



South Carolina Fire Chiefs' Perceptions of Higher Education for Firefighters

2004

South Carolina State Firefighters' Association

Higher Education Committee

George H. McCall, MPA, PE, Chairman
Karl E. Ristow Jr., BA
Daniel J. Cimini, BA

Report Prepared By

Anthony J. Kassekert, Clemson MPA Program

Project Advisors

George H. McCall, MPA, PE, Wade Hampton Fire Department
Robert W. Smith, Ph.D., Clemson University
David Swindell, Ph.D., University of North Carolina, Charlotte

South Carolina State Firefighters' Association

PO Box 67
Simpsonville, SC 29681
864- 967- 8311

Clemson University, Public Administration Program

232 Brackett Hall
Clemson, SC 29634
864- 656- 3233

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Foreword

The South Carolina State Firefighters' Association (SCSFA) has been an advocate for professionals in the fire service since 1905. The SCSFA believes that higher education plays a crucial role in protecting firefighters, raising operational standards, and improving their working environments. The SCSFA Higher Education Committee was established with the purpose of encouraging higher education among the South Carolina fire service. The committee encourages participation in technical colleges and four-year university programs, promotes the remote degree program with the University of Memphis, made scholarships available to SCSFA members, and initiates numerous other efforts to encourage higher education in South Carolina's fire service.

The SCSFA funded this report to evaluate the current state of education in South Carolina's fire service. This report provides descriptive information about the role higher education plays in the firefighting field. This 2004 survey compares perceptions and demographics to the 1997 report.

Executive Summary

The South Carolina State Firefighters' Association conducted this 2004 study on the role of higher education in the South Carolina fire service. The association surveyed the state's fire chiefs with career personnel to gauge the perceptions on higher education. The Clemson University Master's of Public Administration program was contracted to administer the survey and prepare the report.

Only fire departments with over 20 career firefighters included in the sample. The fire chiefs from these 68 departments were mailed a three-page questionnaire in February of 2004, with a second mailing in March. The response rate was 81 percent with 55 of 68 surveys being returned. The results were calculated and compared to the 1997 survey where applicable.

Overall, the survey showed that the perception and importance of education has changed insignificantly since the last survey. Only one question on incentives demonstrated a significant divergence from the 1997 findings. Below is a summary of the survey results:

- The demographic characteristics of the South Carolina fire chiefs are exceedingly homogeneous. The majority are Caucasian males of 45-54 years of age with over 11 years in their current department and over 21 years of lifetime service.
- The level of education for the fire chiefs observed a small but insignificant climb in the number of associate's degrees. The fire chiefs with college degrees were more likely to have majored in business.
- The Executive Fire Officer certification program witnessed a fifteen percent increase in fire chief participation. Unfortunately, many fire chiefs do not recognize the difference between EFO certification and a four-year degree.
- Fire department size ranged from around 20 to over 300. The majority of departments employed less than fifty career firefighters.
- Departmental incentive plans changed significantly since 1997. The departments are promoting programs more by giving time off to firefighters without a make-up requirement. Full and partial tuition reimbursements still appear in about one third of departments.
- The importance of higher education in promotion decisions and the importance of education versus training have decreased slightly but the changes are insignificant. Statistically, the importance of education is not any different than in 1997.
- The fire chiefs compared employees with degrees to those without. None of the comparisons differed significantly from 1997 to 2004. Communication skills are the most significant improvement from education. Other skills that are improved by higher education include problem solving, creativity, quality, and being a strong candidate for promotion. The attributes of reliability, motivation, work attitude, and emergency response performance do not differ with higher education.
- Only three of the chiefs surveyed were currently in a degree-seeking program. Lack of time and being close to retirement were two major reasons for not pursuing higher education.
- Currently, 12 percent of departments require NFPA 1021 certification, an associate's degree, or some equivalent prior to employment. An additional 10 percent are planning on requiring an educational prerequisite in the next five years.
- The chiefs indicated that the national government was doing the most to promote higher education in the fire service. Departmental programs appeared to do a better job than the state and local governments, both of which had more negative responses than positive.

Current Status of Education Requirements in South Carolina

There are several different levels of education that are recognized in South Carolina.

- Associate Programs are typically 66 credit hours in length depending on the college. Some associate degree credits are transferable to other institutions of higher learning.
- OSHA Firefighter is an 80-hour course.
- Bachelor's degrees are around 120 credit hours.
- Executive Fire Officer Program (EFO) is a 12 credit course (4 classes for 2 weeks each year for 4 years). Students may receive up to 16 credit hours towards upper level bachelor programs or graduate credits as offered through the American Council on Education/College Credit Recommendation Service.
- Master's Programs are usually around 36 additional hours past a bachelor's degree.

Prerequisites for employment as a firefighter in South Carolina vary between jurisdictions. A precedent has been set that a firefighter must complete what is termed OSHA Firefighter Training as the minimum training required to be a firefighter. This 80 hour course as designed by the South Carolina Fire Academy trains firefighters to conduct interior structural firefighting duties. After one completes this training the authority having jurisdiction (fire department) certifies the member to conduct these duties.

Associate degree programs are more predominate in community colleges and online universities in South Carolina. However, little to none in the OSHA Firefighter Course is transferable for an associate degree in SC. The OSHA Firefighting Course is more technical firefighting skills while the associate's degree is more business and administrative oriented. The separate orientations of these two programs are mainly why there is little joint credit. One exception is if an individual takes the courses needed to become an accredited firefighter from the International Fire Service Accreditation Congress (IFSAC). South Carolina's technical institutions will evaluate and allow some transfer credits. Currently, the Illinois based City Colleges of Chicago, which is usually in and around many of the military installations, will evaluate any and all firefighter training and give credit hours for most courses completed up to a certain credit amount.

Officer qualifications are extremely diverse across South Carolina. Some departments promote the best firefighter with no testing or training requirements, while others test, interview and/or require minimum training requirements (i.e., IFSAC Fire Officer I, Pro Board, etc.). A few departments have begun requiring degrees in addition to fire service level training (Mt. Pleasant, Myrtle Beach, and the St. John's Fire District all have degree requirements for their officer levels).

Introduction

The South Carolina State Firefighters' Association (SCSFA) is dedicated to improving the working conditions and the professionalism of the state's fire service. The SCSFA realizes the important role that higher education can play in enhancing the capabilities of South Carolina's firefighters. For this reason, a groundbreaking study was commissioned in 1997 and resulted in the publication of the *South Carolina Fire Chiefs' Perceptions of Higher Education for Firefighters* (Colburn and Cunningham, 1997).

The *South Carolina Fire Chiefs' Perceptions of Higher Education for Firefighters* of 1997 study surveyed firefighters on the importance of education on several different levels. The research was beneficial for educational purposes locally and nationally. The *South Carolina Fire Chiefs' Perceptions of Higher Education for Firefighters* of 1997 was also influential in expanding programs and establishing scholarships for the South Carolina fire service.

Since 1997, the world of firefighting has drastically changed. The tragedy of September 11th, 2001 demonstrated both the incredible bravery of firefighters and the recognition of increasing demands being placed on the fire service. The fire service is expected to provide a broad range of first response and emergency services that includes medical, HAZMAT, and terrorism responses.

New advances in technology, increased demands for integration of emergency responders, drastically different economic circumstances, and new threats all have profoundly affected South Carolina's firefighters since 1997. Despite all of the recent changes, most of the benefits of higher education are the same. The 2004 report reinforces the SCSFA's position that higher education can help with training for fire prevention and suppression. The 2004 and 1997 report indicates higher education can reinforce and improve the necessary skills in the fire service.

Higher education is the driving force leading to improvements in personnel management, time management, budgeting, grant writing, and other administrative skills that are critical to an effective fire department. Typically, on-the-job-training and most certification programs provide inadequate attention to management training. Many fire personnel fail to realize the need for administrative skills and therefore fail to see the benefits of higher education.

Firefighting in the 21st century requires a variety of skills and knowledge that go beyond mere training. One advantage of higher education in the fire service that is frequently neglected is professional development (Clark B., 2004). As more firefighters realize the possible benefits of education, higher education institutions will rise to the demand and provide programs. The development of a doctoral fire service field will provide even the smallest departments with research, better training, and improved safety.

This report supports the belief that higher education renders safer communities and safer work environments for firefighters. Higher education can improve safety directly by complementing training in emergency situations. Higher education also has many indirect benefits such as increases in protection. For example, higher education can equip administrators with the tools they need to write grants for new and improved safety equipment. The SCSFA is dedicated to promoting higher education in South Carolina because of the potential and real benefits to the fire service and the citizenry at large.

The South Carolina State Firefighters' Association Higher Education Committee decided to revisit the topic of higher education because of the new demands on firefighting and the unrealized potential of higher education.

Literature Review

Although there is a great deal of technical literature on firefighting and emergency services operations, there is limited academic literature written in its field. Some scholars have acknowledged the lack of research in the fire service, especially in the 1980s and 1990s (Sturtevant, 2001). The fire service does have several professional magazines, but no peer-reviewed academic journals specifically tailored to them. Academics do include firefighters in research on risk management and emergency coordination, but the literature does not go into the impact of education in these areas.

The *South Carolina Fire Chiefs' Perceptions of Higher Education for Firefighters* of 1997 (Colburn and Cunningham, 1997) was one of the first pieces of academic literature that addressed higher education. Their report was based on a census of career fire chiefs in South Carolina with an 88 percent response rate. In general, the report found that fire chiefs in South Carolina placed some importance on higher education, but there were few firefighters with higher degrees. The specific findings from the report are examined in detail later on in this report.

Another important study is Sturtevant's doctoral dissertation "*Fire Service Degree Programs in the United States*" from 2001. Sturtevant surveyed coordinators from accredited fire service related degree programs. The study reported on enrollment demographics, compared curriculums, and reported major hindrances to fire service related degrees. The study was the first survey since 1975 to analyze the availability and usage of fire service degree programs. The dissertation demonstrated a need to encourage enrollment in fire service degree programs, improve incentives for degree ascertainment, and find qualified instructors.

A third group of literature is the substantial technical literature written on higher education in professional publications, which are the primary reference source for the

majority of firefighters. Advocates of higher education appear frequently in these publications (Buhs, 1999; Coleman, 2001; Fleming, 2001; Clark 2001; Bennett, 2003; Onieal, 2003). These publications are experts in the fire service campaigning for higher education to play a larger role in the profession. None of these articles promoting education represent any empirical studies or analysis. The support of expert practitioners is key in promoting educational endeavors, but more quantitative research is also necessary.

Technical journals do occasionally provide quantitative measures along with expert analysis. W. S. Booth, the director of the Booth Research Group, surveyed departments over one hundred personnel in size and discovered that about one third of large departments require associate's degrees for battalion chief and about one third require a bachelor's degree for the assistant chief position (Booth, 1999). South Carolina has few departments with over one hundred members and no study appears in the body of technical literature that explores the minimum education requirements of such smaller departments.

Another major source of firefighting literature is the research papers that are part of the Executive Fire Officer (EFO) certification program. These papers are developed with the advice of experts from the National Fire Academy. The papers are not evaluated with the rigor of a peer-reviewed academic journal, but they are the precursor. Numerous papers gauge the value of higher education based on convenience samples and find the need to implement higher educational requirements into specific departments (Lynch, 2002; Ford, 2003; Cochran, 2001). Similarly, in-house surveys have been used to demonstrate the importance of incentives in promoting higher education (Bayouth, 2003).

A second group of papers uses case studies to examine the impact of education on the firefighting profession. Moschella studied promotion examinations from 1980 to 1995 in a fire department in Revere, Massachusetts (Moschella, 1997). He found that candidates with degrees scored significantly higher than other candidates on promotional exams.

Probability sampling is not frequent in EFO papers. One such paper is Kemp's analysis of the educational needs for departments (Kemp, 1999). The study used a sample of 102 departments in California, Oregon, and Washington. The study concluded that prerequisite educational requirements need to be included in the promotion process and that educational incentives need to be improved.

The report presented here advances the quantitative and qualitative body of firefighting literature. The report uses a census of South Carolina fire chiefs and uses nonparametric statistics to analyze the results. The use of non-convenience sampling and statistical methodology is lacking in the literature available and is a necessary advance in creating an academic study of the fire service.

Survey Methodology and Validity

The Survey

The 2004 study followed the same methodology as the survey in 1997. A census was taken of all the career fire departments in South Carolina. A career department is defined as employing more than 20 career personnel, but departments with over 20 career firefighters can have additional volunteer firefighters and administrative personnel. The *South Carolina State Firefighters' Association Statistician Report for 2003* was used to determine which fire departments were selected.

There were 68 fire departments that fit the definition of career. Of the 68 departments surveyed, 55 surveys were returned. The response rate was 81 percent. The 1997 study had a response rate of 88 percent. The responses were returned and tallied at Clemson University for confidentiality purposes.

