VFCA and IAFC Survey Review and Analysis Final Report

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Executive Summary

- Officials with The Recruitment and Retention Survey successfully administered the questionnaire to a large number (1,805) of Virginia Firefighters.
- Descriptive statistics and visualizations (charts, graphs, etc.) give an overview of the population and the responses regarding recruitment and retention.
- An examination of firefighter beliefs for others leaving the fire service based on lack of leadership, poor fit with others, and politics within departments indicates:
    - Firefighters with 6-10 years in service are more likely to respond to these indicators, while others with fewer years in service as a group generally respond less often to them.
    - Paid firefighters cite leadership and politics issues more often, while volunteers usually mention politics and fit issues.
- The analysts use categorical responses from the survey to create cross-tabulations and visualizations between variables in order to illustrate the relationships between them.
- For this report, the Chi-squared statistic tests the strength of the correlations between variables.
- Correlation analyses with the "Years in Service" variable determine related characteristics of tenured firefighters, and the results indicate: The results indicate:
    - Longer serving firefighters are more likely to enjoy administrative duties.
    - Longer serving firefighters are less likely to enjoy medical and HAZMAT response duties, and community outreach.
- The questions regarding what compelled firefighters to enlist can add some insight into recruitment strategies.
    - According to the respondents, personal interaction with a firefighter is the overwhelming impetus to enlist.
    - Efforts to identify trends among recruitment tools relates to those who did not have a strong circle of friends prior to recruitment, but the results did not indicate a statistically significant relationship with several recruitment tools.
- Correlation analyses of the questions regarding social media use and perceptions of benefit can inform the recruitment strategies going forward.
    - Not surprisingly, firefighters with more years of service are less likely to use Facebook (although nearly 58% did so) compared to their more recently enlisted counterparts.
    - Less intuitively, among all groups of firefighters (with regard to years of service), fewer felt that Facebook is a good recruitment forum than responded that they use Facebook themselves.
- Steps moving forward should include:
    - Informing the marketing strategies under development using the descriptive statistics/visualizations and correlation analyses herein, and
    - Making suggestions to improve future survey efforts using the lessons learned from the analysis of this survey.

Background and Overview

A survey regarding recruitment and retention issues as perceived by Virginia firefighters was administered in the Spring of 2011. Several parties reviewed and revised the survey before finalizing it and making it available to the firefighters. The survey was available to firefighters in digital form via an online survey system (Survey Monkey) and in paper form when firefighters requested access to a written survey.

There were 1,805 responses to the survey from both electronic and paper versions. Of those 1,805 responses, 1,253 of those were from departments in either the Traditional 10 or the GIS 10 participant groups. There were 86 responses where the respondent left the majority of the questions blank on the survey, and the analysts removed these from the analyses provided below. One thousand seven hundred nineteen responses remained. The answers to all of the questions were not mutually exclusive, and in two instances, the respondents had the opportunity to choose multiple responses. In addition, on some questions, the firefighters were given the option of answering "N/A" or "Not applicable", or they had the option to leave questions blank. In these cases, the analysts removed the responses from the analyses of individual questions.

The survey asked a series of questions of the firefighters in several broad categories:

- Basic information items such as Firefighter Status, Primary Occupation, Years of Service, and some demographic information
- Enjoyment levels that firefighters felt for various duties and the time spent each week completing those duties
- Enlistment reasons that compelled their call to fire service
- Social circle structure of the firefighters before and after recruitment
- Motivations firefighters felt for remaining in the fire service, and beliefs regarding why others had left the fire service
- Social media use and firefighter beliefs regarding its effectiveness for recruitment efforts

Officials collected the raw data from the digital and written surveys, and analysts reviewed the findings and generated this report based on those responses.

Nature of the Survey Questions and Potential Analytical Methods

The data from the survey were primarily categorical in nature. That is, officials asked the firefighters to respond to questions in a format similar to that of a Likert Scale, which has several categories on an ordered scale. As an example, in this survey, the firefighters answered questions on the extent to which they enjoyed performing administrative tasks as part of their job. The possible response categories included "I live and breathe for it", "I like it", "Neutral", "I don't like it", or "I strongly dislike it". Since these responses were categorical rather than continuous in nature, a detailed quantitative analysis has limitations. Because of these limitations, this report includes two types of analyses - descriptive and correlative – that are valid on these types of data. The descriptive analyses include statistics, such as averages or median values, and techniques, such as frequency distributions or histograms. The correlation analyses limit comparisons to pairs of variables using cross-tabulations and Chi Squared tests for independence. In addition to these analyses, the ESRI / Interra report includes some descriptive statistics and graphs that complement the additional descriptive analyses that follow. This report begins with an explanation of response rates, continues with descriptive statistics, and focuses on the methods for correlation analysis.

Response Rates

The response rates for the questionnaire, which listed 15 questions, varied by question. Everyone answered the first question on "Status". Therefore, this was the only set of answers to contain a complete dataset of responses. For each of the two-part questions (Questions 7 - 8 and 14 - 15), the response rates matched, indicating that the respondents answered both portions without leaving either one blank. Overall, as noted in the following table, the rates that the respondents omitted answers, the non-response rates, incrementally increased from 0% to 11% with the progression of survey questions.

With this expected progression, respondents will sometimes tire of answering questions or be distracted from the survey, causing them to omit responses on later questions in a survey of this length. In this survey, the only exception to this expected trend, Question 2 regarding Occupation, has a non-response rate of 24%. This derivation from the trend may indicate the need for changes to the format of the question. However, alterations may improve future non-response rates on questions, but some respondents may still leave questions blank when completing a lengthy series of questions. Moreover, survey architects should consider the importance of questions for the analysis of recruitment and retention prior to subsequent survey efforts, so that questionnaires list questions with greater importance at the beginning of the survey.

Questions	Topic	Responses	Blanks	Non-Response Rates
1	Status	1805	0	0%
2	Occupation	1372	433	24%
3	Years in Service	1762	43	2%
4	Professional Likes and Dislikes	1719	86	5%
5	Time Spent on the Job	1704	101	6%
6	Initial Interest in Fire Fighting	1696	109	6%
7*	Peers in Fire Service Before Joining	1694	111	6%
8*	Peers in Fire Service Now	1694	111	6%
9	Speculation Why Others Left	1690	115	6%
10	Motivations	1679	126	7%
11	Other Motivations	1677	128	7%
12	Basic Information	1626	179	10%
13	Social Media	1624	181	10%
14*	Age	1613	192	11%
15*	Fire Department	1613	192	11%
	*Dual Questions			

'Other' Responses

Two questions, Occupation (Question 2) and Initial Interest in Fire Fighting (Question 6), gave the respondent the opportunity to choose one or more responses from a potential list of responses. Among the list of responses was the option "Other (please specify)". There were a significant number (240 and 309, respectively) of "Other (please specify)" responses, even though these questions offered 23 and 15 specific choices for selection, respectively. Since the "Other" responses accounted for 17.5% and 18.2% of the responses to these questions, respectively, an examination should be made of the comments associated with the "Other" responses in order to improve the questions and capture more of the responses with the list of choices.

