

**The Effects of Sleep Deprivation on
The Violet Township Fire Department**

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CERTIFICATION STATEMENT

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ABSTRACT

This study has addressed how sleep deprivation affects the firefighters of the Violet Township Fire Department and determined that there is a possibility that this issue may compromise the safety and health of our employees or the public we serve. The purpose was to identify sleep deprivation issues among our members. This research will be presented to the fire department administration in an effort to develop policies and practices to improve the productivity, health and safety of our members.

This study investigated the following research questions. 1. What is the definition of sleep deprivation and what are the documented signs and symptoms of it? 2. Do a number of our employees suffer from one or more of the negative effects of sleep deprivation, as defined in previously documented studies? 3. Have members of our department personally experienced possible effects of sleep deprivation that could have or did lead to accidents or close calls during the course of routine operations? 4. Is there a need to enact policies in regards to maximum number of consecutive hours worked or mandatory rest periods between shifts or when working another job? 5. What policies and procedures could be implemented at Violet Township Fire Department to alleviate any negative effects to our employees found in this study?

An internal survey determined that there is not currently an issue with sleep deprivation amongst our employees. External survey results show definitive issues within the fire service as a whole on sleep deprivation issues.

Violet Township Fire Department must stay aggressive on this issue through continued Health & Safety Programs, developing Policies and Procedures and analyzing statistical trends from the required yearly physicals to ensure that Sleep Deprivation does not become an issue within this department.

Table of Contents

Introduction	3
Statement of the Problem	3
Purpose of the Study	4
Research Questions	4
Background and Significance	5
Literature Review	6
Procedure	11
Definition of Terms	12
Limitations of Study	13
Results	13
Discussion	17
Recommendations	22
References	23
Appendix 1 Survey Results	26
Appendix 2 Survey Questions VTFD	32
Appendix 3 Survey Questions Non-VTFD	50

INTRODUCTION

Statement of the Problem

The problem this study will address is how sleep deprivation affects the firefighters of the Violet Township Fire Department and if these affects are compromising the safety and health of our employees and the public that we are sworn to help.

Some of the biggest disasters in recent history have been attributed to sleep deprivation. The nuclear accidents at Three Mile Island and Chernobyl and the oil tanker incident with the Exxon Valdez all list sleep deprivation as a contributing factor. (Peri, 2010) Firefighters and paramedics do not mess with nuclear chemicals or pilot ships through dangerous shipping channels; they are entrusted with so much more. Parent's trust firefighter paramedics with their most precious possessions when they unquestioningly hand over their child's lifeless body, home and business owners trust them to enter their properties unescorted during an emergency and motorist trust them while they are responding in a thirty ton fire truck through rush hour traffic with their lights flashing and siren wailing. Most people are taught from a very young age to trust those in Public Safety, the firefighter's, paramedic's and police officer's.

Do employees of the Violet Township Fire Department have issues with sleep deprivation that could be putting them or the public they serve at risk? Without having policies and procedures in place combat the negative effects of sleep deprivation that the Violet Township Fire Department could unintentionally be putting both their employees and the citizens they serve at risk. There has been little training for fire department administrators in the realm of sleep deprivation. Most employees do not even have a basic understanding of the possible effects of sleep deprivation to themselves and the public that they serve. Studies have shown that sleep deprivation can contribute to an increase in accidents and on the job injuries, a slowing

of the cognitive process and serious health related issues. (Vila, 2009) Some data even exist that shows that sleep deprivation can have the same effect as being legally drunk.

The significance of this study is that the results will be used to implement changes to the policies and procedures of the Violet Township Fire Department. These changes have the potential to increase the safety and wellness of our employees and to increase the productivity and consistency of care to the end user in the street. Some of these changes may also involve attitude and cultural changes to both the fire department employees and administration.

Purpose of the Study

The purpose of this study is to identify if there are sleep deprivation issues among the members of the Violet Township Fire Department and if so what effects they have to the department and our members both on and off duty. The findings of this research will be presented to the fire department administration in an effort to develop policies and practices to improve the productivity, health and safety of our members.

Research Questions

The research questions this study will investigate are to be answered by this descriptive research:

1. What is the definition of sleep deprivation and what are the documented signs and symptoms of it?
2. Do a number of our employees suffer from one or more of the negative effects of sleep deprivation, as defined in previously documented studies?
3. Have members of our department personally experienced possible effects of sleep deprivation that could have or did lead to accidents or close calls during the course of routine operations?

4. Is there a need to enact policies in regards to maximum number of consecutive hours worked or mandatory rest periods between shifts or when working another job?
5. What policies and procedures could be implemented at Violet Township Fire Department to alleviate any negative effects to our employees found in this study?

BACKGROUND AND SIGNIFICANCE

The Violet Township Fire Department (VTFD) was established in 1954 and covers an area of approximately 40 square miles in the northwest corner of Fairfield County. This includes the entire city of Pickerington and portions of the city of Reynoldsburg and the village of Canal Winchester and all of the unincorporated area in between. The community is mostly single family residential homes with some light industrial and commercial properties. With a population of approximately 40,000 residents and the city of Columbus adjoining our western border, Violet Township is the typical suburban bedroom community.

VTFD was an all-volunteer organization until 1986, at that time four full time fire fighters were added to work daytime hours. In 1989 a three platoon/shift system was implemented, where the firefighters worked twenty-four hours on duty, and then they had forty-eight hours off. In 2009, VTFD responded to 4344 emergency and fire runs. The majority of these emergency calls 3,454 were EMS related. (VTFD run data 2009) Unfortunately, there is no data available that breaks down run volume by time of day. With a current staff of 42 full time firefighters and 20 part-time / volunteer firefighters, these runs were taken out of three firehouses.