The survey instrument was essentially the same as in 1997 but the format was changed. The 2004 survey contained 28 questions, eight of which were new, but the length of the survey remained at 3 pages. A copy of the cover letter and survey for 2004 is in Appendixes A and B. The 2004 survey was mailed in late February and a second mailing in mid March. The previous survey was mailed in May of 1997. The difference in sampling times is assumed not to alter the results. Both surveys were mailed so that they would arrive on Wednesday or Thursday in order to obtain a high response rate.

Validity

Overall, the high response rate of 81 percent and census nature of the survey enhances validity. The population is relatively small, but well represented. The departments that did not respond were equally distributed across the state in terms of location and size.

Question number 11 was disregarded completely. The question was intended to measure the importance of education in a career move. The responses are with the data in the appendix. The question was not asked in the same manner of the last survey because of an error in the editing. The results from the current survey are questionable and they are definitely not comparable to the 1997 results.

Some questions from the previous survey could have been improved, but were not in order to keep the results comparable. For instance, questions number 9 and 10 both use a scale that only ranges from “not important” to “very important”. A balanced seven-point scale would distribute responses from “very unimportant” to “very important”. A balanced response scale could more accurately measure both questions.

Another possible threat to validity was identified in technical problems with the second mailing. The “mail merge” tool in Microsoft Word unexpectedly changed the numbering scheme in the survey. The questions were not reordered, just renumbered non-sequentially. The problem was not discovered until the surveys were returned. Nonetheless, the survey was still legible for the respondents and the questions were clear. The numbering problems did not affect the final results.

The 1997 study established the methodology followed in the current survey. In the 1997 and 2004 studies, all fire department with 20 or more career firefighters were included in the sampling frame. However, the justification for choosing 20 career firefighters as a cutoff point was undefined. The study will continue to use the 20-employee cutoff to keep the study comparable over time. The current study assumes the number to be valid but the cutoff may need adjustment in future studies.

One other possible threat to validity is in the fact that some of the information from the 1997 study is missing. The data from the 1997 study were only available in their tabulated form. The individual surveys and complete data file were no longer available. Only the data

for individual questions were saved. The lack of observation level data is an unfortunate circumstance that limits our data analysis capabilities to group comparisons.

The 1997 survey did not include any definitions for the variables in question that the respondents ranked (In particular for question number 13). The implied meaning of these variables may have changed over time. For instance, “emergency response performance” could be perceived different since September 11th, 2001. There is no legitimate fix for this possible problem. Developing definitions for the current survey would require knowledge of how respondents defined the variables in 1997.

In closing, the 2004 study is a census of South Carolina fire chiefs, and cannot be extrapolated to represent all fire services nationwide. A measure of this sort would require a national survey or an indication that South Carolina fire services were in some way similar to the rest of the nation. The current study cannot be expanded to explain opinions of volunteer departments within the state for the same reason. However, the survey is an accurate measure of the importance of higher education for career firefighters in South Carolina.

SCSFA Survey Results

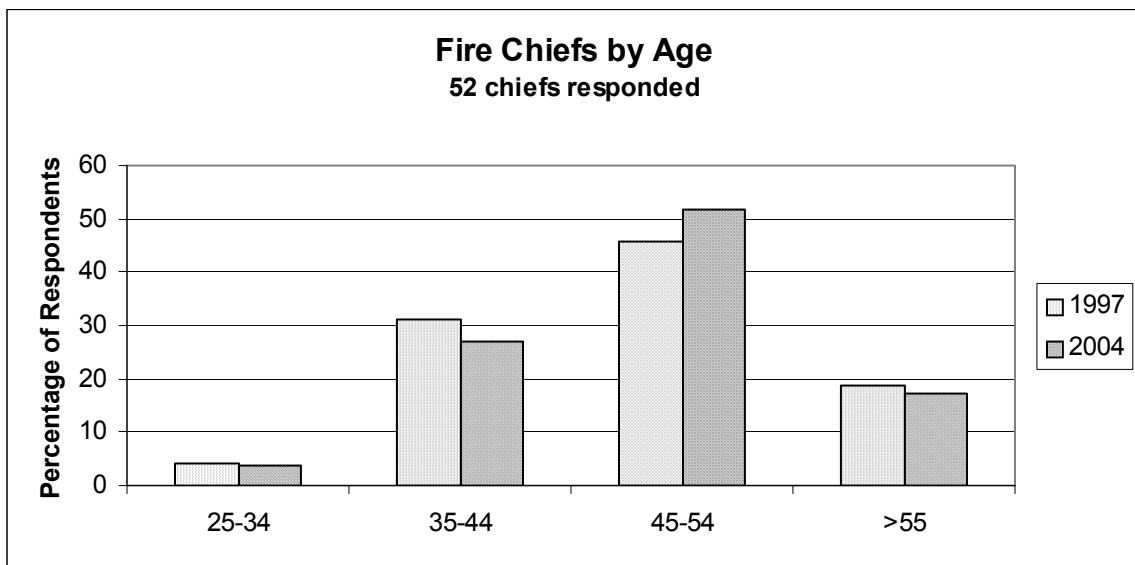
The results for each section of the survey are presented below. Several different statistical tests were used to compare differences between the 1997 and 2004 survey results. Each statistical test is only explained in detail the first time it appears. All “don’t know” responses were dropped out of the statistical analysis. In each of these cases, the frequency of “don’t know” responses is too low to analyze statistically. Please refer to the statistical abstract for further information on these tests. The statistical procedure used is cited in each case.

Profile of South Carolina’s Fire Chiefs

Age, Race, and Gender

The majority of South Carolina fire chiefs surveyed was white, male, and aged 45-55. There were no female respondents. Racial diversity has either stayed the same or decreased since the last survey. There were three minorities’ respondents in both surveys. Since there was a larger sample for the current survey, the actual percentage of racial diversity has decreased.

Figure 1.1



No valid statistical analysis can be performed on race and gender because of the extreme homogeneity. Age, however, can be analyzed¹. The previous survey grouped age, so the same groups were created from the current study.

The Mann-Whitney U test is used on the age data. The age groups have an order, or rank, which is required for this test. The Mann-Whitney statistical technique is used to test if the 1997 median and the 2004 median are equivalent. The W statistic is a calculation used to estimate the variability between the two samples. The W statistic has no practical interpretation. The p value is the probability that the two age groups are different.

The median age has not significantly increased since 1997 at the 95 percent confidence level (See table 1). We can tell this because the p value is greater than .05.

Table 1.1: Mann-Whitney U Test on Age

Year	N	Median
1997	48	45-54 (4)
2004	52	45-54 (4)
W=	2389.5	
p=	0.7994	

Experience

Four different questions were asked in order to measure experience². There has not been a significant change in the distribution of experience since 1997 for two of the questions (Figures 2.2 and 2.3). One question not presented below is that 20 percent of chiefs reported they had experience prior to their current appointment in 2003. The previous experience is up from the 15

¹ In the previous study, age was measured as a grouped variable. In the current survey, Age was measured by asking what year in which the respondent was born.

² The 1997 survey had groupings that were not mutually exclusive, such as “7-10 years” and “10 or more years”. The grouping categories were corrected for the current survey. In this case the last group was changed to “11 or more years”. The correction is not expected to significantly alter responses.

percent reported in 1997. The one noteworthy change is in the “Tenure as fire chief” data (Figure 2.1). The 1-3 year category rose by 10 percent.

Figure 2.1

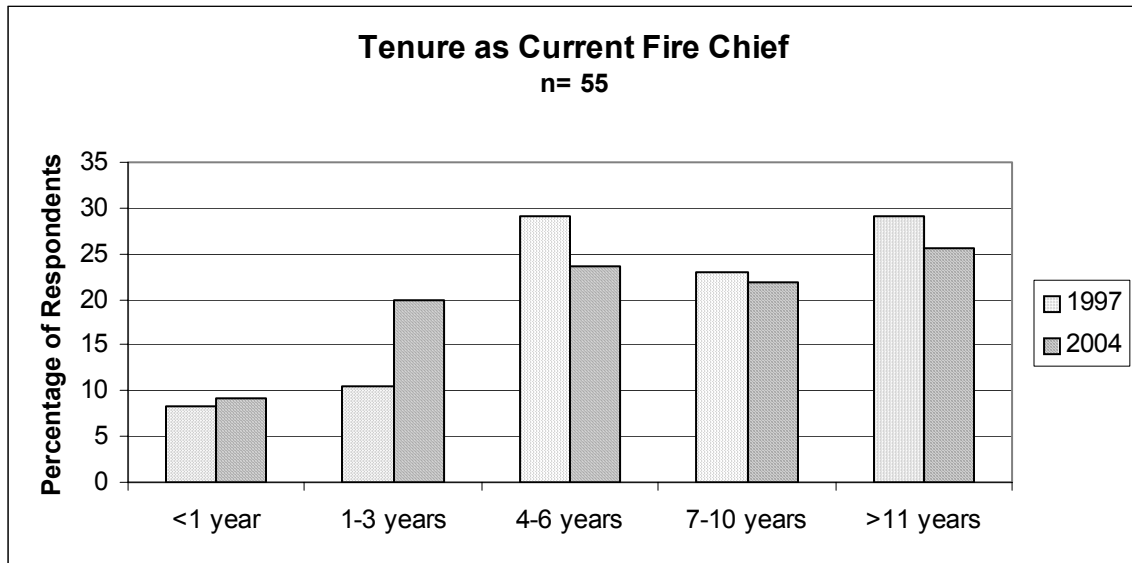


Figure 2.2

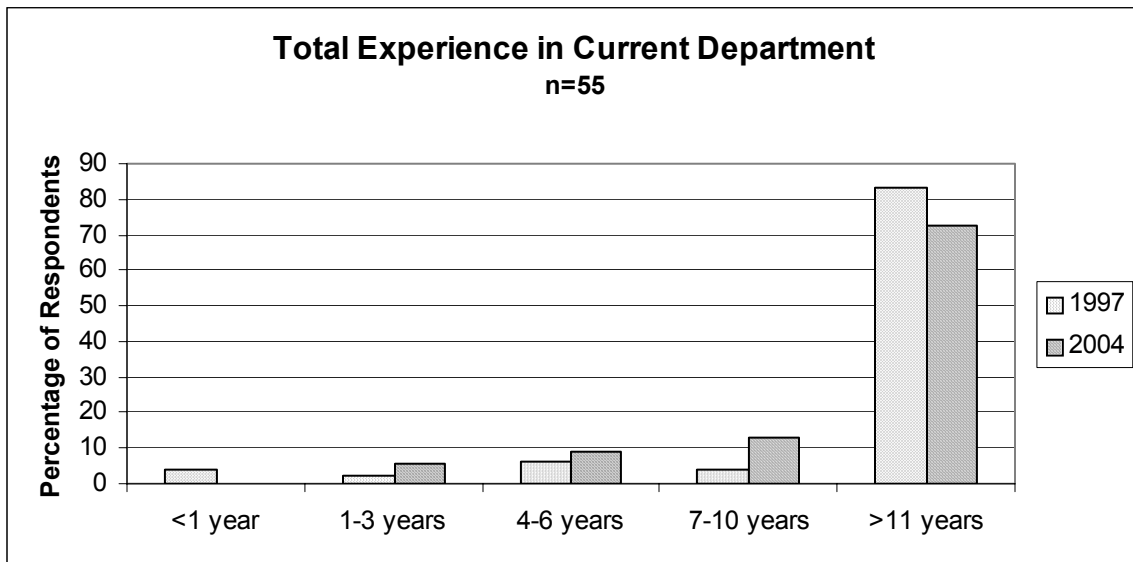
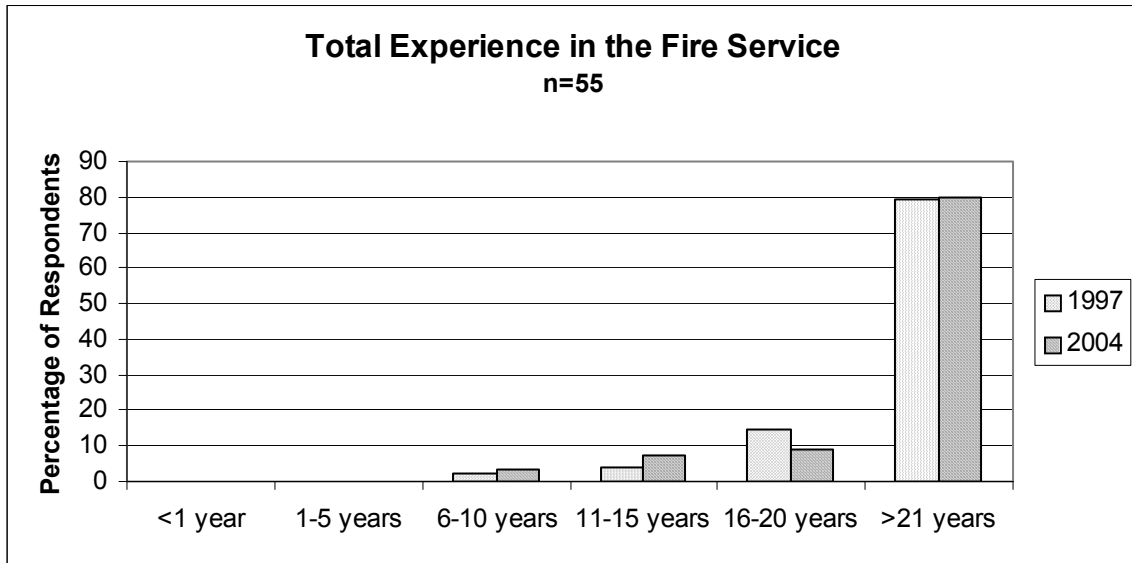


Figure 2.3



Statistical analysis is presented only for the “Tenure as Current fire chief” variable. The results clearly show no significant difference between 1997 and 2004 (Table 2.1). The other two measures of experience clearly have the same medians and a statistical analysis confirmed this expectation although not presented here.