Non-mutually Exclusive Questions

With two questions, "Initial Interest in Fire Fighting" (Question 6) and "Speculation Why Others Left" (Question 9), the questionnaire format gave the respondents the opportunity to choose multiple answers. Multiple choices generated 2,843 responses for the "Initial Interest" question and 7,183 responses for the "Speculation" question. This analysis will review the responses with respect to this modified answering approach.

Descriptive Analysis

First, the questions segmented the surveyed firefighter population into four status groups, "All Paid", "All Volunteer", "Paid/Mostly Volunteer" and "Volunteer/Mostly Paid". Among the groups, the largest was "All Volunteers" with more than half of the population (57.4%) of the respondents self-describing themselves in this manner. To the contrary, the smallest group was "Paid/Mostly-Volunteer" with only 3.1% of the total surveyed population. With the remaining groups, the "All Paid" and "Volunteer/Mostly Paid" firefighters totaled 22.3% and 17.2% of the population, respectively. Next, Question 3 addressed the "Years in Service" category for each respondent, with five categories from which the respondent could choose. The following table includes the totals for each of these "Years in Service" categories. Fifty-five percent of the population surveyed had served 11 or more years. Several groups did not have any respondents with less than one or 1-2 years of service. For this section of this report, the majority of the analyses aggregated the newest firefighters into a category with 0-5 years in service. As noted in the table, the average and median ages for all of the status groups were in the mid-to-upper thirties.

	Years in Service											
Firefighter Status	<1 year	1-2 Years	3-5 Years	0-5 Years	6 - 10 Years	11+ Years	Blanks Exclusions	Total Respondents	% of Survey Population	Average Age	Median Age	Age Range
All Paid	1	5	25	31	92	277	3	403	22.3	39.3	38	21-99
All Volunteer	73	138	168	379	147	477	33	1036	57.4	38.9	39	16-84
Paid/Mostly Volunteer	1	0	6	7	12	36	1	56	3.1	34.7	34	21-53
Volunteer/Mostly Paid	0	3	25	28	75	201	6	310	17.2	36.3	34.5	19-99
Totals	75	146	224	445	326	991	43	1805	100			
% of Total Population	4.2	8.1	12.4	24.7	18.1	54.9	2.4					
Average Age-Service Sector	25.7	27.8	29.7		33.4	44.3						

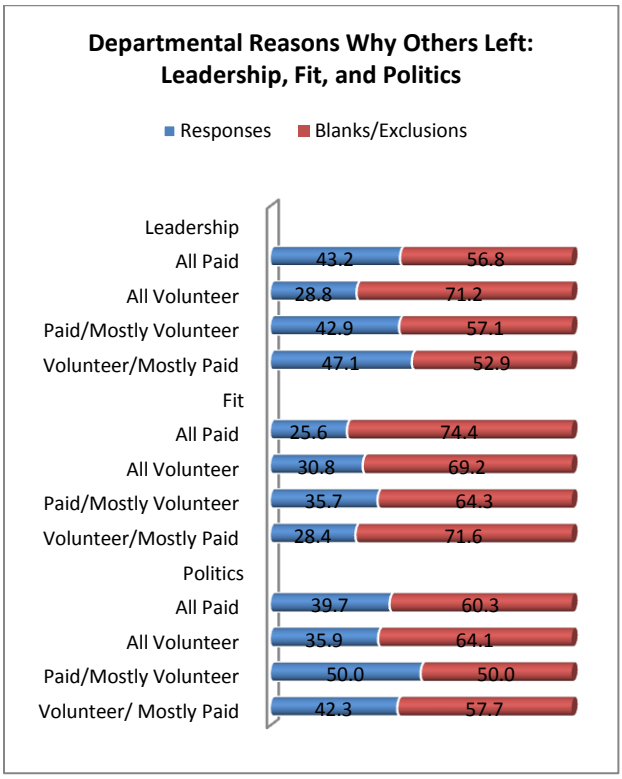
There were a number of questionable responses, including respondents who listed their ages as "0", "7", or "99", and inconsistencies where the reported age was less than 26, while the years in service was greater than 11. With a survey population as large as this one, it is common to expect a few of these unusual responses. Now, the focus will shift to analyzing the responses, beginning with the beliefs why firefighters were leaving the fire service.

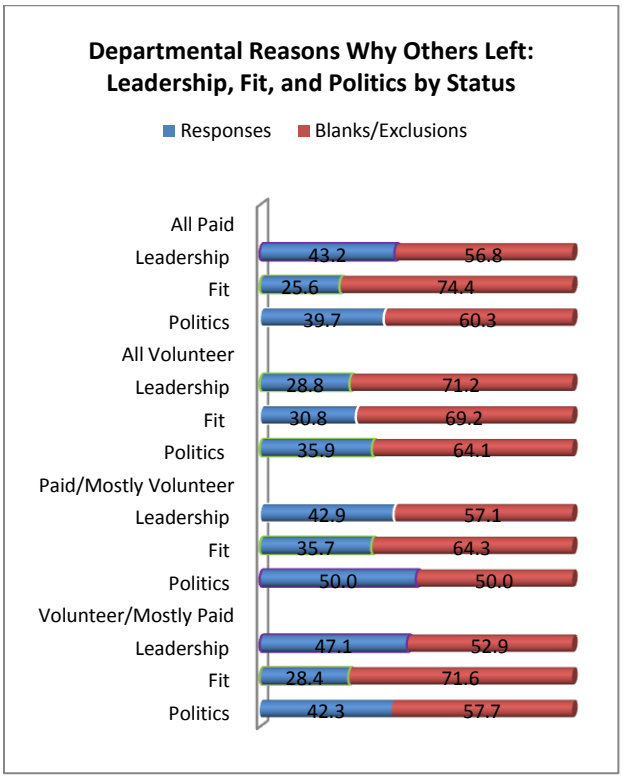
Leadership Focus

One of the survey questions tallied the impressions from firefighters about their beliefs regarding why others had chosen to leave the fire service. Three of the top five responses that were checked for this question were "Lack of Leadership", "Did Not Fit with the Department", and "Departmental Politics", related to dynamics within the stations and departments. A review of these categories within stations indicated different patterns of response rates between firefighter status groups (Figures below). Since the format of the survey intended to capture as many reasons as possible for firefighters leaving the stations or departments, the respondents

could choose one, two, or all three of these responses (among others). Of course, some respondents chose none of these options as relevant factors (in red in the Figures below).