Violet Township Fire has always placed an emphasis on reducing accidents and injuries. There are active safety and fitness committees, along with a departmental physical therapist who are all focused on reducing injuries and improving the performance of our employees. Since the

implementation of these committees, safety awareness has increased and employee injuries have decreased.

With all of our full time staff being both firefighters and paramedics we assign them to a two day rotation. Personnel typically spend two shifts on the Engine, then two shifts on the Medic. This keeps their medic skills sharp and then allows them a 2 day break on the slower trucks. While our medics do not take an extreme amount of runs, they are steady twenty four hours a day; it is very rare that we are not woken up several times during the night for calls. We also have only one house tone with a semi open bunk room at each of our firehouses so if the medic goes out the engine crew is awakened and vice-versa.

Firefighters often complain that they “don’t sleep well while at work” or have sleep issues that spill over into their off days. All firefighters have experienced that run down feeling for days after a rough night at work. Kitchen table discussions have often indicated that many employees experience high blood pressure, high cholesterol and weight gain throughout their careers. The potential impact this study could have on the Violet Township Fire Department is that the policies and procedures of department operations will be changed to enhance the health and safety of our employees.

LITERATURE REVIEW

Sleep, like food, oxygen and water, is an essential biological need and sleep deprivation is caused when the body does not get the recommended sleep needed to reenergize the body and for the brain to store and reorganize information (Widmar 2003). A 2005 National Sleep Foundation Poll found that Americans are getting just 6.9 hours of sleep each night; this is a drop of about 20 minutes per night since 2001 and almost 2 hours less sleep per night since the 19th century (Welsh, 2010). Most people who are beginning to suffer from the negative effects of sleep deprivation do not even realize that is the problem. It is often attributed to getting older or

other stressors in life with no realization that lack of sleep just compounds those issues. Employees who work shifts, rotating hours or prolonged periods build up a “sleep debt” that is caused by a disruption in the body’s natural sleep patterns (Aveni, 1999). Studies have shown that sleep deprivation can contribute to an increase in accidents and on the job injuries, a slowing of the cognitive process and serious health related issues (Vila, 2009). Sleep deprivation causes the body to slow cognitive abilities and reaction times (Welsh, 2010). It also impairs attention, alertness, concentration, reasoning and problem solving abilities and slows reaction times as much as being drunk (Peri, 2010). Sleep deprivation is dangerous, being awake for 19 hours produces impairments that are comparable to having a blood concentration of .05 percent and being awake for 24 hours is comparable to having a blood concentration of roughly .10 percent (Vila, 2009).

Like most fire departments, Violet Township Fire Department (VTFD), requires their employees to work shifts to provide 24 hour a day seven days a week coverage for emergency response. Scheduling around the clock requires finding a way to balance each organization’s unique needs with those of its officers (Vila, 2009). The fire fighters of Violet Township easily fall into the definition of shift work. Aveni states that any work regularly scheduled outside of the normal 7 a.m. to 6 p.m. working interval is considered shift work (1999). Full-time fire fighters for VTFD work a three platoon system consisting of a 56 hour work week. Employees work 24 hours on and 48 hours off, with part time fire fighters choosing shifts in 12 hour increments often working two or more consecutive shifts. The management of VTFD has recognized that their full time employees do need a break between shifts and have included language in the current contract that states that “members working a trade or overtime may not work more than two consecutive tours of duty including their own regularly scheduled shift”

(2010). Many careers require 24 hour staffing, however, the stress and unpredictability of emergency work sets fire fighters apart from most of these other jobs (Widmar, 2010).

Sleep debt is often compared with “shift-lag” and “jet-lag” with the effect of these being very similar in terms of the physical and mental health of police officers, fire fighters and other first responders. Studies in both the U.S. and in Europe have shown that on average shift workers get seven hours less sleep every week than their day working counterparts and that they average only 5.5 hours of sleep every night (Aveni 1999). This makes it inevitable that fire fighters do build up a sleep debt or suffer from shift-lag even if they are not aware of the consequences. With this information it may be necessary to inform personnel of the negative effects of sleep deprivation before we even can truly assess if there is a problem within our department. In a 2001 NSF Poll it was reported that more than 38% of Americans work more than 50 hours a week, with those working more hours sleeping less (Hassen 2008). Shift work has been shown to interfere with normal sleep and forces people to work at unnatural times of the day when their bodies are programmed to sleep (Vila 2009). In a 2007 International Association of Fire Chiefs (IAFC) report there was a comprehensive comparison of the fire service, transportation industry and post graduate medical students in regards to sleep deprivation and effective shift management in an effort to alleviate these consequences (Elliot and Kuehl, 2007).

Some of the largest disasters in recent history, Chernobyl, Three Mile Island and the Exxon Valdez have been attributed to sleep loss (Burgess, 2007). VTFD has been very fortunate in having had very few major accidents or injuries over the past fifteen years. Our most recent and most serious accident to date occurred recently and involved a Battalion Chief’s vehicle being involved in a T-Bone style crash at 3 in the morning; this was attributed to the other driver running a stop sign and possibly suffering from some other impairment at the time of the accident. We have had numerous strain and

sprain type injuries to our personnel during operations however after investigations and in-depth reenactments there has always been a root cause found that points to improper technique or a system failure, never a root cause of sleep deprivation. This does not mean that sleep deprivation has not played a part in any of these incidents it just means it has not been the root cause of them. Often stories are told of fire fighters who had a hard time waking up for a call for service or who have been in a zombie like state for the better part of a run. It is not unusual to witness a rear seat firefighter remain partially asleep en-route to a late night run only to rouse themselves just prior to arriving on the scene. On a national average only 16.4% of fires occur during the midnight to 6:00 a.m. interval however 25.7% of fire ground injuries occur during this time frame. It is possible that fatigue among fire fighters may relate to the disproportionately higher fire ground injury rates observed for the early morning hours (Elliot and Kuehl, 2007).