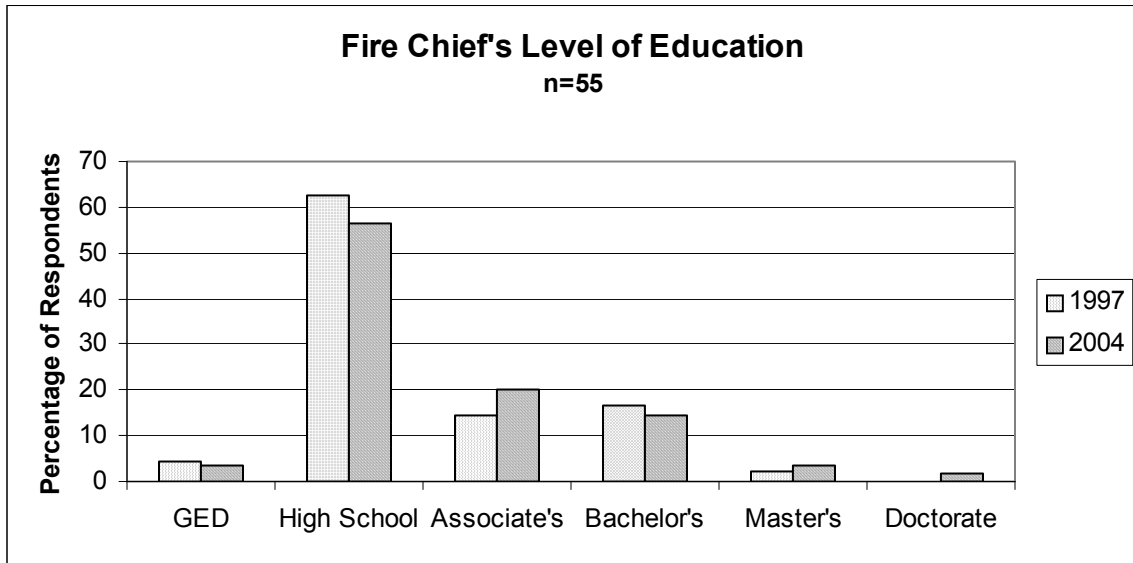
Table 2.1: Mann-Whitney U Test on Tenure

Year	N	Median
1997	48	7-10 (4)
2004	55	4-6 (3)
W=	2610.5	
p=	0.4385	

Education

The distribution of education is similar to the 1997 data (Figure 2.1). There is a 5 percent increase in Associate’s degrees since the previous study.

Figure 3.1



The Mann Whitney U test is used because level of education has an order. The difference between the data for 1997 and 2004 is not significant (Table 3.1). There has been no significant shift in level of education since 1997.

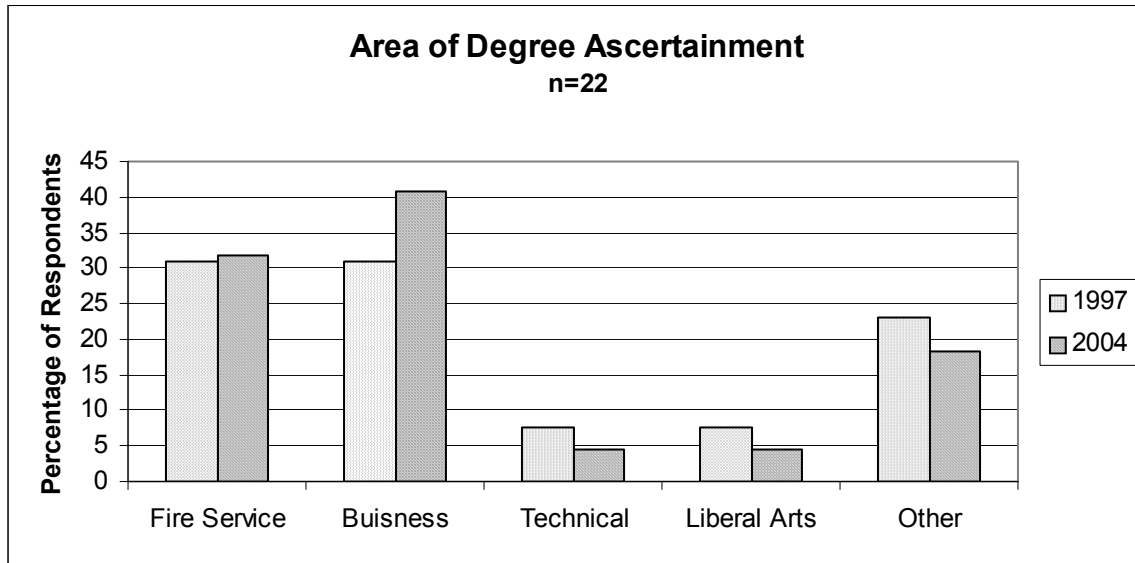
Table 3.1: Mann-Whitney U Test on Education

Year	N	Median
1997	48	High School (2)
2004	55	High School (2)
W=	2409.5	
p=	0.5206	

Of those fire chiefs with a degree, most were in the areas of “Business” and “Fire Service Specific”³ (Figure 3.2). The 2004 data distribution is analogous to the 1997 data, but there is an increase in business degrees since the last survey. As education level increases, business and management degrees become more predominate.

³ The question on area of degree ascertainment did not specify at which level of education. If someone has a Master’s degree, then there is no way of identifying if the degree reported represents both the Bachelor’s and Master’s degree.

Figure 3.2

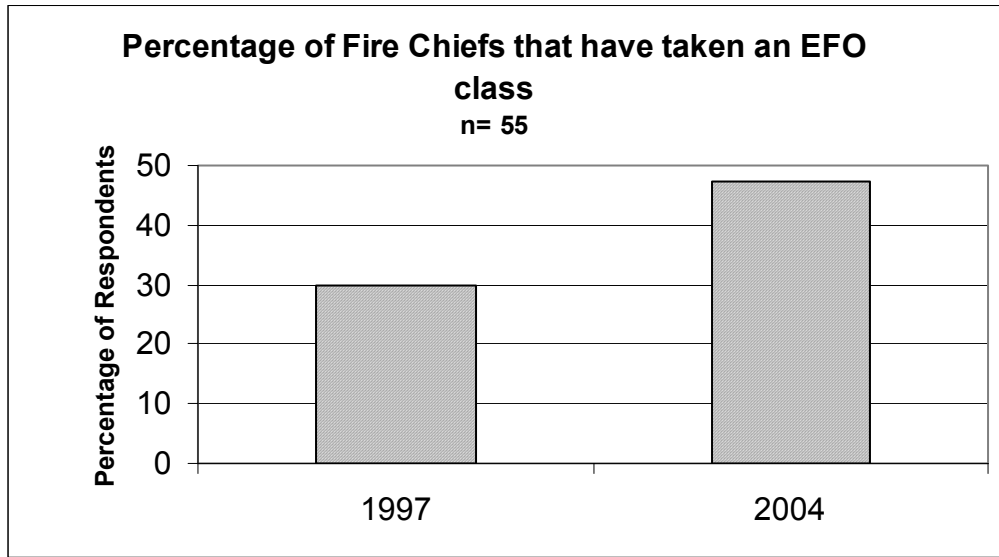


The Chi-Squared statistical test is not appropriate on the areas of degree ascertainment because the number of entries in “Technical” and “Liberal Arts” is too small to meet the assumptions. Collapsing the data into the three categories by adding “Technical” and “Liberal Arts” to “Other” still does not allow for valid analysis because of the low sample size.

Executive Fire Officer Program

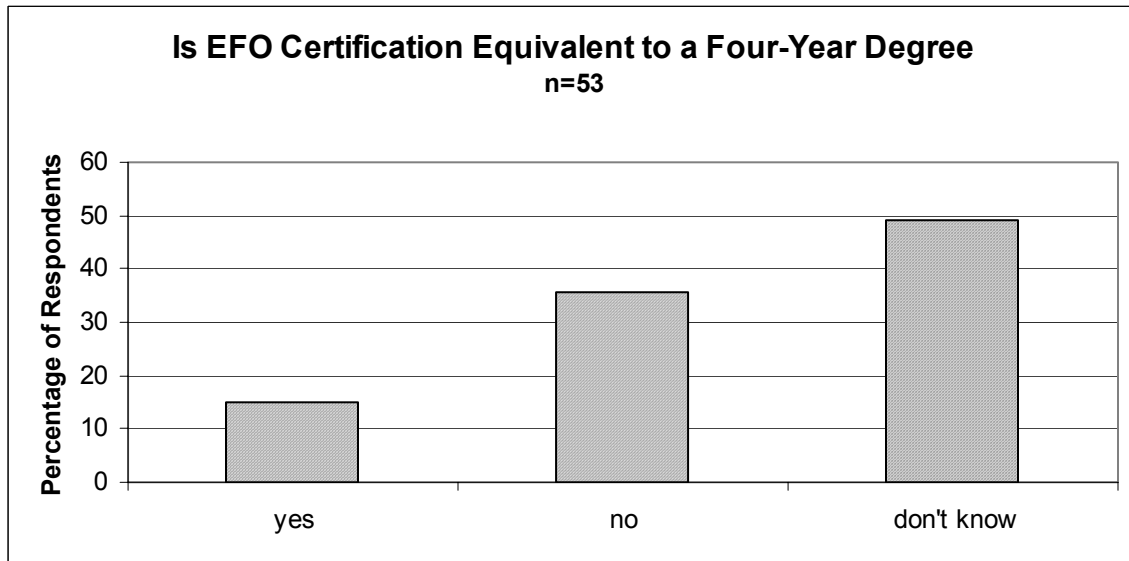
The Executive Fire Officer Certification (EFO) is a national certification given by the National Fire Academy. Almost half of South Carolina fire chiefs have attended an EFO course (Figure 4.1). This is up substantially since 1997. Of the twenty-six chiefs who have taken at least one course, 35 percent have finished the program.

Figure 4.1



An additional question was asked in the current survey pertaining to whether the respondent believed EFO certification is equivalent to a four-year college degree. There has been some disagreement over the standing of EFO certification compared to a four-year degree. Most responded as “Don’t Know” (Figure 4.2).

Figure 4.2

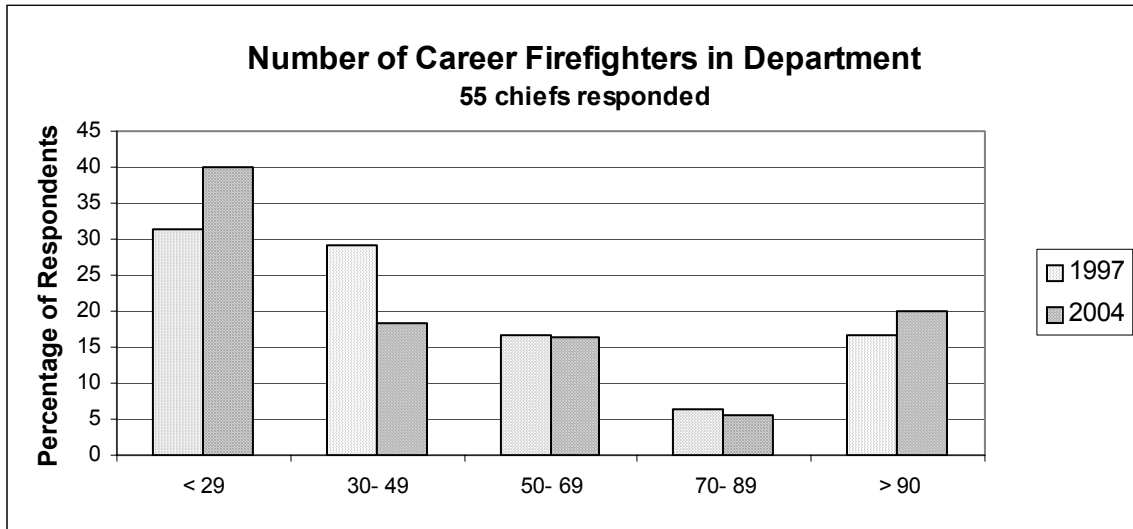


Profile of South Carolina Fire Departments

Size

The size of full time fire departments has not changed much since 1997⁴ (Figure 5.1). The graph of career personnel is slightly misleading because it shows an increase in smaller departments. The visual is misleading due to the grouping scheme. Many of departments are right near the 30 cutoff, and changing the cutoff a few points either way will alter the graphic.