In one visible trend, volunteers seemed less concerned with "Leadership" as a contributing factor to firefighters leaving the service. More specifically, when ordered by the reason for leaving, a smaller percentage of the "All Volunteer" and the "Paid/Mostly-Volunteer" firefighters checked "Lack of Leadership" compared to the firefighters in the other status categories. Within the volunteer groups, the "Paid/Mostly-Volunteer" group tallied an 18% higher response rate for "Lack of Leadership" as compared to the "All Volunteer" group. For this calculation, the higher rate was associated with a small population of paid firefighters who spend most of their time as volunteers (3.1% of the respondent population). In addition, this response rate was associated with a considerable number of "All Volunteer" firefighters in the respondent pool (57.4%). It suggested that this percentage was an accurate reflection of this group. Irrespective of the differing sample sizes, for the "All Volunteer" and "Paid/Mostly Volunteer" respondents, departmental or station politics was the leading cause listed in the survey for leaving the fire service.





Although the respondent population sample size for the "Paid/Mostly Volunteer" firefighters was considerably smaller than the other three groups, half of the "Paid/Mostly Volunteer" group speculated that politics was the reason that others had left the departments. Out of all the groups, this was the largest percentage of responses within the three departure categories. In addition, the "All Volunteer" and the "Paid/Mostly Volunteer" firefighters led the percentage of respondents in the "Did Not Fit in the Department" category with 30.8% and 35.7%, respectively. Overall, 35.9% of the volunteer firefighters tallied responses for politics, 30.8% indicated fit with others, and 28.8% marked leadership concerns as the reasons why others had left the station or department.

With similar sample sizes, the "All Paid" (22.3% of respondents) and "Volunteer/Mostly Paid" firefighters (17.2% of respondents) paralleled each other with either the highest or lowest response rates in the "Lack of Leadership", "People Fit", and "Station Politics" categories – with the exception of the large response rate (50%) for the "Paid/Mostly Volunteer" firefighters in the "Politics" category. For the lack of departmental leadership category, 47.1% of the "Volunteer/Mostly-Paid" firefighters and 43.2% of the "All Paid" firefighters choose this reason in the survey. These groups mentioned "Fit" less often than their volunteer counterparts did, but mentioned "Politics" more often than the "All Volunteers" and less often than the "Paid/Mostly Volunteer" firefighters. Overall, the response rates for the "All Paid" and "Volunteer/Mostly-Paid" firefighters corresponded within 3%-4% of each other for the "Leadership", "Fit", and "Politics" reasons for leaving.

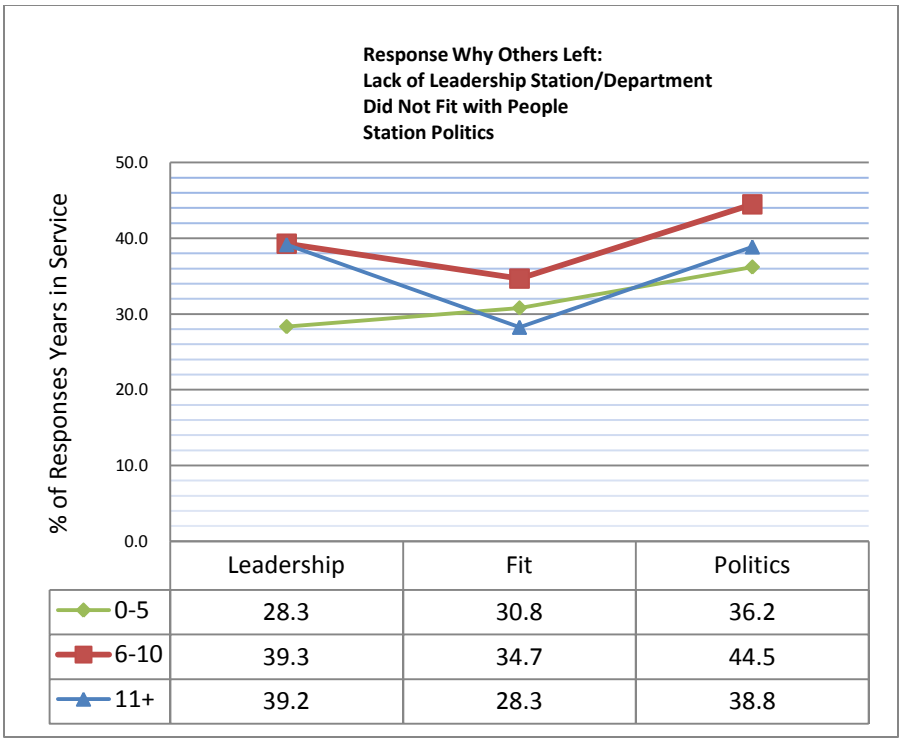
In summary, while the response rates for these three reasons for leaving ranged from 25.6% to 50% within the respondent groups this range of variation may be indicative of the multiple response options by each of the survey participants. Moreover, the fact that between 25% and 50% of the respondents in these groups feel that leadership, fit, and politics are significant factors in firefighters leaving the service demonstrates that these considerations demand attention with regard to firefighter retention.

When comparing the results from another recent survey conducted by the Volunteer & Combination Officers section of the IAFC (http://www.zoomerang.com/Shared/SharedResultsSurveyResultsPage.aspx?ID=L24PVLVM3WQD) to this one, the importance of this issue becomes apparent. That survey of 979 officers asked for the reasons given by volunteer or paid-on call members who had left the department. Only 8% of the respondents to the survey stated that "Department Leadership" was an expressed reason for leaving. These results contrast to more than 35% of the respondents in the survey under review here. Although the questions are significantly different in that one asked about expressed reasons and the other asked about beliefs, the difference between officers and the general firefighter population was nonetheless considerable.

Descriptive Analyses: "Years in Service"

A breakdown of firefighters by years in service helps to clarify their response rates to perceived developmental problems that relate to others leaving the fire service. To compare years in service categories with different range years, this analysis attempts to equalize the populations by tallying the surveyed populations with fewer years in service (<1 year, 1-2 years, and 3-5 years) to create a new 0-5 years in service category. Merging of these categories obscured the single response results in the <1 year in service category for the "All Paid" and "Paid/Mostly Volunteer" firefighters.

As noted in the following figure, newer firefighters in the 0-5 service-years category (green) responded to leadership and political issues at lower rates than their senior peers. For the "Fit" category, the group responded at comparable levels to the firefighters with the most seniority. Overall, when choosing these three response categories (leadership, fit, and politics), the firefighters with 0-5 years in service responded at lower rates or within a few percentage points when compared to their more senior counterparts.



Contrary to the lower response rates within the newer population of firefighters, the 6-10 service-years category responded at higher rates – across the board – than their peers. "Politics" dominated the responses within this group. For the 11+ service-years category, "Fit" ranked the lowest while nearly 40% of the firefighters listed "Leadership" and "Politics" as reasons for others leaving the fire service.