Like every other fire department we are not immune to witnessing trauma and tragedy. It is not uncommon to go several months without being sent to a traumatic event and then experience death or traumatic type runs for several runs or shifts in a row. This stress is compounded by the lack of sleep or the buildup of a sleep debt. When stress is compounded, so are the associated health risks of high cholesterol, high blood pressure, weight gain and depression. Vila a veteran law enforcement officer and a professor at Washington State University, Spokane, discusses how public safety officers have the same stresses that all people have regarding family, health and finances and work related issues involving difficult work assignment and supervisors but in addition they also experience trauma and other dangerous incidents. He then ties this together with the additional stress of sleep deprivation from shift work and how this relates to many public safety officers having an increase in health related problems (2009). Fire fighters also have documented increases in their risks for cardiac disease and malignancies, which are also illnesses that may be promoted by the chronic sleep deprivation associated with long work hours (Elliot & Kuehl, 2007). In her article on WebMD, Peri cites serious problems that are

associated with sleep loss including an increase in accidents, serious health problems, weight gain and depression (2010).

There may be no magic bullet for sleep deprivation issues faced by fire fighters but there are lessons to be learned from other industries. The United States Coast Guard has implemented a Crew Endurance Management (CEM) program that strives for at least six hours of continuous sleep on all days. There have been changes in ship policies and recommendations to allow on-watch napping when work is completed and at least one other crew member is awake and on watch (Comperatore & Rivera, 2003) (Elliot and Kuehl, 2007). Shift officers must be allowed to monitor their crews for signs of fatigue and adjust schedules accordingly. It has been shown that when fire fighters work hard for 12 hours they expend the same amount of energy as someone who has run a marathon and that their bodies remain in a physiologically depressed state for up to five days. (Elliot and Kuehl, 2007). The National Wildfire Coordination group recommends a 2:1 work rest cycle for every two hours of work that the employee is provided one hour for work or rest. In addition they also have strict rules stating that no driver may drive more than 10 hours during any duty day (2004). VTFD has loosened the attitudes towards napping on duty in recent years but it is still generally frowned upon during the normal Monday through Friday working hours of 8:00 a.m. till 4:00 p.m. working interval. Short naps of 20 minutes or longer naps of approximately two hours are shown to be best at restoring the bodies physiological state (Elliot and Kuehl, 2007) (Widmar, 2010). Short naps can dramatically improve mental quickness, mood and alertness resulting in increased productivity and less risks for on the job accidents (Randall, 2003). Educational programs for shift workers on the challenges of shift work lifestyles and schedule management can help the employee deal with the inherent physical and social challenges of shift work (Sirois, 2009). Work shift times can be altered. The 10/14 shift can provide relief for fatigued and extremely busy individuals and crews through proper rest periods at the end of a ten or fourteen hour shift (Rule, 1999). Fire fighters also have a responsibility to themselves, their crew and their families to

report for duty well rested and ready for work. Fatigued workers should stay home, just as if they were intoxicated (Widmar, 2010). These suggestions will need to be studied more in depth before recommendations are made to change the current policies and procedures of the VTFD.

Procedures

There were three segments used for this study: an internal survey of Violet Township Fire Department employees, an external survey that includes other departments across the United States and a review of studies and trends being examined both within the fire service and in other industries.

The internal survey was pilot-tested by departmental officers. The final version consisted of eighteen closed ended, multiple choice questions and one open ended question pertaining to employee's general health and sleep patterns both on and off duty. This survey was sent by email to all members of the Violet Township Fire Department through their department email. The survey pool consisted of 42 full time and 20 part-time / volunteer employees. The survey was available online for ten days, with two reminder emails sent out during the survey period. The initial response from part-time / volunteer employees was very poor with only 3 personnel (15%) responding to the initial survey. Personal contact was then made with active part-time / volunteer staff with the three original respondents identified. Hard copies of the survey were then distributed to 15 additional part-time / volunteer employees with 11 (73%) of those returned anonymously to a mailbox in the Lieutenants office at Station 592. Of the 62 personnel surveyed, 46 (74%) were completed with 32 (52%) of those coming from full time employees and 14 (22%) coming from part-time / volunteer employees.

The External Survey included the same eighteen closed ended, multiple choice questions that were presented to the members of the Violet Township Fire Department with an additional 12 closed ended questions related to the demographics of their particular departments. It is

undetermined how big this survey pool actually was. This survey was sent out to forty three fire officers from across the country with an introductory statement asking them to forward it on to members of their departments. There were 208 responses to the external survey.

Research was also conducted regarding policies and procedures developed by other fire departments, the military and other industries in the area of sleep deprivation policies and practices. These included maximum hours worked, minimum rest periods, and other factors that might affect the performance and well being of employees. This also included policies dealing with internal department practices and policies regarding outside employment. These policies and procedures were researched with the anticipation of finding already established practices that will benefit the health, well-being and productivity of employees.

Definition of Terms

- CAD. Computer Aided Dispatch
- Crew. A group of fire fighters or medics usually assigned to the same fire department vehicle or station.
- Cross Staffing. When one crew staffs more than one fire department vehicle in their station. Choice of vehicle is determined by the type of emergency dispatched.
- EMS. Emergency Medical Services
- Engine. A fire department vehicle that is minimally equipped with a pump, water and hose used to suppress fires.
- GOG. General Operating Guidelines.

