of personnel make-up classifications (Figure Q). The departments which had run volumes which were conducive to using volunteers had substantially lower costs per run than did the departments which relied strictly on paid personnel. The highest costs per run were seen in those departments who used nothing except for full time personnel and did not use either volunteer or part time personnel.

At this time, it should be mentioned that, although the use of volunteer personnel has definite economic advantages, this may not be a practical option for some departments. For example, departments with an excessively high run volume would very likely over-tax their volunteer members. Also, due to the socioeconomics of their population, some communities may not have the personnel resources available to support a volunteer segment for their department ... e.g. the people living in a somewhat wealthy community may not be willing or able to serve in what is traditionally a blue collar profession.

Of interest, the average response times for the various types of personnel were all very similar, with the exception of the departments which relied entirely on volunteers. The response times for volunteer departments were substantially longer than the response times for combination and 100% paid departments (Figure R).

Data Summary: Research Question #1

The first research question for this paper asked how the Deer Park Silverton Joint Fire District compares with other departments when judged on a “cost-per-run” basis. Based on the data which were collected, it can be concluded that the DPSJFD is performing extremely well in this area. The cost-per-run for the DPSJFD ranks in the top 20% of the responding departments in Hamilton County and was 40% lower than the average of this same group.

Data Summary: Research Question #2

The second research question for this paper asked how efficient the Deer Park Silverton Joint Fire District was at answering each emergency call promptly and having the resources available to handle the volume of calls received. The response time data in this report would seem to indicate that, based on benchmarking against other departments in their area, the DPSJFD has been providing an extremely prompt response, both in fire and EMS. In both of these response time analyses, the DPSJFD was substantially under the survey-wide average and ranked in the top 25% of the responding departments for providing prompt arrival to an emergency scene.

Data Summary: Research Question #3

The final research question for this paper asked how a department's efficiency is affected by the staffing of the department, ie full-time, volunteer, part-time, combination, etc. The data assembled in the report seem to indicate that staffing make-up can have a tremendous impact in each of the measured performance criteria. The presence of volunteer and part-time employees can have a very definite advantage in lowering a department's cost per run. However, an over-reliance on volunteers can result in relatively long response times, both on fire and EMS emergency runs.

DISCUSSION

The stated purpose of this study was to develop and test a method to determine how the Deer Park Silverton Joint Fire District measures up when compared to other fire and EMS services in southwestern Ohio in order to assess performance and determine potential areas for improvement. The goal was to benchmark the emergency response times and overall costs against other similar neighboring departments using data which are relatively simple and easy to obtain. Based on the excellent response to the survey which was sent to each department in Hamilton County, it would appear as if the key data used in this study were, indeed, readily available to most departments. Completed surveys were received from 29 of the 37 departments which received the requests for information. Of the departments who responded to the survey, all but one department were able to provide 100% of the key data. The one department which was not able to provide all of the key data was missing only one data point.

Due to this high response level (78%) and due to the ability of the responding departments to provide a complete set of the key measurement data, it can be concluded that this study did, in fact, use data which were relatively simple and easy to obtain.

Further, when the performance data from the various departments were grouped together and sorted based on the responding departments' descriptive data, the data were stratified enough that comparisons could be made as to the relative performances of the various departments. Multiple descriptive parameters were used to sort the data, so a department's performance data could be compared to similar departments based on different criteria.

The approach used by this paper is similar to that used by Gregory A. Brown when he used benchmarking techniques to measure the performance of the Colerain Fire and Emergency Medical Services against other similar departments across the country. Although both studies

were able to generate similar data, Brown's work differs from this study in the sense that this study limited itself to comparisons using departments in the same geographical area ... i.e. Hamilton County, thus removing any economic variations which would normally be related to the differences in the cost of living across the country.

Whereas other evaluation methods such as ISO Ratings rely on the measurement of available resources to predict the ability of a fire department to respond to and mitigate emergency situations, this study was able to successfully use actual performance data to rank and compare the performances of different departments in Hamilton County.

Based on the high response level, the ability of the responding departments to provide the requested information and the stratification of data, it would appear that this paper has been successful in addressing its purpose. The paper has identified readily available data which can be used to benchmark the performance of the Deer Park Silverton Joint Fire District against other departments in Hamilton County.

In his work, Doyle offered that benchmarking information such as this should be used to "judge performance and make choices about how services can be improved". Based on the data in the report, it can be concluded that with regards to the chosen parameters, the Deer Park Silverton Joint Fire District is performing at a level which is definitively better than the average for fire departments in Hamilton County.

However, this does not mean that improvements cannot be made. It would be worthwhile for the administrators of the DPSJFD to look at other departments which performed well in parameters measured in this report. How were four departments able to provide a lower cost per run? Do they have systems in place which could be applicable (at least in part) to the DPSJFD and further reduce their cost per run? Even though the DPSJFD ranked in the top 25% for

emergency response times, several departments were able to provide an even quicker response. Again, it may be helpful to look at why these departments have such a quick response and to determine if there is an opportunity to further improve the response time of the DPSJFD.

Additionally, this concept of benchmarking can be carried to another level and applied within the different groups within the Deer Park Silverton Joint Fire District. How do the response times of the different work units/shifts compare? Is one shift outperforming the others and are they employing response methods which could be used by the other shifts to improve their response times?

Although not specifically covered by the purpose of this paper, the results of this study can also be used by the administration of the DPSJFD to help assure the citizens of the community that the department is providing them with an excellent level of service and that they are using their resources wisely and carefully. Ultimately, data such as that contained in this report could even help provide the DPSJFD with key information which could be used to help justify a levy for additional funding.