Overall, the distribution of results related to departmental issues indicated a distinct difference in response rates based on years in service. The firefighters with 6-10 service years responded at higher rates than their peer groups, while the newest group comparatively responded the least for leadership and political issues, but mentioned "Fit" as a concern for those leaving their departments.

Correlation Analysis Methods – Cross Tabulations

Beyond examining the distribution of responses, analysts can – within limitations – derive quantitative correlations between the responses to pairs of questions. Determining the level of correlation between variables suggests what characteristics of firefighters might correlate with traits that are associated with long-serving firefighters (retention). In addition to these characteristics, other correlation traits might encourage firefighters to volunteer for service (recruitment).

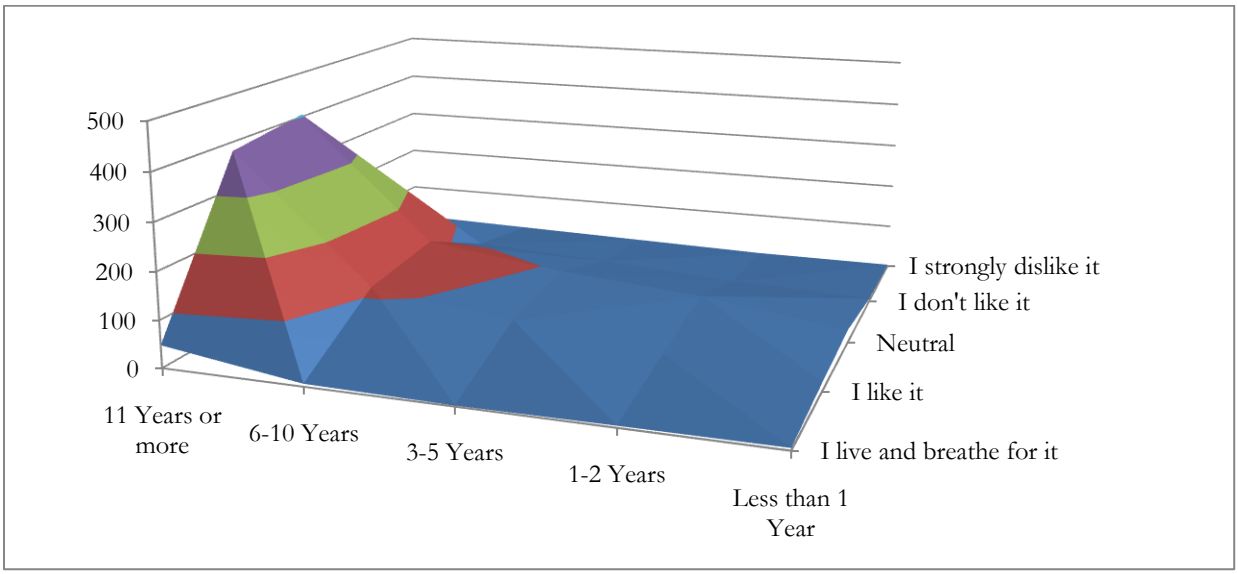
Correlations begin by generating cross-tabulations between any two variables. This process essentially produces a two-dimensional frequency distribution with the categories for one variable tabulated in rows and the categories for the second variable tabulated in columns. The value in any cell of the resulting matrix is the count of respondents who chose both the category associated with the row variable and the category associated with the column variable. For example, the following table shows the cross-tabulation of the variables "Length of Service" and "Enjoyment of Duties-Administrative".

Sum of Count	Enjoy Duties - Administrative					
Years in Service	I live and breathe for it	I like it	Neutral	I don't like it	I strongly dislike it	Grand Total
11 Years or more	48	381	405	104	21	959
6-10 Years	6	113	133	49	15	316
3-5 Years	2	75	94	34	9	214
1-2 Years	4	38	69	16	3	130
Less than 1 Year	5	19	29	6	3	62
Grand Total	65	626	730	209	51	1681

This cross-tabulation allows comparisons to determine the correlations between these variables. In the example above, some trends are clear in these numbers. First, in every category more firefighters are neutral with regard to their enjoyment of administrative duties. However, over 44% of the firefighters who have 11 or more years of service, chose the categories of "I live and breathe for it" or "I like it" with regard to their enjoyment of administrative duties, while the corresponding percentages for the other years in service categories are 37.7%, 36%, 32.3%, and 38.7%, respectively.

While this relationship may not be extraordinarily strong, and while the correlation between enjoyment of administration duties and length of service may not represent a causal relationship, the relationship exists nonetheless. In this case, these results could be interpreted to mean that one may be able to encourage retention by 1) targeting persons who are more predisposed to administrative duties, 2) making administrative duties more attractive to firefighters with fewer years of service, or 3) reducing administrative duties altogether for more junior firefighters.

With this cross-tabulation, the visualization displays the values of the matrix in three dimensions. In this case, the results include the counts of firefighters choosing their respective categories. This three-dimensional visualization provides the ability to view the general trend of the responses across the two variables.



Correlation Analysis Methods – Chi-squared Test for Independence

Finally and perhaps most importantly, the Chi-squared test for independence uses these cross-tabulations to test the strength of the correlation relationship between these two variables. This test is appropriate with two

categorical variables from the same population, which is the case here. Moreover, the sampling strategy is simple-random sampling where no firefighter has a greater chance than any other to complete the survey, and the sample is no more than one-tenth the size of the population. In this case, the 1,719 responses are less than 10% of the total number of firefighters in Virginia – approximately 26,500 in 2010.

In order to determine the extent to which we can determine the category of one variable from the category of the other variable we first need to formulate our null and alternative hypotheses. In the case of this example, the hypotheses are:

- Null hypothesis → N_0 = The responses to "Years in Service" are independent of the responses to "Enjoyment of Duties – Administrative"
- Alternative hypothesis → Na = The responses to "Years in Service" are not independent of the responses to "Enjoyment of Duties – Administrative"

If we can reject the null hypothesis, and therefore accept the alternative hypothesis, we can act with some certainty in the knowledge that we can predict the response to one variable from the response to the other. If we can predict "Years in Service" from the attitudes toward "Administrative Duties", we can use this to our advantage in recruitment and retention efforts.

Once we have established our analytical framework, we can use the Chi-squared test for independence to determine whether we can reject the null hypothesis with some level of certainty. This test requires us to determine the number of degrees of freedom available for the test. Generally, the degrees of freedom are the number of independent pieces of information available to generate the value of the statistic.
In the Chi-squared test, the equation to calculate the degrees of freedom follows:

$$\text{d.f.} = (r - 1) * (c - 1)$$

where r is the number of categories for the row variable, and c is the number of categories for the column variable.