Figure 5.1



It is important that after comparing the medians, the tests show no statistical difference in size between 1997 and 2004 (Table 5.1). This reaffirms that the graphical representation above is accurate, albeit slightly misleading.

Table 5.1: Mann-Whitney U Test on Size

Year	N	Median
1997	48	40.00
2004	55	36.00
W=	2534.0	
p=	0.8041	

⁴ The size question did not have a separate category for part-time or on-call. Therefore, the inclusion or exclusion of part-time and on-call employees is a source of error in the results.

The distributions of volunteer and other personnel in departments with over 20 career firefighters have not varied significantly since 1997. The graphs are not presented because the 1997 and 2004 data is identical. The percentage of career departments with volunteers went down from 65 percent to 56 percent, but the median number of volunteers per department stayed at 10. Statistical analysis affirms the lack of difference between 1997 and 2004.

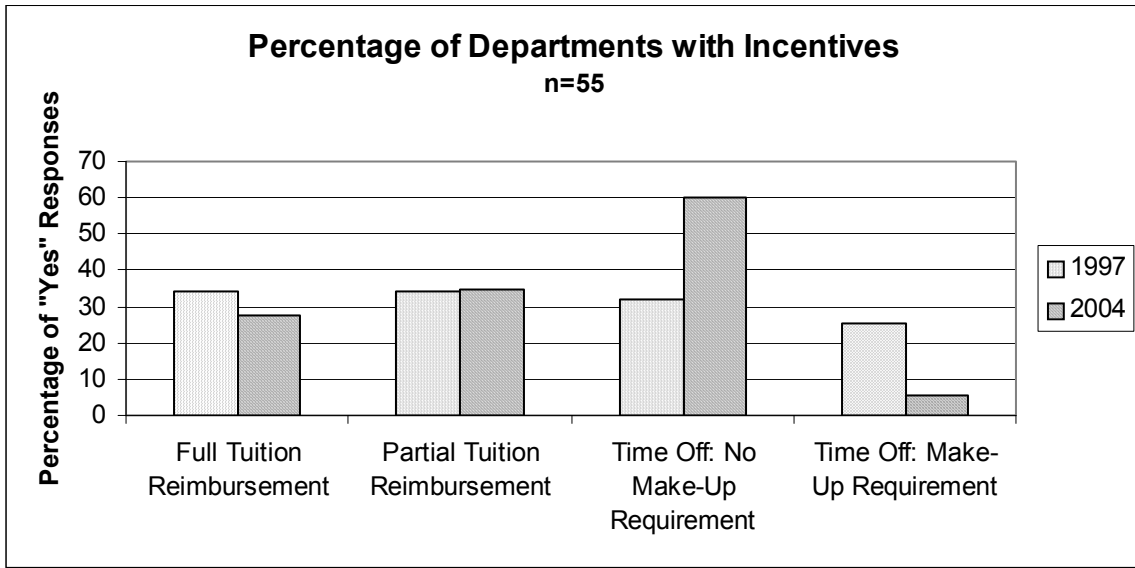
The percentage of departments with other personnel has dropped from 38 percent to 20 percent. The median number of other personnel remained at 1. There was no statistically significant difference between 1997 and 2004.

Departmental Policies on Higher Education Incentives

An important aspect in measuring a department's support of higher education is its incentive policies. The survey developed four general types of incentive policies. Full and partial tuition reimbursements are both systems where the department covers the direct cost of education. Time off with no make up requirement allows firefighters to take classes while at work. Time off with a makeup requirement allows firefighters to have flexible hours while attending school. Most departments had at least one, usually two, of the four incentive types. Only 13 percent had no incentive policies, which is about the same as in 1997. Some of the policies varied in practice, such as more reimbursement for higher grades. However, the vast majority of departments have some sort of educational incentive.

The major shift since 1997 is in the distribution of time-off requirements (Figure 6.2). Almost twice as many departments offer time off with no make-up requirement. There has been a drop in the percentage of fire departments that offer full tuition reimbursement.

Figure 6.1



The Chi-Squared test was used to analyze this categorical data. The difference between the data for incentives and the previous data is that there is no hierarchy to the categories. The Chi-Squared test compares the frequencies between each categories and tests for equality between the two distributions.

After performing a Chi-Squared test comparing the 1997 and 2004 incentive distributions, the data shows that the distributions are significantly different (Table 6.1). The statistical test only reaffirms what is clearly presented by the graph of the data. There is no doubt that there is a significant shift from “make up” to “no make up” for time-off requirements.

Table 6.1: Chi-Squared Test for Incentives

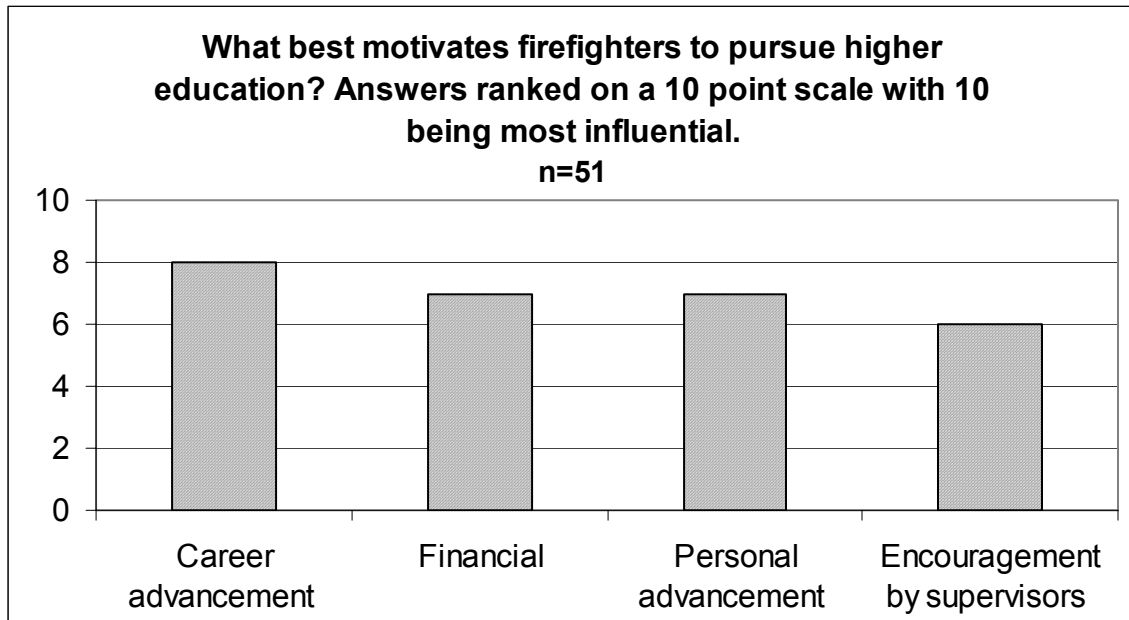
Chi-Squared	p
11.586	0.009

A couple of new questions were added to measure the effectiveness of incentives. The first asked the fire chiefs if they felt the incentives provided by their department were effective. The result was that 77 percent did think departmental incentives were effective.

The second addition to the current survey tried to determine what factors motivate firefighters to pursue higher education (Figure 6.2). Each incentive type was ranked separately.

Career advancement was ranked as the most influential. Both financial and personal advancement concerns were ranked equally below career advancement. Encouragement by supervisors was ranked the lowest.

Figure 6.2



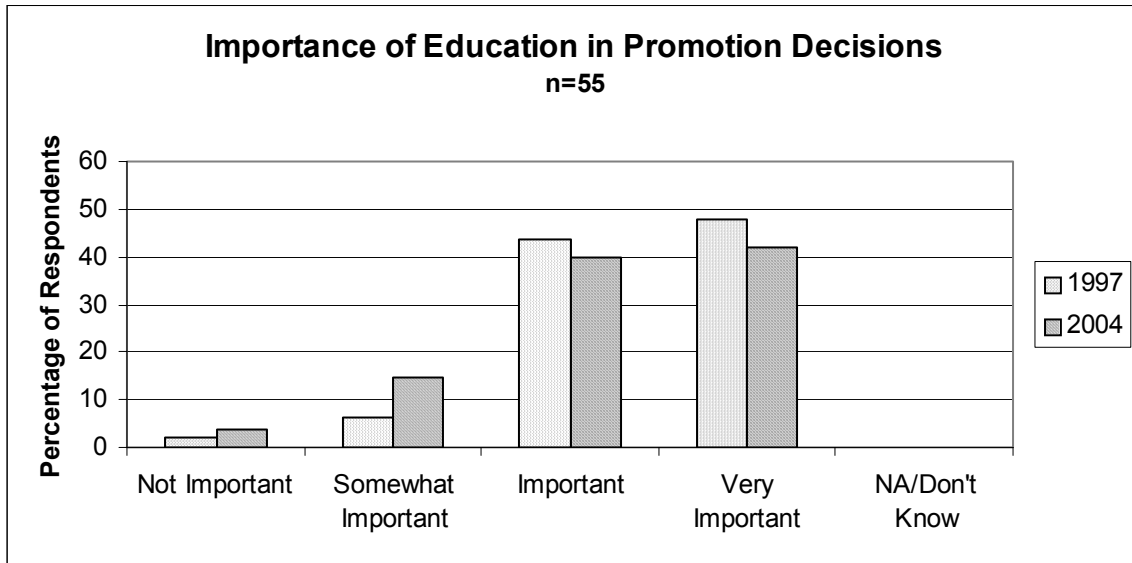
The Role of Education in the Department

The Importance of Higher Education in Departmental Promotion Decisions

The importance of higher education in promotion decisions has dropped slightly since 1997⁵ (Figure 7.1). Higher education has at least some importance in promotion decisions according to 96 percent of the respondents.

⁵ The importance of education in promotions question does not specify the level of promotion. Some chiefs may consider the entry-level positions while others only top positions.

Figure 7.1



The slightly lower rankings did not significantly shift the distribution (Table 7.1). The medians for both time periods are not significantly different at a 95 percent confidence level.

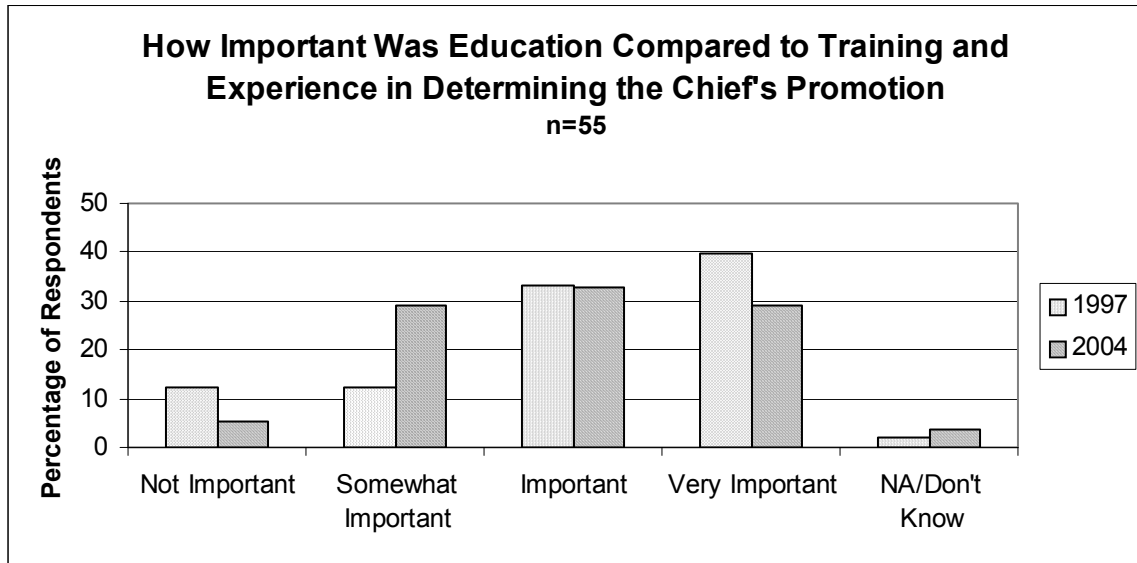
Table 7.1: Mann-Whitney U Test on Promotion Importance

Year	N	Median
1997	48	Important (3)
2004	55	Important (3)
W=	2636.5	
p=	0.3117	

Higher Education versus Training

The percentage of fire chiefs who thought higher education was more important compared to experience and training shifted (Figure 8.1). More chiefs realized there is some importance while less ranked it as “very important”.

Figure 8.1



The medians are not significantly different for 1997 and 2004 (Table 8.1). The distribution shows some variation. The “Not Important” and “Very Important” both shifted towards the middle of the distribution. It appears that the shifts may have canceled each other out because the overall level of importance has not changed according to the medians.