- Heavy Rescue. Specially equipped fire department vehicle that has capabilities beyond an Engine or a Ladder. Equipped for technical rescues such as high angle, confined space or complex extrications.
- Ladder. Short for Ladder Truck. A fire department vehicle that is minimally equipped with a large mechanized ladder or elevated platform.
- Medic. Short for Paramedic, a person trained in specific life saving measures. This term is also used to describe a fire department ambulance that is staffed with paramedics and transports patients to the hospital.
- SOG. Standard Operating Guidelines.
- SOP. Standard Operating Procedures.
- VTFD. Violet Township Fire Department

Limitations of the Study

- This study was designed for one specific fire department in central Ohio and may not be applicable to fire departments in other geographical areas.
- The study is focused on determining if there is a sleep deprivation issue among the members of VTFD and recommending ways to improve the operations of this department. There are many other aspects of safety, health and wellness that are not addressed in this study.

RESULTS

The internal survey results were designed to indicate trends and habits of the individual members of VTFD. The information obtained was designed to establish if there was a need for policies and procedures regarding sleep deprivation within the fire department and to determine if there is an issue with sleep deprivation within the department. The first research question was

a two part question, that asked what the definition of sleep deprivation is and what are the documented signs and symptoms of it? This question was studied in depth during the literature review. The first part, the definition of Sleep deprivation, is that sleep is an essential biological need and sleep deprivation is caused when the body does not get the recommended sleep needed to reenergize the body and for the brain to store and reorganize information (Widmar 2003). The second part, the documented signs and symptoms also came during the literature review. Some of the documented signs and symptoms include chronic fatigue, insomnia, high blood pressure, high cholesterol, and weight gain. These were symptoms that were directly addressed in the survey that was sent out to both the internal and external pools.

Research question number two dealt directly with the employees of VTFD asking if they suffered from one or more of the negative effects of sleep deprivation, as defined in previously documented studies. This question was explored during the survey to the internal group. The survey identified that the majority of respondents (68.1%) reported that they had less than four hours of uninterrupted sleep each night while at work. Those same respondents overwhelmingly reported (83.8%) that they received five or more uninterrupted hours of sleep each night they were off duty. A majority (69.4%) also reported that they experienced some type of trouble sleeping either at the firehouse, at home or both. There were no respondents who reported having been diagnosed with insomnia and only one member (3.2%) reported being diagnosed with chronic fatigue and a majority (83.9%) reported that they had not needed either an over the counter or prescription sleep aid. Six of the respondents (19.4%) reported that they had high blood pressure. The majority (81.6%) reported suffering from no adverse health effects, including not having high cholesterol.

An external survey was distributed through the International Association of Fire Chiefs fifteen members Medical Evaluation Task Force, two members of the International Association

of Fire Chiefs Volunteer and Combination Officers Section board of directors and the twenty members of OFE Class Ten to compare the responses of VTFD to random departments throughout the country. The demographics of the external survey reflected many similarities with the response from VTFD. The majority of the respondents (91.7%) were full time paid members of departments representing an Urban / Suburban environment. All respondents represented departments that had some type of EMS function with a nearly even split between those that performed transport functions (53.3%) and those that did first response functions (44.7%). Truck staffing of the respondents was also comparable to VTFD with the majority having a three or four man Engine (97.6%) or Heavy Rescue Crews (55.3%) and a two man Medic Crew (53.9%).

The responses to the external survey were compared to the internal survey results. Of the responses received (83.8%) reported getting less than four hours of sleep each night while on duty at the fire house. Nearly the same percentage (85.5%) reported sleeping five or more hours each night that they were off duty. The external survey also showed that over 80% of those polled reported some type of trouble sleeping with 42.3% reporting problems both on and off duty. The survey also showed that 75.7% had a desire to nap at least occasionally while on duty and 84.6% had a desire to nap at least occasionally on their days off. Only 4.5% reported no need for napping. As for negative effects to health, 3.4% reported being diagnosed with Insomnia, 1.9% reported being diagnosed with Chronic Fatigue 19.2% reported High Blood Pressure and 26.9% reported High Cholesterol. The majority (62.5%) reported no adverse health effects. Of those polled, the majority (72.1%) reported that they did not have a need for over the counter or prescriptions sleep aids. There did not appear to be any correlation between the number of people assigned to a vehicle and problems reported with sleep.

The third research question asked about if members of the department personally experienced possible effects of sleep deprivation that could have or did lead to accidents or close

calls during the course of routine operations. The results to this question were an overwhelming no. The majority of the respondents reported not having experienced an accident or close call that they attributed to fatigue. This question was asked in a way to describe experiences both on and off duty.

Research question number four discussed a need to enact policies in regards to maximum number of consecutive hours worked or mandatory rest periods between shifts or when working another job. This question was researched in two different ways. The first being habits and tendencies that were discovered during the survey portion and the second being studying department SOG / SOP and contract language of neighboring departments. Most department members that I spoke with from neighboring departments stated that they had contract language that prevented them from working more than 48 hours at a time. They were then required to have a 12 hour “rest period” before coming back to work. There were no limitations on what could be done during this “rest period.” Omni Flight the parent company of Med Flight of Ohio which provides EMS air medical transport in the central Ohio region has a very specific SOP with regards to air crew rest periods (Omniflight 2010). This is based on Federal Aviation Administration regulations for flight crews. This SOP prevents flight crews from engaging in other commercial flight activities during their rest periods. This was the only written guideline found that specifically prevented employees from participating in activities during their “rest period” that mirrored their employment activities on either a full time or part time basis.

The final research question discussed what policies and procedures could be implemented at Violet Township Fire Department to alleviate any negative effects to our employees found in this study. The answer to this question is dependent on finding negative effects of sleep deprivation on the employees of VTFD. The results of this study’s internal survey do not conclusively show that there is a major issue with sleep deprivation among our departmental

members. The study does show that there are potential issues looming in the future and that the time is now to begin an educational program on the effects of sleep deprivation and to begin implementing policies and procedures before there becomes a major issue.