The Chi-squared test determines the level of correlation based on the difference between the expected frequencies and the observed frequencies in each cell of the cross-tabulation. We therefore must compute r * c expected frequencies, according to the following formula:

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where $E_{r,c}$ is the expected frequency count for level r of the row variable and level c of the column variable, n_r is the total number of sample observations at level r of the row variable, n_c is the total number of sample observations at level c of the column variable, and n is the total sample size. In the example using the cross-tabulation given above, the calculation of the expected value for the 1st row and 4th column cell (with an observed frequency of 104) would be calculated as:

The test statistic itself compares the observed and expected frequencies by using of the following equation:

where $O_{r,c}$ is the observed frequency count in cell r,c and Er,c is the expected frequency count for the same cell.

With a value for the Chi-squared test statistic in hand, and the appropriate degrees of freedom, we can compare the value of the test statistic against the reference Chi-squared distribution. This comparison allows us to determine the probability that the correlation we see in the data happened by random chance. If it is unlikely that the correlation is due to random chance, then we can reject the null hypothesis and act with certainty in the knowledge that the variables are related.

The probability level at which the null hypothesis is a subject of considerable debate, and is generally based on discipline or area specialty norms. A p-value of 0.05 is common, although there is substantial variation in accepted values. For the example above, the derived p-value is 0.002. This means that a value of this statistic, as extreme as the value found in this case, only occurs 2 times in 1000 by random chance. Therefore, it is very unlikely that this relationship has occurred due to random chance, and with that level of certainty, we can reject the null hypothesis that these variables are independent.

In the following section, we use the cross-tabulations, their visualizations, and the Chi-squared test to examine a series of relationships and make suggestions about potentially significant relationships that may have consequences for recruitment and retention of firefighters.

Correlation Relationships that Suggest Actions for Recruitment and Retention

Since the survey results database has 96 variable columns that correspond to firefighter responses, it is theoretically possible to generate correlations from every possible pair of variables. However, these combinations would generate 96*95 = 9,120 correlations. We do not recommend generating this number of correlations for two reasons; first, many of these correlations would not make logical sense. For example, correlating a variable measuring why a firefighter is compelled to enlist with a variable describing why firefighters believe others have left the service would not generate actionable information. Second and perhaps most importantly, it would be extremely difficult to derive actionable information from that many correlation data points.

In the light of the issues in this section, we select variables for correlation analysis that we feel may give some insight into the motivations of firefighters to do their jobs and to stay in their jobs for an extended time. In this spirit, we focus on the variable of "Years in Service" as it appears to be appropriate for measuring the characteristics of tenured firefighters. The first example that follows focuses on the variables regarding "What

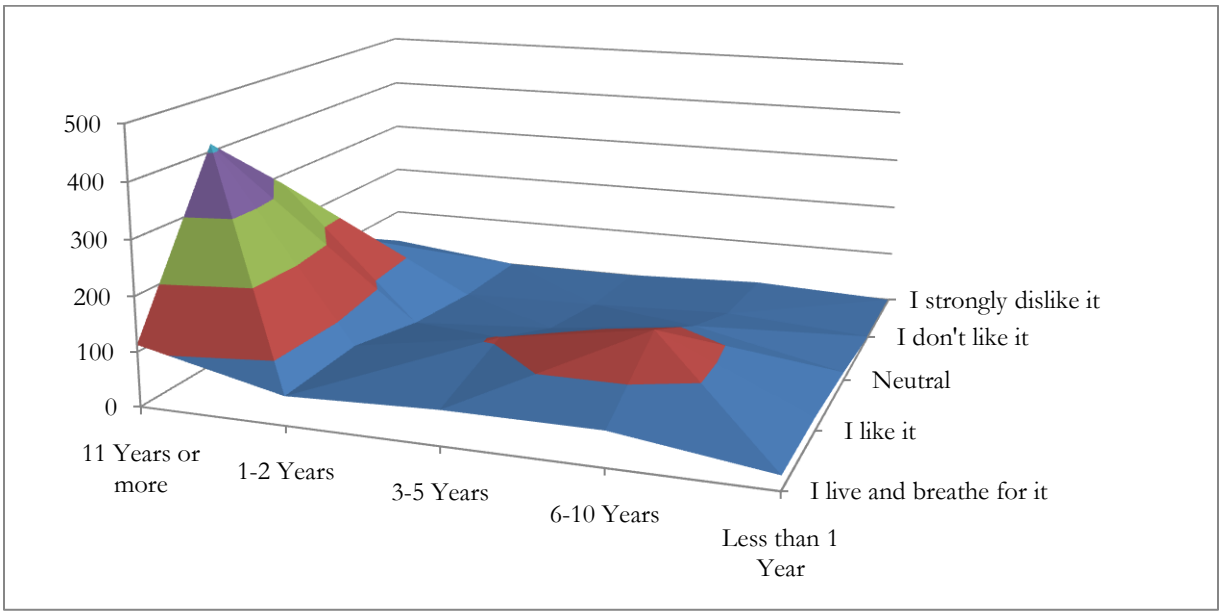
Compelled your Enlistment" for insight into recruitment. The second example looks into issues regarding the use of social media to inform recruitment efforts.

"Years in Service"

In contrast to the above example where longer serving firefighters are more likely to enjoy administrative duties, there are less-popular duties among firefighters with greater time in service. When we examine the correlation between "Years in Service" and "Enjoyment of duties – Medical Response" we see a strong relationship between length of service and a drop in the enjoyment of this type of duty. We include both the actual and the expected values in the tables below.

Actual Values	Enjoy Duties – Medical Response					
Years in Service	I live and breathe for it	I like it	Neutral	I don't like it	I strongly dislike it	Grand Total
11 Years or more	113	414	281	107	31	946
1-2 Years	53	58	22	4	1	138
3-5 Years	63	104	40	10	1	218
6-10 Years	63	148	74	20	11	316
Less than 1 Year	26	25	15	1		67
Grand Total	318	749	432	142	44	1685

Expected Values	Enjoy Duties – Medical Response					
Years in Service	I live and breathe for it	I like it	Neutral	I don't like it	I strongly dislike it	Grand Total
11 Years or more	179	421	243	80	25	946
6-10 Years	26	61	35	12	4	138
3-5 Years	41	97	56	18	6	218
1-2 Years	60	140	81	27	8	316
Less than 1 Year	13	30	17	6	2	67
Grand Total	318	749	432	142	44	1685



By examining the cross-tabulations of observed and expected values we can see that there are far fewer firefighters who have served 11 or more years who "Live and breathe" for "Medical Response" duties than is