Table 8.1: Mann-Whitney U Test on Education Versus Training

Year	N	Median
1997	48	Important (3)
2004	55	Important (3)
W=	2608.0	
p=	0.4408	

Comparing Degree Holding and Non-Degree Holding Fire Personnel

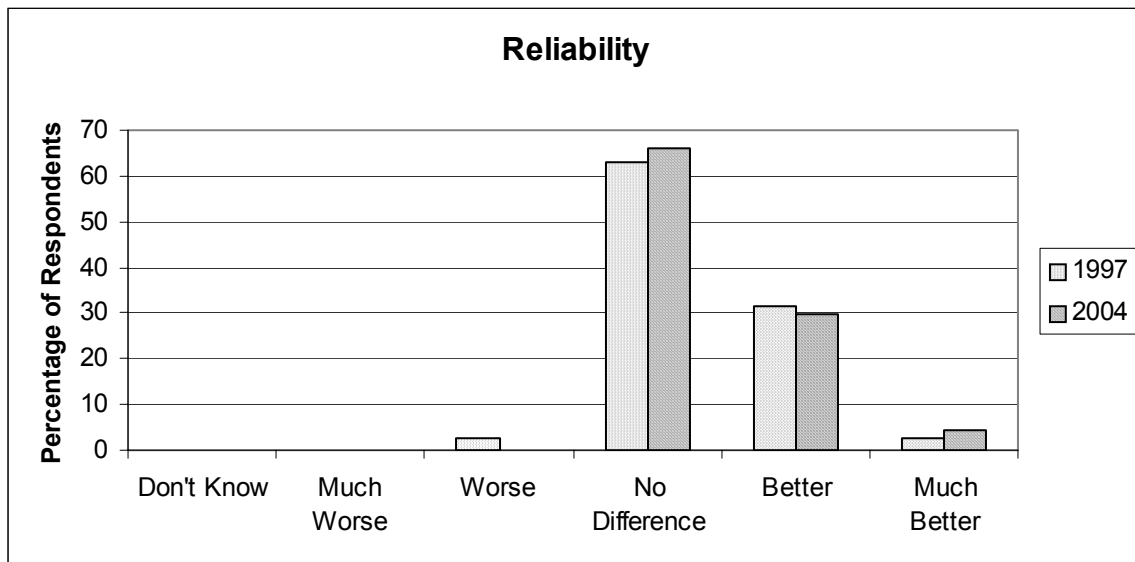
The survey asked South Carolina fire chiefs to compare nine different attributes for college-educated personnel versus those without degrees. The survey found that 89 percent of the fire chiefs had some degree holding personnel in their employment. There were forty-seven responses for each of the nine variables.

The comparisons are taken with some caution because 75 percent of the departments with degree-holding personnel had less than 10 percent degree holding employees. Many of the comparisons made by the chiefs in this section were made based on a small sample.

Reliability

There was very little change in views on reliability since 1997 (Figure 9.1). Most fire chiefs responded higher education has no effect on reliability. None thought that education reduced reliability, and over 30 percent thought that education improved the trait.

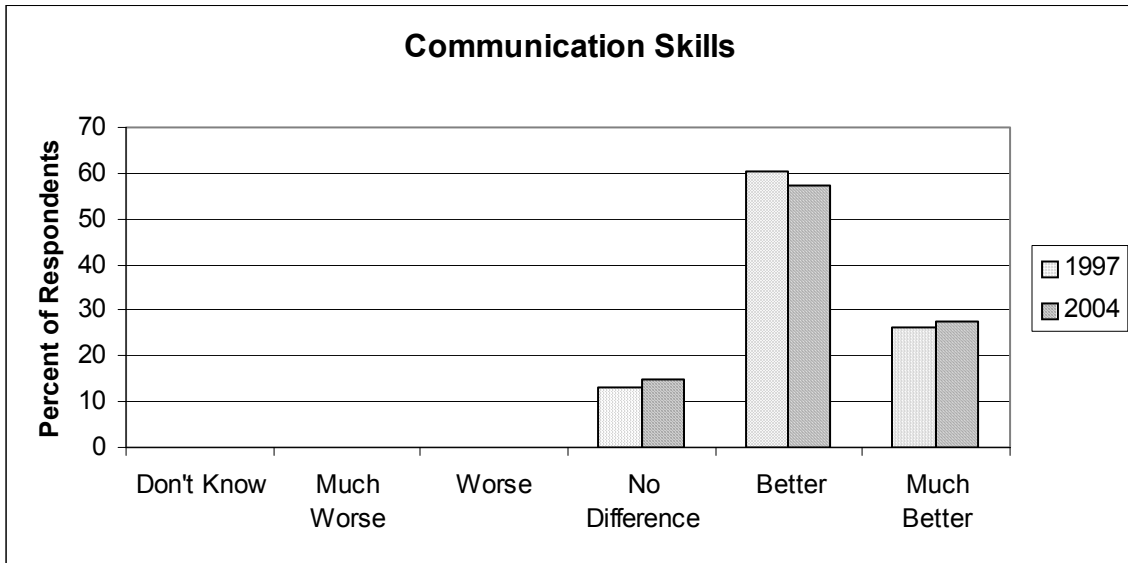
Figure 9.1



Communication Skills

Almost 90 percent of the fire chiefs surveyed believed higher education improves communication skills (Figure 9.2). In both the 1997 and 2004 survey, communication skills are greatest asset for degree holding personnel. Again, this result has not changed much since 1997.

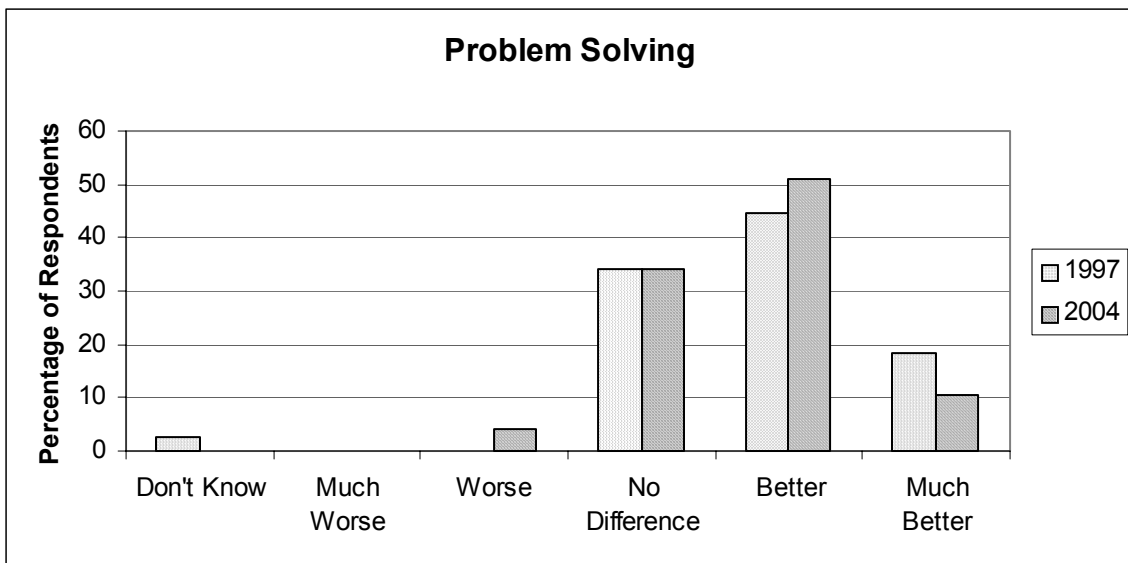
Figure 9.2



Problem Solving

A majority of the fire chiefs believed that higher education improved problem solving skills (Figure 9.3). There was a slight shift from “much better” to “better”, but the overall message is still that most fire chiefs view employees with college degrees as better problem solvers. There were 34 percent who believed there was no difference, and none who viewed higher education as detrimental to problem solving skills.

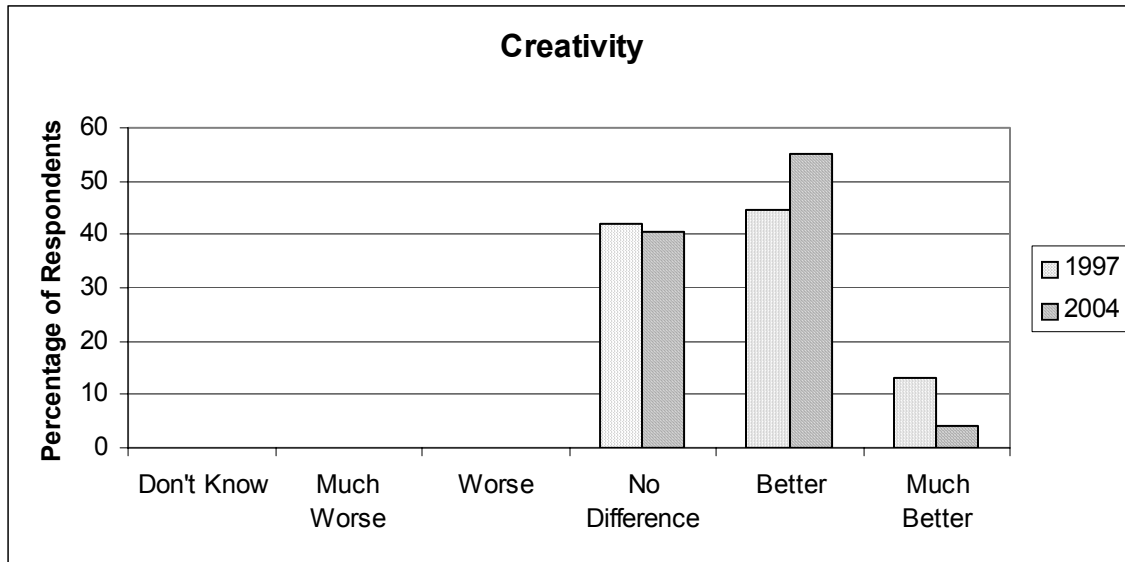
Figure 9.3



Creativity

The majority of fire chiefs responded that higher education increases creativity (Figure 9.4). There were 40 percent who saw no difference and none who saw a negative relationship. There is a shift from “much better” to “better” since 1997.

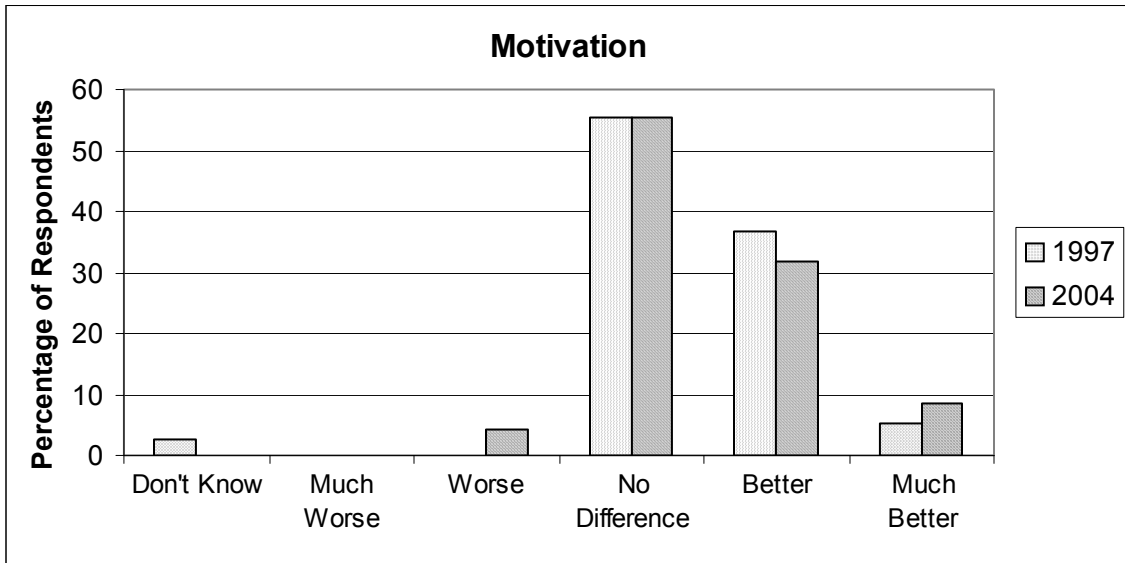
Figure 9.4



Motivation

The majority of fire chiefs believe there is no difference between the motivation of degree-holding and non-degree-holding personnel (Figure 9.5). About 40 percent believed that higher education improves the motivation of their employees.