DISCUSSION

Health, safety and wellness have been buzz words in the fire service for several years. When most people, fire fighters included, think about the dangers of fire fighting and emergency medical services, they think of the dangers encountered on an actual emergency scene. They do not consider the repetition of the daily activities performed. These could be as simple as the motion of climbing in and out of a truck on a daily basis for twenty five years or routinely going without sleep several times a week over the span of a career.

The findings of the internal survey were very similar in most ways to the external pool and different in others. This can be attributed to several causes. The first cause being that VTFD does not have the run volume as some of the departments included in the external survey. Every year the run volume for VTFD has increased by approximately 8 to 10% (Violet Township 2009). The department has been fortunate in the fact that run volume has increased at a relatively slow, even pace. There have not been layoffs, brown outs or staff reductions due to attrition; manpower for the department has actually increased over the past two years. That does not mean that the future will always be so pleasant.

Most VTFD employees on average get 3-4 hours of uninterrupted sleep each night (Figure 1.) The external survey showed the majority also averaged 3-4 hours of uninterrupted sleep each night (Figure 2.) VTFD employees had a higher percentage of personnel that slept 5 to 6 hours each night they were off duty than the external group. There are several factors that could affect this. First we have specific station alerting. We do not wake up every station when one truck or station receives a call for service. Based on comments in the external survey there

were several departments surveyed that woke all stations up for a single truck response.

Secondly, VTFD has three stations. The headquarters station has four vehicles that respond from it, an Engine, Heavy Rescue, Medic and Battalion Chief. With two specialty trucks, the Heavy Rescue and the Battalion Chief, this station is alerted on a more frequent basis than the VTFD station that has an Engine and Medic or the station that just has a medic. The headquarters station has a semi private bunk room with a common PA alerting system. When one truck is sent on a response the entire station is awakened, it is possible that the personnel stationed at the headquarters station do in fact get woken up more than the other two stations.

The surveys also differed in the number of people who reported trouble sleeping. VTFD reported a much higher incidence of respondents reporting no trouble sleeping either at the fire house or at home than the external survey (Figure 3.) The external showed that a higher majority surveyed reported some type of trouble sleeping either at fire house or at home than the response from the internal survey (Figure 3. & Figure 4.) When the survey results were filtered there was not any correlation between years of service or age to sleep issues on either the internal or external surveys.

The data received from survey responses regarding accidents and close calls was interesting. VTFD has a program in place to investigate accidents and to share close calls with the entire department. Unfortunately, there are very few close call incidents that are shared. The culture of the department has become more open over the last several years, especially among the officers, however there are still employees that feel that management is “out to get them” and they will not share experiences that others could learn from for fear of retribution. The majority of the respondents in both the internal and external surveys reported not being involved in an accident or close call on or off duty (Figure 5. & Figure 6.)

The comments received from the external survey were probably the most insightful. Numerous comments were made about station alerting systems. The most common suggestions were to alert only the personnel assigned to the responding vehicle. This is very difficult to implement in stations with a common or semi private dorm or bunk room for the crews. VTFD has either a common dorm or semi private bunk room at all of the firehouses. This is an issue that can currently only be resolved with new station implementation or remodeling of the current stations. Along the same lines were comments of the need for private or semi private bunkrooms to reduce noise, light and traffic in sleeping areas. The second most common comment was again directed at the station alerting systems. Instead of an immediate loud alert with lights on, it was recommend having a gradual increase in the alerting tone along with a gradual increase in lighting in the station. This would alleviate the initial jarring awake of the personnel and allow them to wake up gradually over a few seconds.

A majority of respondents in both surveys felt that there was a direct correlation between general health and general attitudes and the amount of sleep you get each night. That shows an instilled awareness that the issue of sleep deprivation is important. This is a positive sign to the importance of these issues.

RECOMMENDATIONS

Recommendations for a sleep deprivation program for the Violet Township Fire Department will guide the department in future policy development and fire station design and enhancements. These recommendations will continue a longstanding tradition of concern for health safety and wellness of department employees.

- Reestablishing a yearly report that highlights run volume by time of day, day of week, month and responding apparatus. This report has not been available since 2005. The information must be provided in a reliable,

easily analyzed package from either our CAD provider Emergidata or our dispatching center.

- Education of employees as to the dangers of sleep deprivation. This includes discussing how sleep deprivation can affect employee performance and safety while at VTFD.
- Establishing a standardized list of questions to be utilized during accident or injury investigations by the fire department safety committee. Specifically questions that pertain to the sleep or rest periods in the twenty four hour time frame prior to any accident or injury. This information has not been collected or retained in past accident / injury investigations and would be useful data in establishing trends in historical data.
- Recommended questions should include:
 - How much sleep did the employee receive during the twenty four hour time frame prior to the accident / injury?
 - Did the employee receive sleep in consecutive hours during the aforementioned twenty four hour time frame? If not, how many hours of sleep did the employee receive and how many consecutive hours of sleep occurred during each sleep period?
- Continue to investigate station alerting systems and integrate new technology when available into current stations and use the data collected in future fire station design to improve conditions for the health, safety and wellness of VTFD employees.

- Recommend the installation of a separate alerting device for the VTFD headquarters station for the Battalion Chief. The Battalion Chief sleeps in an office on the other side of this fire house. There is no reason to wake up the entire station when the chief receives an alert to respond with one of the other stations.
 - The estimated cost of a separate alerting device is approximately \$5000 and could be installed by duty personnel.

The practice of mandatory yearly physicals should be continued to alert personnel of possible health issues related to sleep deprivation. The department wellness committee must begin to collect statistical data that would be used to establish trends of health issues caused by sleep deprivation. At this time no statistical data is available as to the number of employees who are treated for high blood pressure, high cholesterol, chronic fatigue or insomnia. This data can be collected in an anonymous way to protect the privacy of the employees yet still give the department accurate data.