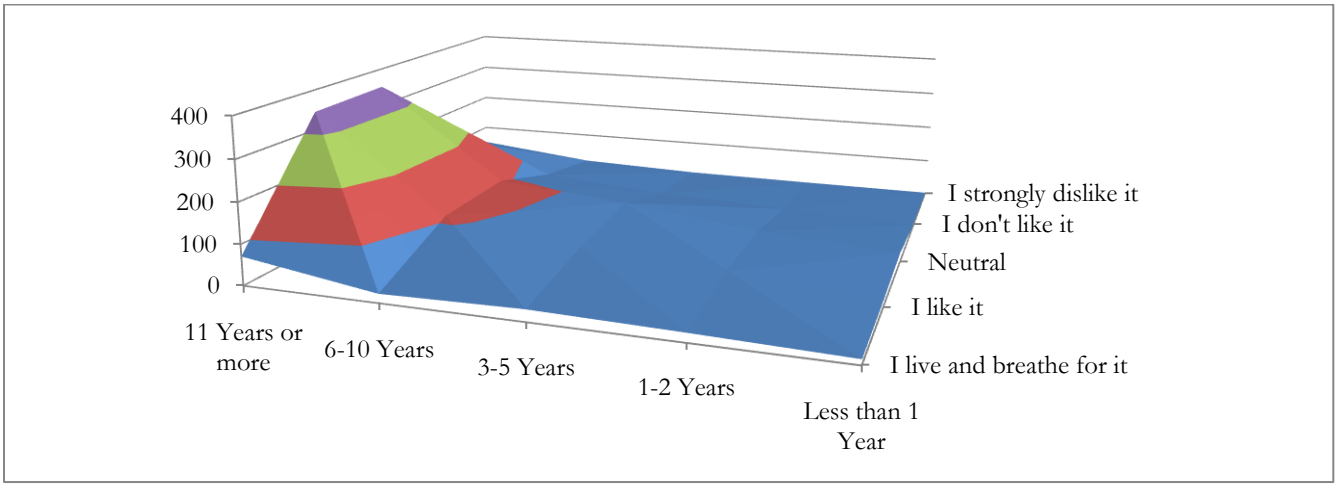
expected. Further, there are fewer in the "I like it" category, and more in each of the "Neutral", "I don't like it", and "I strongly dislike it" categories that are expected. Conversely, every other category of "Years in Service" has more than the expected number who "Live and breathe for it". The Chi-squared statistic is extremely strong in this case with a p-value of $1.4*10^{-19}$.

There appears to be a very strong relationship between less of an affinity for medical response and length of service. Why does this relationship exist and how can it encourage retention? Is this a reflection of a change in duties over a number of years, where more medical response is now the norm? Is it possible that firefighters who enjoy medical response are leaving to pursue greater opportunities to practice that duty? If so, are there means of encouraging them to stay, perhaps by increasing medical response training for those who are interested?

A nearly identical relationship exists with the cross-tabulation between "Years of Service" and "Enjoyment of Duties – HAZMAT". This has a low p-value (0.0001), suggesting a strong correlation between the variables.

Observed Values	Enjoy Duties – HAZMAT					
Years in Service	I live and breathe for it	I like it	Neutral	I don't like it	I strongly dislike it	Grand Total
11 Years or more	71	345	351	137	51	955
6-10 Years	22	109	115	51	16	313
3-5 Years	29	67	85	24	6	211
1-2 Years	22	46	44	11	4	127
Less than 1 Year	13	16	25	1	3	58
Grand Total	157	583	620	224	80	1664

Expected Values	Enjoy Duties – HAZMAT					
Years in Service	I live and breathe for it	I like it	Neutral	I don't like it	I strongly dislike it	Grand Total
11 Years or more	90	335	356	129	46	955
6-10 Years	12	44	47	17	6	127
3-5 Years	20	74	79	28	10	211
1-2 Years	30	110	117	42	15	313
Less than 1 Year	5	20	22	8	3	58
Grand Total	157	583	620	224	80	1664



Again, it may be that these specialized response duties appeal more to younger firefighters, or that these duties are not the norm when the older firefighters entered the service. The same relationship repeats with regard to "Enjoyment of Duties – Fire Prevention" and "Enjoyment of Duties – Community Outreach" (p-values of 0.005 and 0.0001, respectively).

Observed Values	Enjoy - Fire Prevention					
Years in Service	I live and breathe for it	I like it	Neutral	I don't like it	I strongly dislike it	Grand Total
11 Years or more	99	499	295	56	12	961
6-10 Years	37	166	92	11	8	314
3-5 Years	41	112	56	6	3	218
1-2 Years	24	78	30	2	2	136
Less than 1 Year	12	29	25			66
Grand Total	213	884	498	75	25	1695

Expected Values	Enjoy - Fire Prevention					
Years in Service	I live and breathe for it	I like it	Neutral	I don't like it	I strongly dislike it	Grand Total
11 Years or more	121	501	282	43	14	961
6-10 Years	39	164	92	14	5	314
3-5 Years	27	114	64	10	3	218
1-2 Years	17	71	40	6	2	136
Less than 1 Year	8	34	19	3	1	66
Grand Total	213	884	498	75	25	1695

Observed Values	Enjoy – Community Outreach					
Years in Service	I live and breathe for it	I like it	Neutral	I don't like it	I strongly dislike it	Grand Total
11 Years or more	126	548	252	28	12	966
6-10 Years	47	184	74	6	8	319
3-5 Years	52	126	35	3	3	219
1-2 Years	28	90	19	1	1	139
Less than 1 Year	19	35	13			67
Grand Total	272	983	393	38	24	1710

Expected Values	Enjoy – Community Outreach					
Years in Service	I live and breathe for it	I like it	Neutral	I don't like it	I strongly dislike it	Grand Total
11 Years or more	154	555	222	21	14	966
6-10 Years	51	183	73	7	4	319
3-5 Years	35	126	50	5	3	219
1-2 Years	22	80	32	3	2	139
Less than 1 Year	11	39	15	1	1	67
Grand Total	272	983	393	38	24	1710

From these results, it appears that there are clear differences. The firefighters who have served for various lengths of time have different preferences for duties. Firefighters who have served for 11 years or more are likely to enjoy administrative duties, and less likely to enjoy medical response, HAZMAT response, or community outreach duties, than their counterparts with fewer years of service.

"What Compelled your Enlistment?"

Based on the results of this survey, there are several challenges in addressing issues of recruitment. First, of course, officials administered the survey to existing firefighters, a group that has already gone through several – if not many – screening processes since their initial recruitment. Second, many of the respondents have served for more than 11 years (and some for decades according to written comments), so their experiences with regard to their own recruitment happened some time ago. Third, as demonstrated in the descriptive analysis, there was an overwhelming response (58.4% of respondents) from firefighters indicting that their personal contact with friends or family members significantly influenced their decision to enlist.