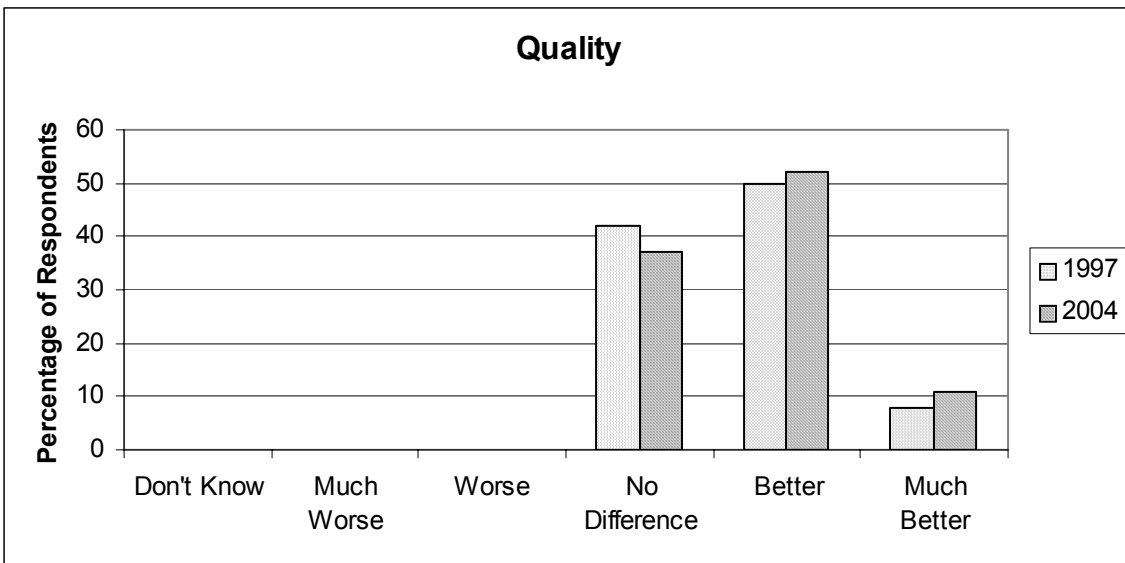
Figure 9.5



Quality

The majority of fire chiefs replied that quality is improved by education (Figure 9.6). There is a slightly higher opinion of this relationship than in 1997. There were still 37 percent who believed there was no educational effect on quality, but none believed education detracted from quality.

Figure 9.6



Work Attitude

The majority of respondents believed that education has no affect on work attitude (Figure 9.7). There was a slight shift since 1997. Both “worst” and “better” categories increased, but the net gain was in the “better”. Over 30 percent viewed education as having a positive effect, while only 9 percent believed that there was a negative relationship.

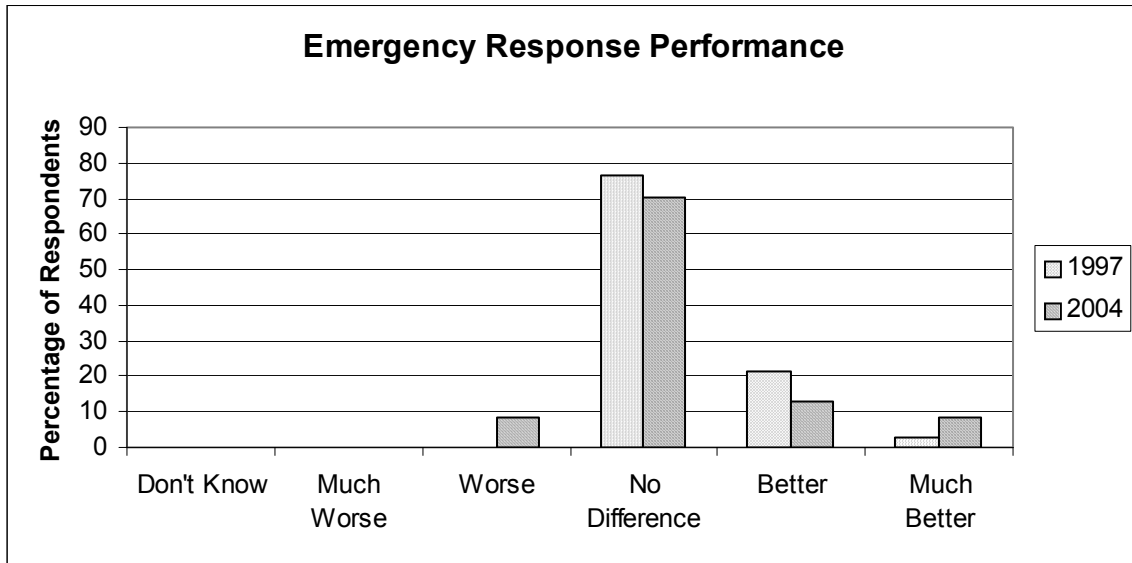
Figure 9.7



Emergency Response Performance

The majority of South Carolina fire chiefs observe no difference in emergency response performance between college and non-college graduates (Figure 9.8). About 20 percent considered education to have a positive effect in both the 1997 and 2004 data, and 9 percent believed education to have a negative effect.

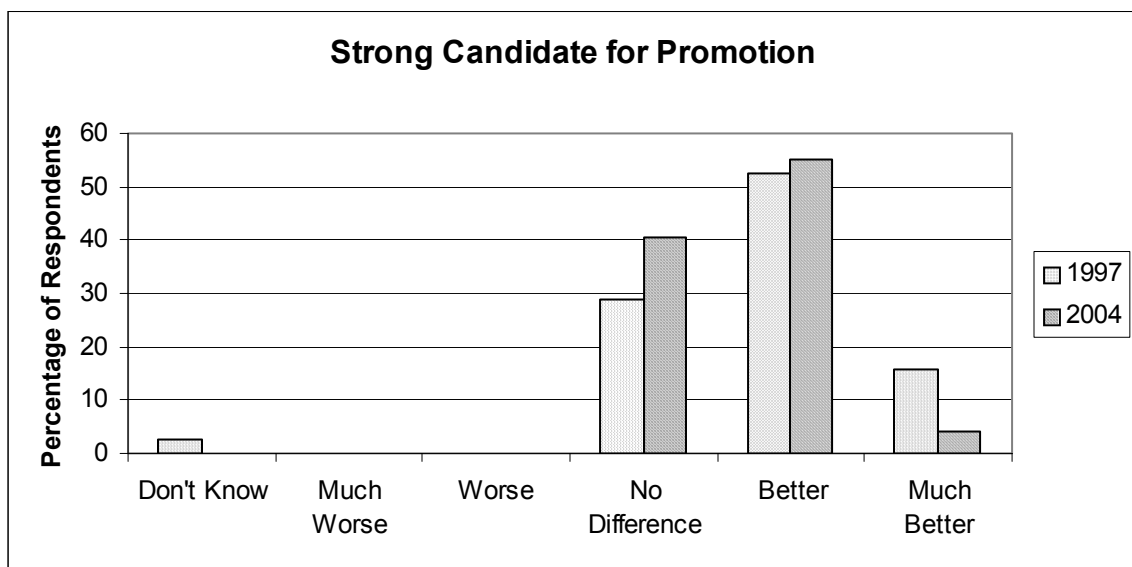
Figure 9.8



Strong Candidate for Promotion

The bulk of fire chiefs view employees with college degrees as strong candidates for promotion (Figure 9.9). However, there is a 10 percent increase in the number of chiefs who perceive no difference since 1997. There is a 10 percent increase in respondents who view degree-holding personnel equivalent to non-degree holding personnel as candidates for promotion.

Figure 9.9



Statistical analysis for each attribute is provided below (Table 9.1). The Mann-Whitney U test compares the 1997 and 2004 rankings for each pair of characteristics. The p values are all below .05. None of the attributes have changed significantly since 1997.

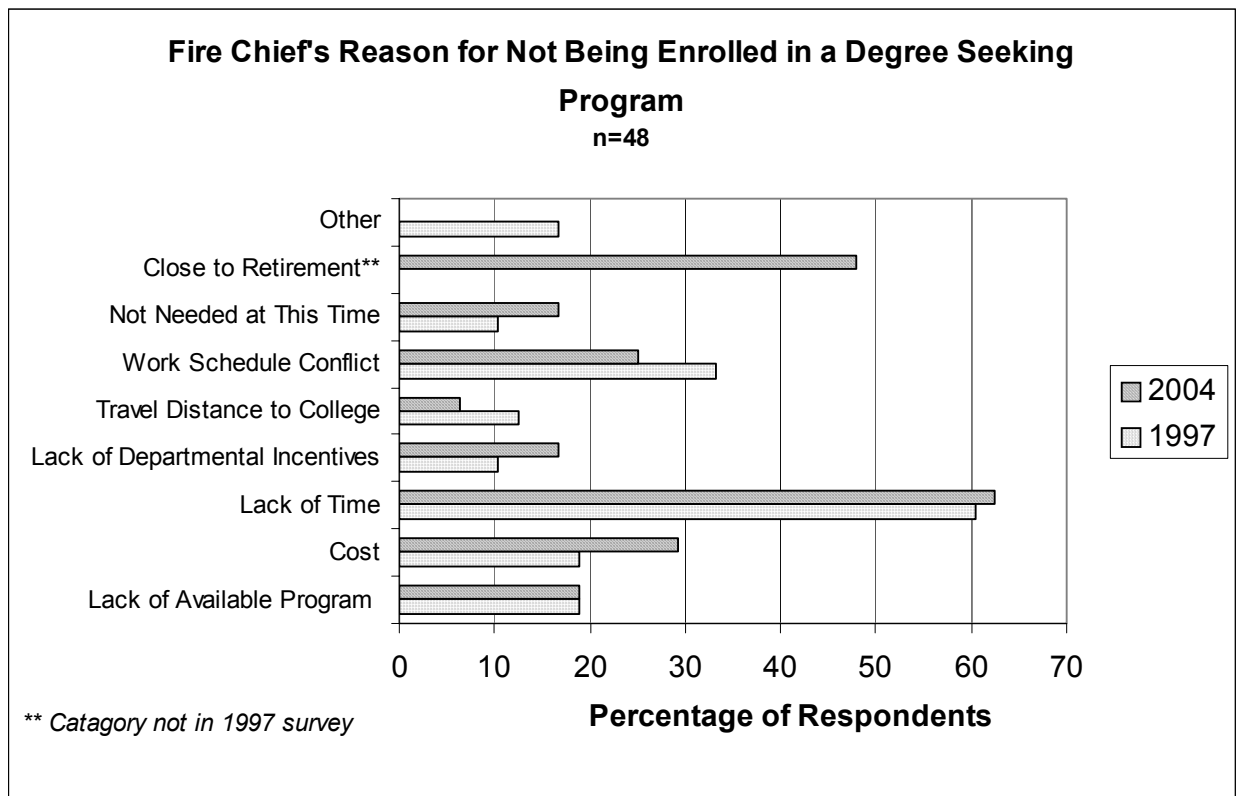
Table 9.1: Mann-Whitney U Test for Attributes

Attribute		Median	W	p
Reliability				
	1997	No Difference (3)	1569	0.4958
	2004	No Difference (3)		
Communication Skills				
	1997	Better (4)	1635	0.996
	2004	Better (4)		
Problem Solving				
	1997	Better (4)	1692.5	0.5771
	2004	Better (4)		
Creativity				
	1997	Better (4)	1667	0.7481
	2004	Better (4)		
Motivation				
	1997	No Difference (3)	1605	0.7446
	2004	No Difference (3)		
Quality				
	1997	Better (4)	1558.5	0.5747
	2004	Better (4)		
Work Attitude				
	1997	No Difference (3)	1542.5	0.7584
	2004	No Difference (3)		
Emergency Response Performance				
	1997	No Difference (3)	1700.5	0.4541
	2004	No Difference (3)		
Strong Candidate for Promotion				
	1997	Better (4)	1476.5	0.1252
	2004	Better (4)		

Chiefs and Higher Educational Programs

Only three fire chiefs reported that they were enrolled in a higher education degree-seeking program (Figure 10.1). When asked why they were not continuing their education, the lack of time continues to be the major reason. The category of “close to retirement” was added because numerous chiefs wrote it in the other category on the 1997 survey.

Figure 10.1



The three significant improvements made since 1997 are “travel time to college”, “other”, and “work schedule conflict”. The “cost”, “lack of incentives”, and “not needed at this time” reasons all increased.

The one drawback to including “close to retirement” is that the previous survey did not specify the option. The 1997 answers are not necessarily comparable to the current responses. This is because the category will get more attention and possible responses when listed directly. Therefore, the probabilities of entry into the category are not the same for both surveys. Statistical analysis of the question is inappropriate for this reason.

Educational Requirements in South Carolina

Additional questions pertaining to the current role of education in the department were added to the 2004 survey. The first asked fire chiefs if their department required National Fire Protection Agency (NFPA) 1021 certification, an Associate's degree or some other equivalent prior to employment⁶. Of the 54 chiefs that responded, 12 percent currently require some equivalent of NFPA 1021 certification before employment as a chief officer. Of the 88 percent of departments that did not currently require NFPA 1021 equivalency, 10 percent plan on creating the requirement in the next five years.