The Violet Township Fire Department prides itself in being at the forefront of technology, health, wellness and safety. Some of the issues involved in this study were not even on the radar with either the department members or administration. All of the issues that arose will be implemented into the cultural change that has been ongoing in the department for several years. This will make the department a safer place to work and increase the health and productivity of the employees for many years to come.

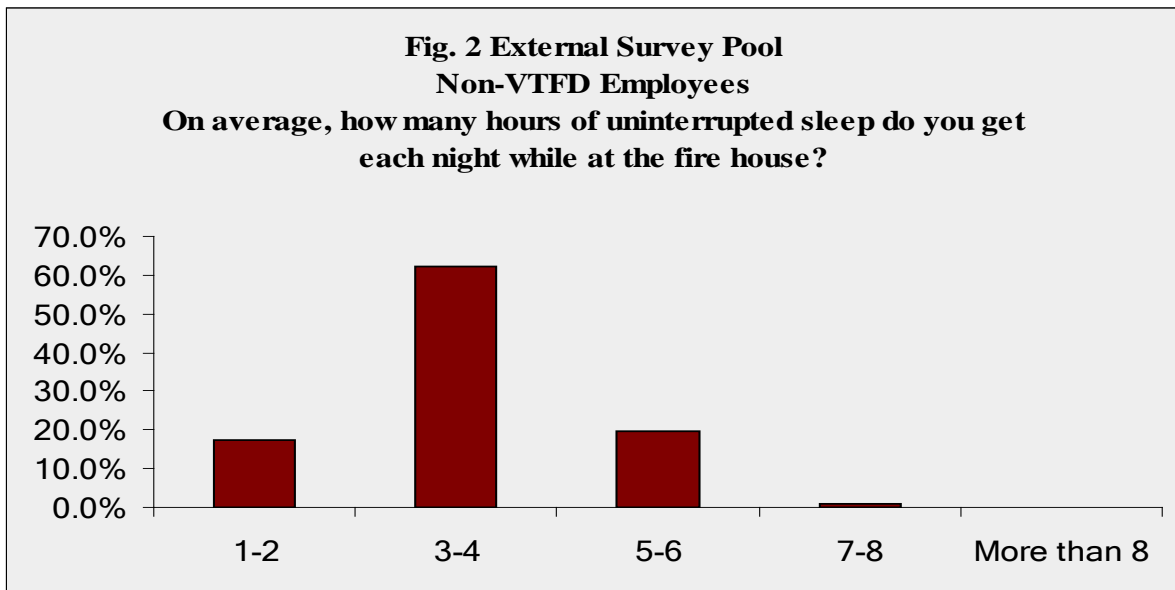
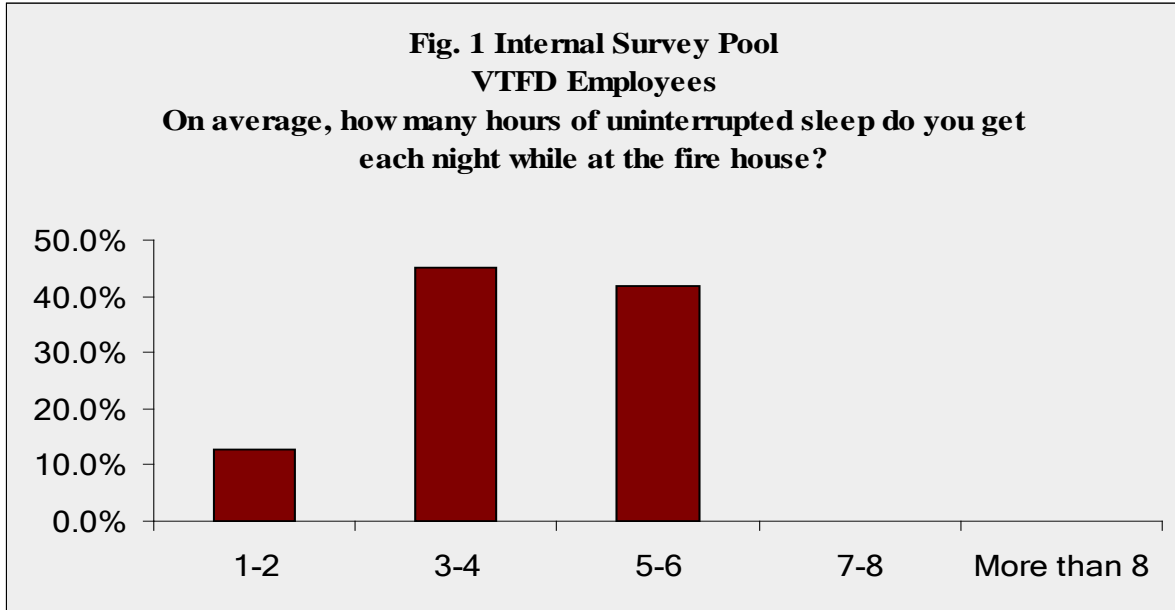
REFERENCES