This response is so overwhelming that it needs no further analysis. It would clearly be a benefit to exploit this knowledge in the recruitment of volunteer firefighters. The question here is *what else* has a significant influence on the decision to enlist? Toward that end, the following lists the deletions to the survey database:

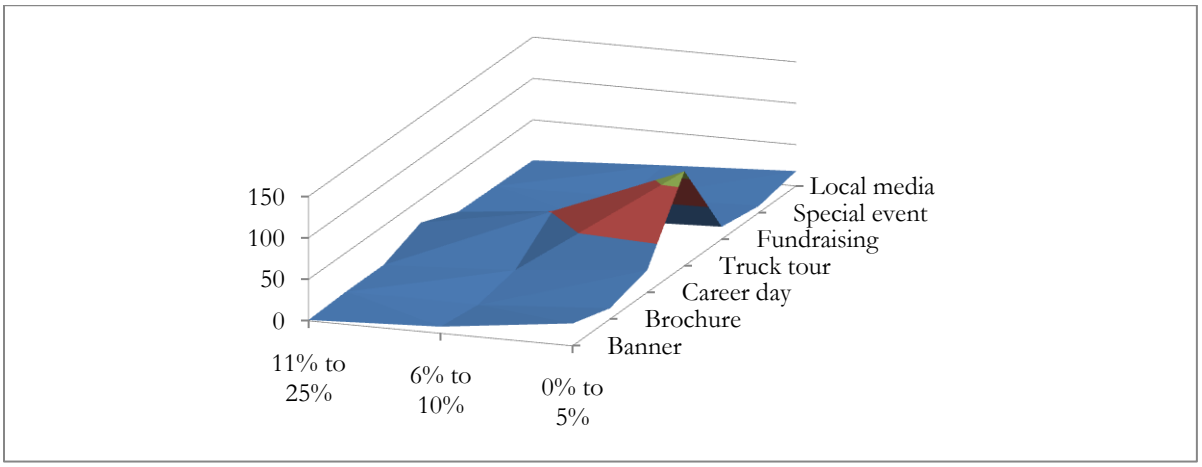
- Due to the acceptance of their overwhelming influence
    - Friend or Family Member Referral
    - Personal Contact with a Firefighter
- Due to an appropriate strategy to take advantage of such circumstances, even for the benefit of volunteer firefighter recruitment efforts
    - "Experienced, Family, Friend, or Personal Tragedy"
- Due to minimal respondent selection:
    - Radio
    - Email
    - Television
    - Facebook
    - Newspaper

After narrowing down the database and the possible enlistment tools, the remaining categories are "Banner at the Station", "Brochure", "Station or Truck Tour", "Participated in Fundraising", "Special Event", and "Story in the Local Media". In order to generate a single variable for the correlation analysis, the following table ranks these categories by the number of respondent who chose them. It is assumed that the higher the ranking the more important an impetus this enlistment tool is to the respondent. This is a significant assumption, but no other logical alternative presents itself.

Since the purpose of this analysis is to see what will influence potential recruits, *other than* those with personal contacts among firefighters, the next step cross tabulated the "Enlistment Tool" variable with the variable "Firefighter Social Circle % Before Service". Hopefully, this correlation will show that those firefighters who did not have personal contact are more likely to be influenced by a particular enlistment tool. Unfortunately, as the observed and expected values on the cross-tabulations show, there is no particular trend toward a specific enlistment tool based on a variation in the percentage of a recruit's social circle in the fire service.

Observed Values	Enlist Tool							
% Social Circle	Banner	Brochure	Career day	Truck tour	Fundraising	Special event	Local media	Grand Total
11% to 25%	1	3	3	22	3	2	1	35
6% to 10%	8	2	12	51	9	3	10	95
0% to 5%	27	13	27	114	15	8	18	222
Grand Total	36	18	42	187	27	13	29	352

Expected Values	Enlist Tool							
% Social Circle	Banner	Brochure	Career day	Truck tour	Fundraising	Special event	Local media	Grand Total
11% to 25%	4	2	4	19	3	1	3	35
6% to 10%	10	5	11	50	7	4	8	95
0% to 5%	23	11	26	118	17	8	18	222
Grand Total	36	18	42	187	27	13	29	352



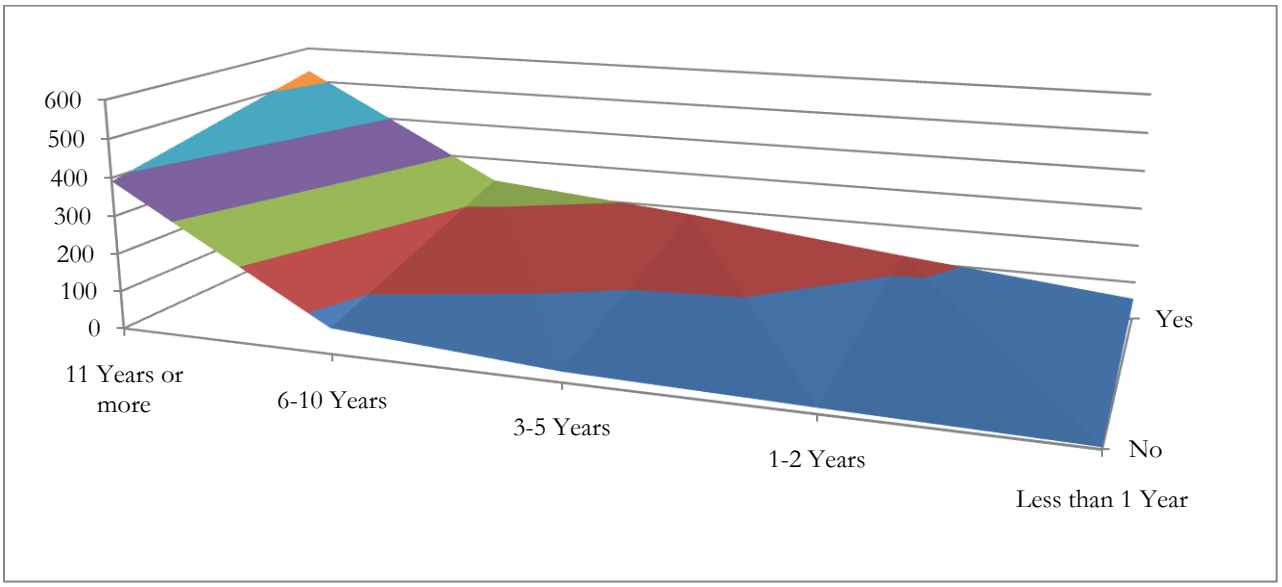
The Chi-squared statistic confirms this result (p-value of 0.63) and we are unable to reject the null hypothesis.

"Do you use Facebook?"

There is significant interest in using new means of social media to attract recruits for volunteer fire service. This is the motivation for including questions on this topic in the survey. While it may not be an unexpected finding, we can show that firefighters with more years of service are far less likely to use Facebook than their more recently enlisted colleagues.