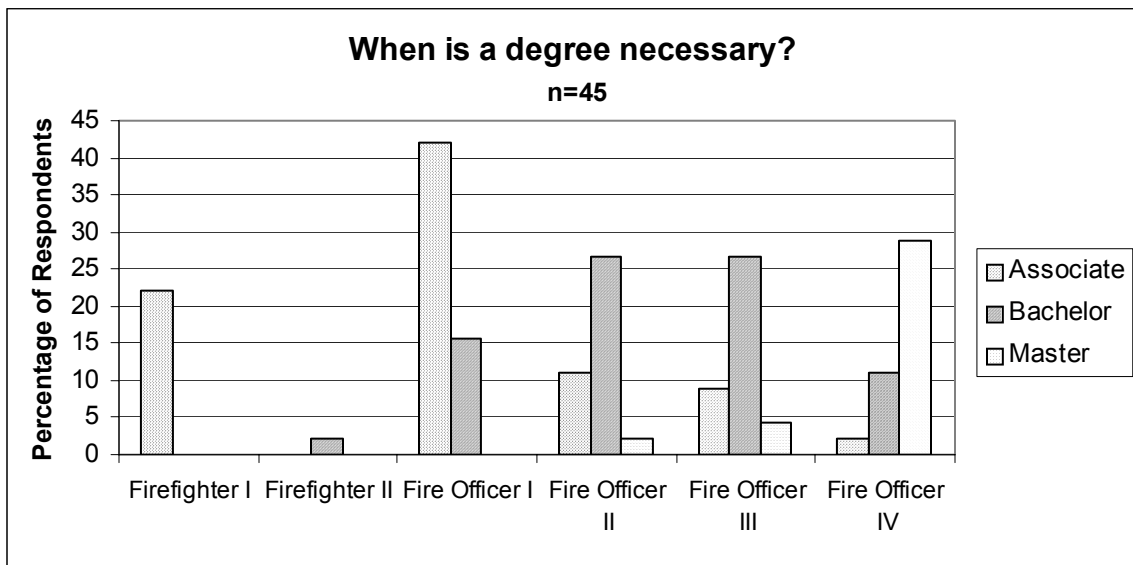
Fire chiefs were also asked if their department required higher education in job descriptions and promotional decisions. Only 19 percent of the 54 respondents require higher education. Several surveys indicated that these requirements only applied to the chief position.

The fire chiefs were asked to rank the need for an Associate's, Bachelor's, and Master's degree along a firefighter's career⁷ (Figure 11.1). Most of the 42 responding fire chiefs believed that an Associate's degree was needed at Fire Officer I certification or before. A Bachelor's degree was needed at or before Fire Officer II or III certification. The majority of fire chiefs did not rank a Master's degree. Those who did believe a Master's degree was needed usually placed it at Fire Officer IV.

⁶ The survey did not indicate at which hiring level the certification is required.

⁷ This question has questionable validity. No category was included for respondents who believed no education was necessary or for those who did not know. The responses should only be considered to represent the opinions of chiefs who believe higher education is a necessity in the fire service.

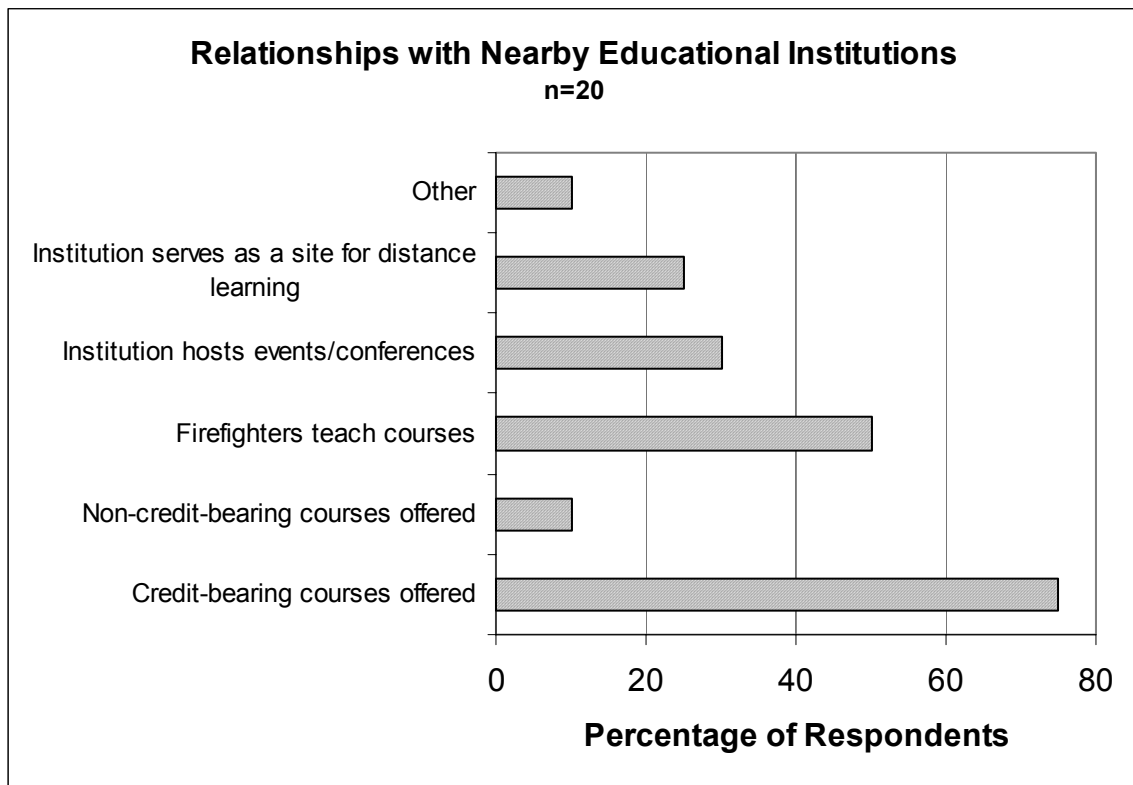
Figure 11.1



South Carolina Fire Department’s Relationship with Institutions of Higher Learning

All 55 fire chiefs responded to the question asking if their department has a formal relationship with a nearby higher educational institution (Figure 12.1). Only 36 percent of the state’s fire departments had such a relationship. Almost all of the relationships between departments and educational institutions involved course offerings. Most educational institutions used the fire departments to teach classes.

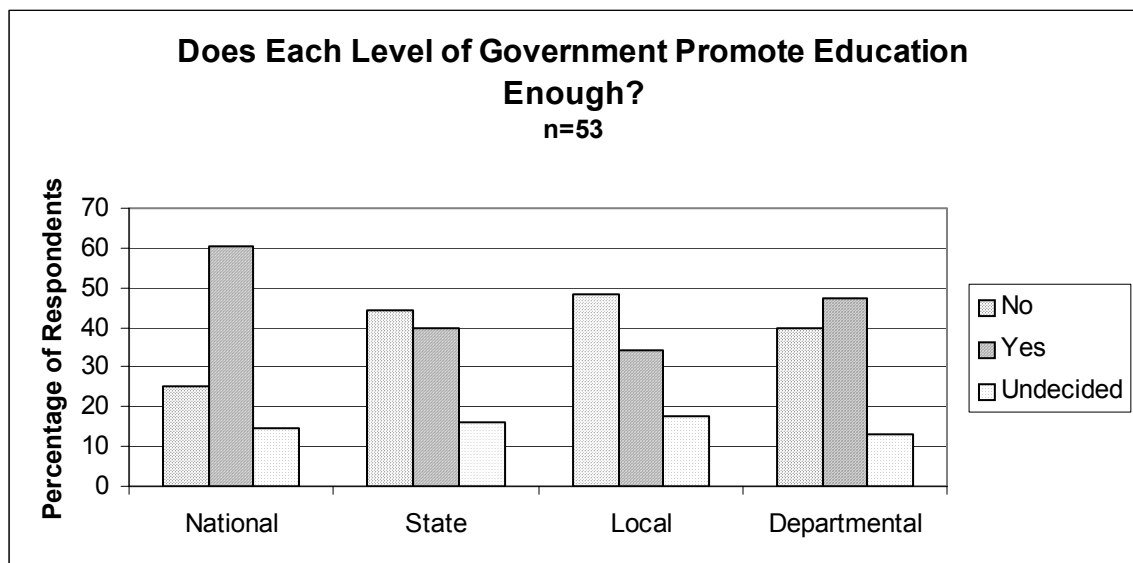
Figure 12.1



Governmental Support for Education

The survey tried to let fire chiefs give their perspectives on which levels of government were putting enough emphasis on education (Figure 13.1). The national agencies clearly are promoting education in South Carolina. Both state and especially local governmental bodies are failing to provide enough support for educational causes according to the survey.

Figure 13.1



Examination of Results

Department Characteristics

Most demographic characteristics of both the departments and their chiefs stayed roughly the same from 1997 and 2004. Since there has been no major shift in the composition of the population, it is safe to assume that changes in responses are shifts in perception. The lack of females and minorities in the fire service is a national trend (Sturtevant, 2001). The research presented here is only a survey of career fire chiefs and is not directly comparable to the nationwide numbers. The data from this survey does show that South Carolina's career fire chiefs are a vastly homogeneous group in demographic terms.

The reason for the drop in percentage of departments with volunteers and other personnel is not found in the survey and should be a cause for further inquiry. One possibility is that along with socioeconomic factors, the increased amount, expense, and complexity of training necessary for volunteers has had a detrimental affect on their use. It is an interesting note that although the number of departments with volunteers and other personnel types has decreased, the median number of these employees within departments with volunteers and others has stayed the same.

The distributional shift in incentive types needs to be examined further. The departments may be using the "time off with no make-up requirement" to counter the cost of tuition subsidies during this period of economic downturn. Another possibility is that "time off without a make-up requirement" may be a more effective incentive than tuition reimbursement. This is a realistic possibility since "lack of time" was the most frequent response by chiefs for not continuing their own education. This dramatic change deserves continuing investigation.

Fire Chiefs' Characteristics

The fire chiefs' experience level did not change much from the last survey. The one significant change was in the "Tenure as fire chief" data. The 1-3 year category rose by 10 percent. One possible reason for this rise is the percentage increase of fire chiefs with prior experience, meaning some chiefs have shifted jobs recently.

The distribution of education is roughly similar to the 1997 data. There is a 5 percent increase in Associate's degrees since the previous study. This increase is probably due to the proliferation of fire service specific Associate's degrees over the last ten years.

The predominance of degree ascertainment in fire service and business degree areas is an indicator that the fire service is looking for a specific skill set. As education level increases, business and management degrees become more predominate. One reason for this phenomenon is most likely due to the lack of fire service specific degrees at higher degree levels. Also, Business and management degrees fill the budgeting, personnel, and other administrative needs where certifications fail. Business degrees also have a wider range of applications than fire service specific degrees and might attract some administrators who wish to pursue multiple interests.

According to leaders in the firefighting educational field is that EFO certification is not equal to a four-year degree. The misperception of the EFO program is a national problem. The fact that only 15 percent of South Carolina fire chiefs do not realize the difference is a good sign. However, the majority of respondents are still unclear in the distinction. More efforts need to be made to explain the differences between EFO and degree attaining programs in the state and nation.

The fact that "lack of time" and "close to retirement" are the major hindrances to fire chiefs continuing education indicates that degree ascertainment may need to be obtained before the chief position is obtained. Given that fire chiefs do not have sufficient time to pursue higher

education in their current position, the departments should be promoting education earlier in their personnel's careers. The need to start early coupled with the high proportion of retiring fire chiefs is a sign that now is the time for fire departments to push for higher education.

The travel time improvement is probably due to the abundance of online courses and distance learning opportunities. Another reason travel time might have decreased is that some colleges now cater to the departments, providing on-site classes. The "other" category likely improved because of the addition of "close to retirement".

The rising cost of higher education in South Carolina is probably contributing to incentives becoming a greater concern for our fire chiefs. There has also been a drop in the number of fire departments who offer tuition reimbursement, as reported earlier, which may be leading to the increase in the "lack of incentive" category.

Fire Chief's Opinions on Higher Education

The current study shows slightly lower but statistically insignificant rankings of the importance of education in promotion decisions and "strong candidate for promotion" when comparing between degree and non-degree holding personnel. In both cases higher education was still seen as important by a vast majority of fire chiefs. The insignificant shift could be random variation or an indication that academic education is only one component of the combination of technical, field, and management skills necessary for advancement in the fire service.

The 2004 respondents gave roughly the same opinions of degree holding personnel compared to non-degree holding personnel as their 1997 counterparts. Communication skills were clearly better among degree-holding personnel. The majority believed that problem solving, creativity, quality, and chance of promotion were better among degree holding personnel. The factors reliability, work attitude, and emergency response performance were ranked with the

majority in the “no difference” category. Since the rankings are so closely aligned over both surveys, it is reasonable to assume that these responses reflect the long-term benefits of higher education in the fire service.

The high levels of undecided responses in the question asking if enough emphasis is being put on education by the different levels of government is surprising. Fire department administrators should know where the support for their programs originates. More research needs to be done on where funding and other support for higher education is emerging from and if fire personnel are aware of the support available to them.

Conclusion

The South Carolina Fire Chiefs' Perceptions of Higher Education for Firefighters of 2004 was implemented to see if opinions on higher education have changed over time and what direction higher education is heading in the future. For the majority of variables analyzed at in the study, there was no significant change from 1997. None of the demographic variables of the fire chiefs have changed significantly and the demographics of the fire station personnel are also similar to the 1997 results.

The lack of variation in perception of higher education indicates that higher education is still in high demand. The 2004 survey correlated with the 1997 results give the both studies some longitudinal validity. For instance, the exceedingly better communication skills of degree holding personnel versus non-degree holding personnel are reaffirmed by the 2004 survey. The solid agreement between the two surveys grants the opinions presented by the South Carolina fire chiefs legitimacy.