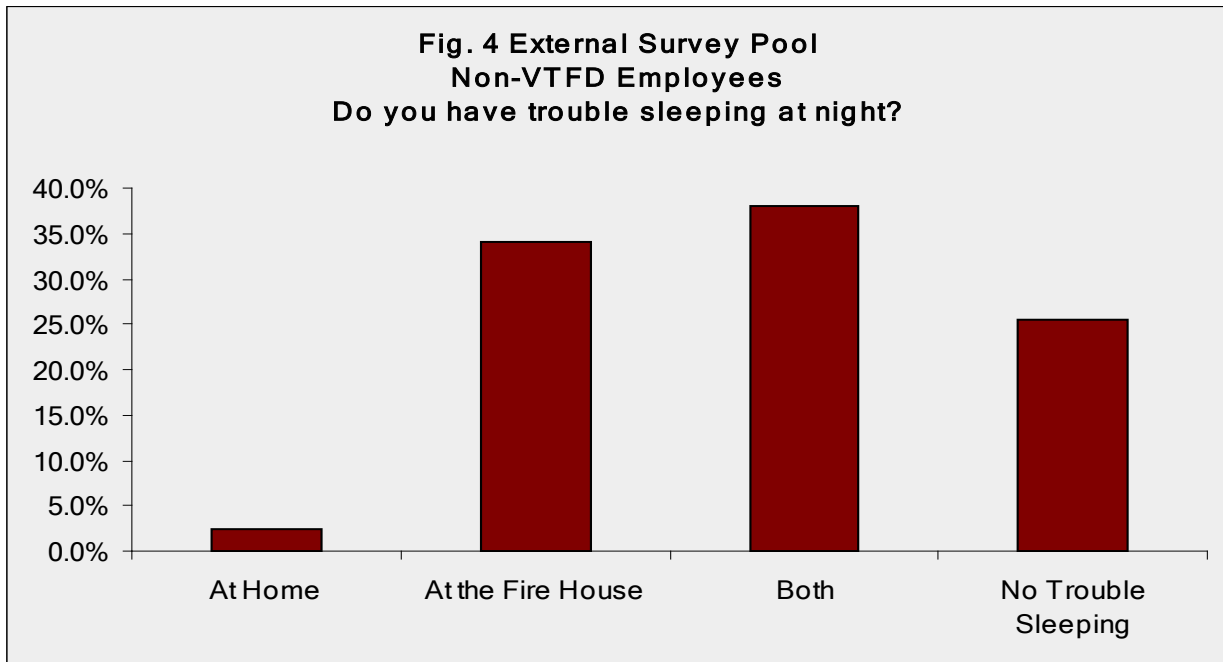
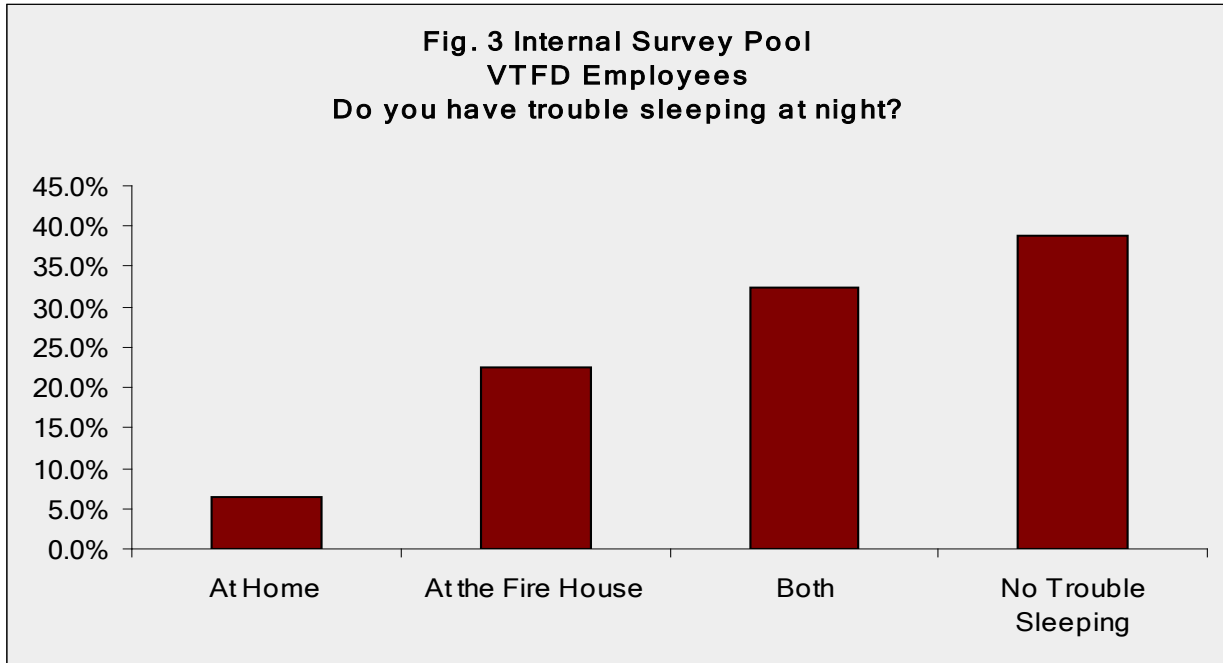
- Aveni, T.J. (1999, Summer). Shift work and officer survival. *S&W Academy Newsletter*, (31), 1-4.
- Bowen, B. (2010 December). A discussion about sleep issues in the fire service. Violet Township Fire Department Safety Committee.
- Breus, M. (2006). *Good night*. New York, NY: Penguin Group.
- Burgess, P.A. (2007) Optimal shift duration and sequence: Recommended approach for short term emergency response activations for public health and emergency management. *American Journal of Public Health*, 97, s88-s93.
- Dernocoeur, K.B. (2003. February). Sweet dreams? Sleep deprivation and shift work in EMS. *Emergency Medical Services*, 32(2) 55-59.
- Elliot, D. L., & Kuehl, K.S. (2007). *Effects of sleep deprivation on fire fighters and ems responders*. Portland, OR: International Association of Fire Chiefs.
- Foldvary-Schaefer, N. (2006). *Getting a good night's sleep*. Cleveland, OH: Cleveland Clinic Press.
- Frank, A.J. (2004, February). Fatigue management. *EMS*, 84-86.
- Grossman, D., & Christensen, L. W. (2008). *On combat*. United States: Warrior Science Publications.
- Hassen, F. (2008, February 24) *Sleep deprivation: effects on safety, health and the quality of life*. Retrieved from <http://mcclarenblog.com/?p=230>
- Idzikowski, C. (2000). *Learn to sleep well*. San Francisco, CA: Chronicle Books LLC.
- Maas, J.B. (1998). *Power sleep*. New York, NY: Villard Books.
- Peri, C. (2010, February 17). *Coping with excessive sleepiness*. Retrieved from <http://www.webmd.com/sleep-disorders/excessive-sleepiness-10/10-suprising-results>