Observed Values	Do you use Facebook?		
Years in Service	No	Yes	Grand Total
11 Years or more	391	531	922
6-10 Years	67	235	302
3-5 Years	27	182	209
1-2 Years	15	116	131
Less than 1 Year	5	55	60
Grand Total	505	1119	1624

Expected Values	Do you use Facebook?		
Years in Service	No	Yes	Grand Total
11 Years or more	287	635	922
6-10 Years	94	208	302
3-5 Years	65	144	209
1-2 Years	41	90	131
Less than 1 Year	19	41	60
Grand Total	505	1119	1624



There is a clear trend showing that far more of the newer (and presumable younger) firefighters use Facebook than would be expected if there were no correlation between "Years in Service" and use of Facebook. Conversely, the firefighters with longer tenure are far more likely not to use Facebook than would be otherwise expected. This trend is confirmed by an extraordinarily strong value of the Chi-squared statistic (p-value = $1.5*10^{-28}$). There is no question that, when younger potential volunteers are the target audience for volunteer enlistment materials, Facebook is a viable medium for disseminating these materials. Moreover, although firefighters with more years of service are less likely to use Facebook, a significant percentage of them did in fact use it. Nearly 58% of the firefighters with 11 or more years of service did state that they use Facebook.

Interestingly, the firefighters themselves appear to be less enthusiastic about Facebook as a recruiting tool than might have been expected given the number who use Facebook themselves. Compare the observed

values for firefighters' belief in Facebook to recruit firefighters (below), to the observed values for firefighter use of Facebook (above).

Observed Values	Facebook to recruit?		
Years in Service	No	Yes	Grand Total
11 Years or more	403	519	922
6-10 Years	119	183	302
3-5 Years	61	148	209
1-2 Years	37	94	131
Less than 1 Year	22	38	60
Grand Total	642	982	1624

In every category of "Years of Service", fewer firefighters respond that Facebook is appropriate to recruit than responded that they use Facebook themselves. This simply illustrates that some firefighters feel that Facebook may be inappropriate for recruitment efforts. To pursue a Facebook recruitment strategy, it may be worthwhile to try to explore why some firefighters feel this way and to try to anticipate any difficulties in the use of Facebook for recruitment.

Additional Relationships and Validity Issues

Lastly, there are several unreported relationships described in detail here. This is generally for one of two possible reasons. First, there is a rule of thumb that when conducting a Chi-squared test for independence - any one cell of the cross-tabulation matrix may not have fewer than 5 respondents. Although this did not occur frequently with the testing, it did occur. Other relationships have many cross-tabulation cells with fewer than 5 respondents per cell. Examples of such relationships included:

- "Years in Service" with "Enjoyment of Duties – Training"
- "Years in Service" with "Enjoyment of Duties – Fire Response"

On examining these relationships the small (or zero) values in many of the cells are due to near unanimity of answers across all categories. While answers that are uniform across categories certainly tell us about the likes and dislikes of fire fighters, they do not allow us to discriminate between subgroups, or to use the differences between them to our advantage in recruitment or retention efforts.

Steps Moving Forward

We hope that the analyses above (and subsequent investigations) will be of continuing use. In the continuing research and applied recruitment and retention efforts, we see three primary areas. For immediate and medium-term contributions, see below.

Informing the Marketing Process

The analyses presented above are all intended only to support the overall research effort designed and implemented by the IAFC on behalf of the VFCA. In the short term, the relationships described above can inform the developing marketing strategies. Hopefully, ongoing discussions with the marketing experts can lead to additional research questions that encourage greater success in recruitment and retention.

Additional Statistical Analyses

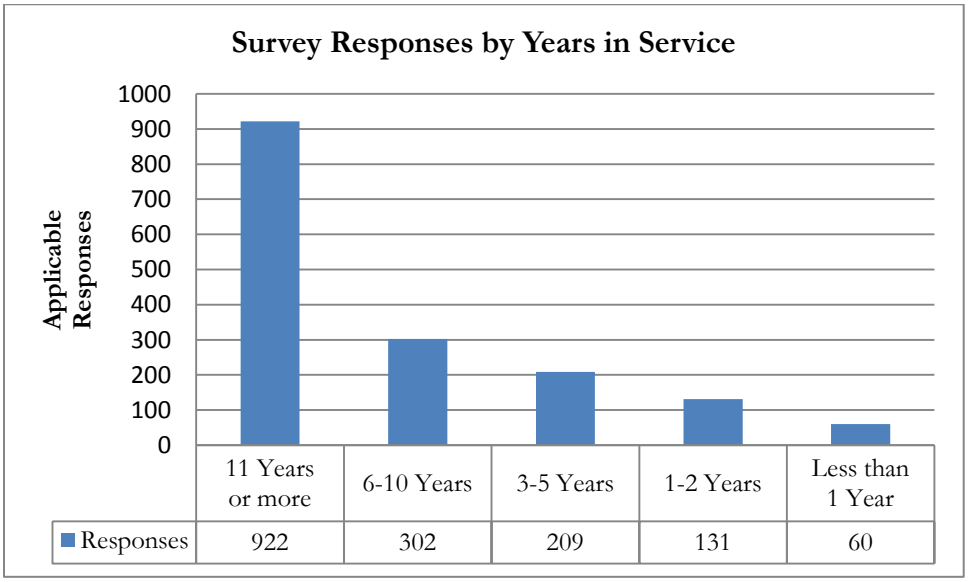
There are several avenues for additional statistical analysis should it prove useful to the overall effort. These generally separate into three groups:

- Ongoing additional descriptive analysis as identified by any of the interested parties
- Additional correlation analysis identifying relationships of interest based on ongoing discussions
- Analysis exploration of the technique Analysis of variance (ANOVA) to determine if a relationship were to exist between variables, where in the distribution the variables move in unison.

Recommendations for future surveys

It appears that the survey is successful in allowing several parties to generate useful descriptive and inferential statistics from the data. However, the results highlight areas for improvement when conducting additional future surveys. For example, in some variables it is possible to see that the questions did not capture the possible variety in the responses.

A good example of this is the "Years in Service" question. After diagramming the 'Years in Service" responses in a histogram, it is clear that we are not capturing all the possible diversity in the distribution. A large majority of the distribution are in the "11 Years or more" category, while relatively few are in the "1-2 Years" and "Less than 1 year" categories. Based on this distribution, we suggest using 5-year age cohorts (0-4, 5-9, 10-15, etc.) to evenly spread the results across this distribution.



Another example concerns the questions phrased as "What compelled your enlistment?". For these questions, the respondents are able to check all possible options that they feel have an influence on their enlistment. This is important information since many firefighters hear about the service from different venues. For the kind of analyses in this report, knowing the firefighters' primary motivation for enlisting in the service would be useful to know. Although these are just two examples, the larger consideration is that we should take the time to review the survey results in order to assess the lessons learned for improving future ones.