RECOMMENDATIONS

1. The administrator of a fire department needs to be able to assess the effectiveness and cost efficiency of his department based on the objective measurement of actual performance data. Further, this should be an ongoing process, with improvements being made and then performance being re-measured. Towards that goal, it is recommended that this benchmarking study be repeated periodically in order to continuously evaluate the performance of the Deer Park Silverton Joint Fire District.
2. Although the Deer Park Silverton Joint Fire District compares extremely favorably when benchmarked against the other departments in this study, it is recommended that the administration of the DPSJFD meet with representatives of the other departments which also performed well. The goal should be to determine if these other departments have procedures, practices or policies which could further enhance the performance of the DPSJFD.
3. Just as the data in this report were used to benchmark the Deer Park Silverton Joint Fire District against other departments in Hamilton County, it is recommended that this same process can be used internally within the DPSJFD. The different shifts within the department can be benchmarked against each other. Again, the goal should be to identify “best practices” which may be able to be applied throughout all shifts to further improve the performance of the overall organization.
4. This report clearly shows that the presence of volunteer members plays an important role in maintaining a low cost per run. It is recommended that the Deer Park Silverton Joint Fire District maintain or even expand the volunteer staffing which they presently employ.

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Appendix I Questionnaire

COST-PERFORMANCE BENCHMARKING
PROJECT

Name of Department: _____

Person Filling Out Questionnaire: _____

Contact Phone Number: _____

Staffing:

-Number of Stations: _____

-Full Time, Part Time, Volunteer or Combination? _____

-Hours/Day with On Station Staffing: _____

-Minimum Staffing Level: _____

-Total Man-Hours Per Week Paid Staffing: _____

Services Provided:

-Circle Appropriate Area(s)

Fire

Paramedic

Rescue

BLS

Service Area (Sq. Miles): _____

Daytime Population: _____

Nighttime Population: _____

Total Expenditures, 2005: _____

Total Fire Prevention Expenditures, 2005: _____

BENCHMARKING PROJECT (CONT.)

Total # of Fire Runs in 2005: _____

-Average Response Time _____

-Dispatch Until First Unit on Scene

-Use Runs in Your District Only

-% of Runs with Response Time Under 4 Minutes: _____

-Dispatch Until First Unit on Scene

-Use Runs in Your District Only

-% of "Assist EMS" Runs in 2005: _____

Current ISO Rating: _____

Total # of EMS Runs in 2005: _____

-Average Response Time _____

-Dispatch Until First Unit on Scene

-Use Runs in Your District Only

-% of Runs with Response Time Under 4 Minutes: _____

-Dispatch Until First Unit on Scene

-Use Runs in Your District Only

Total EMS Runs Made Via Mutual Aid in 2005: _____

Total EMS Runs Given Away to Mutual Aid in 2005: _____

Would you like a copy of the finished research project? _____

Appendix II Explanation Sheet

BENCHMARKING PROJECT
EXPLANATION SHEET

Hours/Day with On Station Staffing: How many hours of the day is there at least one person on station available to make fire and/or EMS runs?

Man-Hours Per Week Paid Staffing: Please include the total number of man hours for all stations. In addition to any EMS and fire suppression personnel, please include any administrative, clerical, fire inspection and fire prevention staff.

Minimum Staffing Level: What are the least number of people scheduled to be on station and available for emergency runs. If there is a difference between minimum staffing during the daytime hours versus the nighttime hours, please use the *smaller* of the two.

Total Expenditures: This number should include any and all expenditures including, but not limited to, salaries and benefits, equipment, supplies, maintenance, capital expenditures, etc.

Fire Prevention Expenditures: Please include any expenditures which were strictly related to Fire Prevention activities (inspections, public education, etc.). Please include salaries/wages for personnel whose *primary* responsibility is Fire Prevention and who are not normally available for emergency responses when performing those Fire Prevention duties.

Average Response Time: Elapsed time between dispatch and the arrival of the first unit on the scene. Please exclude mutual aid runs into other fire districts, as this could upwardly skew your average response time.

Appendix III Cover Letter

Evendale Fire Department
10500 Reading Road
Cincinnati, Ohio 45249

Attn: Chief John Vail

January 26, 2006

Dear Chief Vail,

My name is Bob Murray and I am a Lieutenant with the Deer Park Silverton Joint Fire District. I am currently a member of "Class V" of the Ohio Fire Executive Program. As a part of the program, each member in the class is required to complete a research project on a topic which is of significance to our home department. My project involves the evaluation of the relative cost efficiency performances of fire departments in Hamilton County.

In order to pull together the information which I need to gather, I have put together the questionnaire which is enclosed with this letter. I would like to ask that you please complete the questionnaire and return it to me via the enclosed self-addressed stamped envelope.

Most of the requested information is fairly straight-forward. However, some brief explanations are provided at the end of the questionnaire. If any additional clarification is needed, please don't hesitate to contact me. I can be reached at the Deer Park Silverton Joint Fire District on most Unit #1 days. The phone number is (513) 791-2500. I can also be reached via e-mail at bmurray@dpsjfd.org. I check the e-mail address on a regular basis, so I should be able to get back with you within a day.

Please allow me to thank you in advance for your help in providing this information. I am quite excited about the information which I am gathering as I believe that it will be very helpful in benchmarking the performance of our departments.

Thank-you and take care,

Robert T. Murray
Lieutenant