The research also raises numerous questions for further study. The current study only examines at career departments. The majority of fire departments in the state are volunteer or some mix of career and volunteer personnel. Research needs to be done on South Carolina's volunteer and mixed departments to see if higher education's benefits are universal. The SCSFA Higher Education Committee hopes to pursue this question in the next few years.

The lack of diversity in South Carolina's fire service is an issue that should be further researched. The 1997 and 2004 samples contained few minorities and extremely few females. There is no evidence presented in this study for why South Carolina or the nation as a whole is consistency homogenous in demographic composition.

The importance of higher education in career advancement is a subject that requires further inquiry. Both the 1997 and 2004 surveys responses indicated higher education is important in promotion decisions. However, the percentage of personnel holding degrees is still

very low. The majority of departments have fewer than 10 percent of their employees with degrees in 2004. A study needs to be completed to measure the importance education plays in promotion within fire departments. If degree-holding personnel are receiving promotions faster, then this information needs to be used to encourage higher educational programs. If the relationship between education and promotion is not clear, then other factors need to be identified and studied.

Incentives for firefighters to acquire higher education deserve more attention. The research shows a significant shift in incentive policies among fire departments. The number one comment made in the free response section of the survey concerned budget cutbacks and lack of money for education. Incentive research does not focus only on money. Providing funds does not necessarily create demand. All incentives, including financial ones, should be researched so that fire departments can find effective ways to encourage higher education.

The conclusion of this research is a call for more research. The lack of scientific study into the fire service is what prompted the 1997 project. The continued lack of academic inquiry is partly the inspiration for the 2004 study. Research can lead to better and safer departments but the fire service has not promoted higher education sufficiently so that it can benefit them. The fire service needs to continue its professional development by encouraging research and beginning its own peer-reviewed journal for the dissemination of such information. The fire service may need to support the creation of a doctoral program that will encourage academic endeavors in the fire service and overall advance the profession of firefighting.

Acknowledgements

The author would like to thank several people for helping with this report. Thanks to all of the members of the South Carolina Firefighters' Association's Higher Education Committee. First and foremost, Fire Marshal George McCall for proposing the project and continuously providing his expert advise throughout the survey process. Chief Karl Ristow and Assistant Chief Daniel Cimini were vital in supporting and advising the building and interpreting of the report.

The South Carolina Firefighters' Association deserves thanks for funding the survey and advancing higher education in the state's fire service. The association's staff, particularly Mary Sassano, assistance was an essential part of this reports success.

Appreciation is also due to Clemson University and its staff for assisting in the data collection and development of the report. In particular, Dr. David Swindell helped improve the survey instrument and provided assistance with the research methodology. Dr. Robert Smith was instrumental in the writing and editing of the report. Angie Guido also deserves thanks for her assistance in data collection and networking skills that made the surveying process work smoothly.

The expert advise provided by Ed Kaplan and Dr. Burt Clark of the NFA was greatly appreciated. The comments made by these individuals enhanced this paper immensely.

My friend Erica Augustine deserves special thanks for reading this report repeatedly and making sure that the report was grammatically correct and was written in a manner that the public could understand.

The final and most important thanks are to the entire South Carolina fire chief's that responded to the survey. The high response rate indicates your dedication to improving your profession. The honesty and high level of involvement demonstrated in this survey are a result of your dedication.

Appendix A

February 11, 2004

CHIEF [name here]
CITY FIRE DEPT.
1227 MAIN ST.
CITY, SC 29000

Dear CHIEF [name here],

The South Carolina State Firefighters' Association is continuing its devotion to promoting and improving the status of firefighters. The SCSFA Higher Education Committee and I would like to invite you to assist us in enhancing our profession's development.

The South Carolina State Firefighters' Association and researchers at Clemson University have joined efforts to explore the role of education in the South Carolina fire service. We are following up the research we did in 1997 on perceptions of higher education among fire chiefs. The 1997 research gained us state and national attention. The past study was beneficial for both educational and lobbying efforts in the state for our organization.

Please take the next few moments to fill out and return the attached survey. Enclosed is the survey and return materials. The survey has a tracking number for use by the Clemson researchers, but results will remain confidential. Each fire chief will receive a copy of the results and they will also be posted online. The expert insight you provide will help us plan and direct educational efforts in the South Carolina fire service.

Sincerely,

SC STATE FIREFIGHTERS' ASSOCIATION

Chief James Moore
President

Appendix B

SCSFA Perspectives on Higher Education Survey

- 1.) How long have you been chief of this fire department? (n=55)
- Less than one year (5)
 - 1-3 years (11)
 - 4-6 years (13)
 - 7-10 years (12)
 - 11 or more years (14)
- 2.) How many years of service do you have at this fire department? (n=55)
- Less than one year (0)
 - 1-3 years (3)
 - 4-6 years (5)
 - 7-10 years (7)
 - 11 or more years (40)
- 3.) Did you have fire chief experience at a different fire department before being appointed to your current position? (n=55)
- Yes (11)
 - No (44)
- 4.) How many years of total service do you have as a fire service professional? (n=55)
- Less than 1 year (0)
 - 1-5 years (0)
 - 6-10 years (2)
 - 11-15 years (4)
 - 16-20 years (5)
 - 21 or more years (44)
- 5.) How many fire service personnel do you have in your department? (n=55)
Number of:
- _____ Volunteer (0-190)
 - _____ Career (14-257)
 - _____ Other (administrative assistants, etc.) (0-24)
- 6.) Does your department provide any incentives for personnel to continue their education? (Check all that apply.) (n=55)
- Full tuition reimbursement (15)
 - Partial tuition reimbursement (19)
 - Time off (no make-up requirement) (33)
 - Time off (with make-up requirement) (3)
- 7.) Do you feel the incentives provided by your fire department are effective?
- Yes (39)
 - No (12)

[tracking number here]

8.) Rank the motivational factors that encourage your firefighters to pursue education. Use a scale of 1 for least incentive to 10 for the best incentive. (n=51)

_____ Personal Improvement (7) _____ Encouragement by Supervisors (6)
_____ Career Advancement (8) _____ Financial (7)

9.) Judging from your knowledge of your fire department, how important do you think having higher education is in making promotion decisions? (n=55)

- Not important (2)
- Somewhat important (8)
- Important (22)
- Very important (23)
- Not Applicable/ Don't Know (0)

10.) Compared to your fire service training and experience, how important do you think your education was in determining your promotion to fire chief? (n=55)

- Not important (3)
- Somewhat important (16)
- Important (18)
- Very important (16)
- Not Applicable/ Don't Know (2)

11.) Do you anticipate a career change, or a move to a larger department? If yes, how important do you think having a college degree will be in helping you make this change or move? (n=48)

- Not important
- Somewhat important
- Important (8)
- Very important (20)
- Not Applicable/ Don't Know (20)

12.) Do you supervise college graduates (including Associate Degree)? (n=55)

- Yes (49) No (6)

• If yes, how many? _____ If no, skip to item 14. (0-60)

13.) If you supervise college graduates or personnel who have attended college level courses, rate them as a group on the following traits compared to others who you supervise who do not have any college education. Use the following scale to rate each trait. (n=47)

0 - don't know 3 - no difference
1 - much worse 4 - better
2 - worse 5 - much better

_____ Reliability (3) _____ Problem Solving (3)
_____ Strong Candidate for Future Promotion (3) _____ Emergency Response
_____ Creativity (3) _____ Performance (2)
_____ Motivation (2) _____ Work Attitude (2)
_____ Communication Skills (3) _____ Quality (2)

- 14.) What is your year of birth? _____ (n=55) (45-54)
- 15.) What is your sex? (n=55)
 Male (55) Female (0)
- 16.) What is your race? (n=55)
 African American (2)
 Asian American/Pacific Islander (1)
 Hispanic (0)
 Native American (0)
 White (52)
 Other (0)
- 17.) What is the highest level of education you have completed? (n=55)
 GED (2) Bachelor's (8)
 High School (31) Master's (2)
 Associate's (11) Doctorate (1)
- 18.) Have you attended any of the National Fire Academy Executive Fire Officer courses?
 (n=55)
 Yes (26) No (29)
 • If yes, have you completed the program? (n=29)
 Yes (10) No (19)
- 19.) Do you consider EFO certification equivalent to a four-year college degree? (n=53)
 Yes (8) No (19) Don't Know (26)
- 20.) Are you currently enrolled in a higher-education degree-seeking program? (n=53)
 Yes (3) No (50)
- 21.) If you have a degree, in what area did you receive it? (22)
 Fire Service Specific (7)
 Management/ Business (9)
 Technical/ Trade (1)
 Liberal Arts (1)
 Other (4)

22.) If you are not enrolled in a higher-education program, why? (check all that apply) (n=48)

- Lack of Available Fire Service Program (9)
 - Cost (14)
 - Lack of Time (30)
 - Lack of Departmental Incentives (8)
 - Travel Distance to College (3)
 - Work Schedule Conflict (12)
 - Not Needed at This Time (8)
 - Close to Retirement (23)
 - Other (Specify) 0
-

23.) Do you currently require NFPA 1021 certification, an associate's degree, or some educational equivalent prior to employment? (n=54)

- Yes (8) No (46)

• If no, are you planning on requiring NFPA 1021 certification in the next five years? (n=42)

- Yes (7) No (35)

24.) Does your department require higher education in the job descriptions and/or promotional process? (n=54)

- Yes (13) No (41)

25.) Does your fire department have a formal relationship with a nearby higher educational institution? (n=55)

- Yes (20) No (35)

• If yes, please specify below:

- Credit-bearing courses offered (15)
 - Non-credit courses offered (2)
 - Firefighters teach courses (10)
 - Institution hosts events/conferences (6)
 - Institution serves as site for testing or distance learning (5)
 - Other (Specify) 2
-

26.) At what point in a firefighter's career does a degree become necessary?
Please put the degree code beside the position where that level of education becomes necessary. Use the following code:

- "A" – Associate "B" - Bachelor "M" - Master*
- _____ Firefighter I
- _____ Firefighter II
- _____ Fire Officer I (e.g. Lieutenants and Captains) (A)
- _____ Fire Officer II (e.g. Battalion Chiefs) (B)
- _____ Fire Officer III (e.g. Assistant Chief and Deputy Chief)
- _____ Fire Officer IV (e.g. fire chief)

27.) Do you think the different levels of government that affect the fire service put enough emphasis on education? *Put "Y" for Yes, "N" for No, and "U" for undecided.*

- _____ National (i.e. DHS, FEMA, NFA)
- _____ State (i.e. SCFA, SCLLR)
- _____ Local (city, county)
- _____ Department (within your fire department or SPD)

28.) If there are any additional comments that you would like to make, please do so. Feel free to continue writing on back if there is not enough room below.

Thank you for completing our survey.

Appendix C

Statistical Abstract

NOTE:

Statistical analysis is used to address error in measurement. Because the study presented in this report is a census, there is no error and statistical analysis is technically inappropriate. However, using statistics to compare groups in such a case is commonly accepted practice.

The statistical packages SPSS, SAS, and Minitab were all used in the development of this report. The data file available from the SCSFA is stored in SPSS.

Mann Whitney U Test/ Wilcoxon W Test (the tests are equivalent)

The test is performed between two independent groups of data. The medians of the two groups are compared for equality. The test is appropriate when the data is ordinal (ranked) or the distribution is skewed. The assumptions are that the data is independent and the distributions are roughly the same shape. All of cases in which this test is used meet these assumptions.

Chi-Squared Test

The Chi-squared test is used to test if two nominal (categorical) distributions are equivalent. The data must be grouped, such as male and female. Mathematically, each group needs an expected frequency of at least 1 and no more than 20 percent of the categories can have an expected distribution of less than 5. Any statistical package will

warn the user if these assumptions are violated. The question on areas of degree ascertainment does not meet these requirements; therefore the test is not used.

For more information on these tests, two good references are Giventer or Gibbons works (both cited in bibliography). Giventer's book is geared to practitioners without much mathematical background who perform public policy research. Gibbons' work is a traditional mathematical text focusing on nonparametric statistics.

Glossary

p: The level of significance. In all tests for this paper, p is the probability of equality. A difference is significant if the value of p is less than .05, or in other words 5 percent. A significant difference indicates the groups are not equal.

W: A test statistic for the Mann-Whitney test. The statistic has no practical interpretation.

Mann Whitney Test: Statistical test for equal median values between two ranked (ordinal) data sets.

Chi-Squared Test: A statistical test for equality in distributions for grouped (nominal) data.

Chi-Squared Statistic: A test statistic used for the Chi Squared test that has no practical interpretation.

Median: A measure that uses the 50th percentile as an estimate of central tendency. This measure is appropriate for skewed interval or ratio and ordinal data.

Mean/ Average: A measure that uses the arithmetic average as an estimate of central tendency.

NFPA: National Fire Protection Association

N: The total sample size. In this paper, the N is 55.

n: The number of respondents to each question. Some surveys did not contain answers to every question, so the number of responses (n) can vary.

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