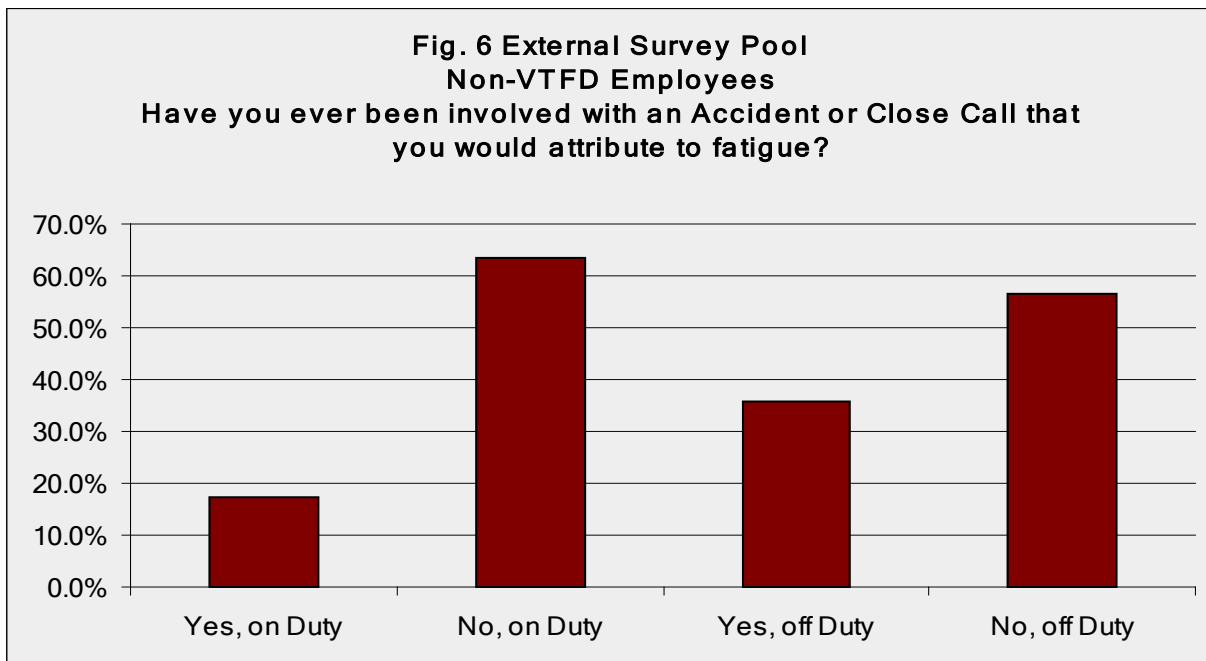
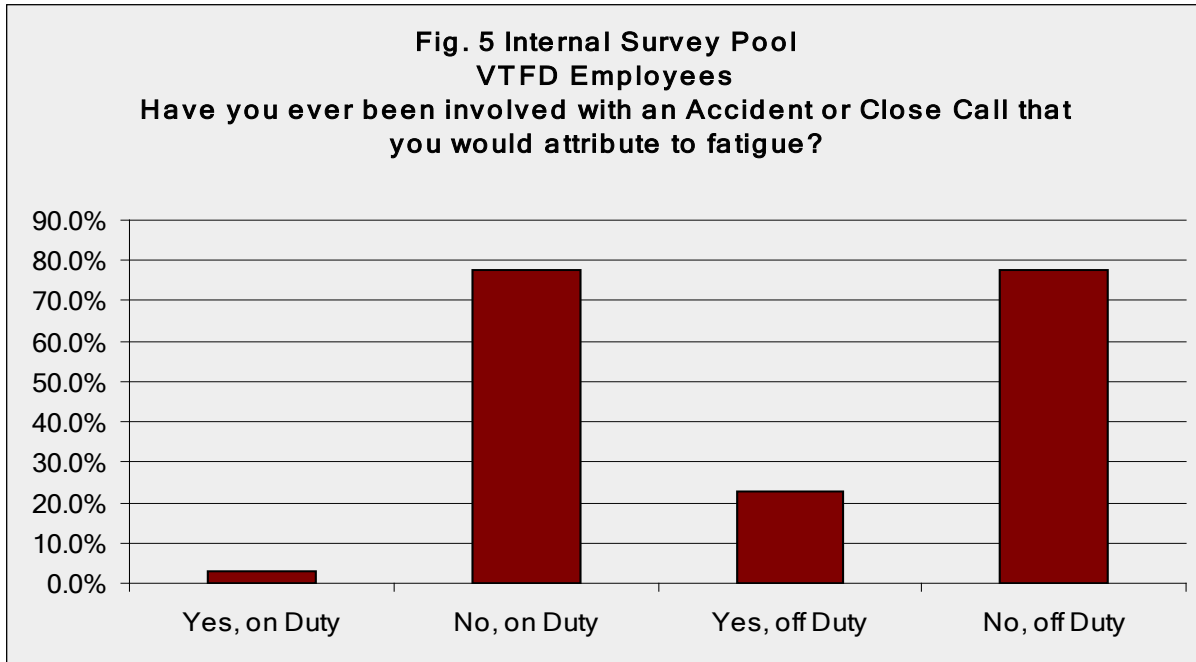
- National Fire Protection Association [NFPA]. (2007). NFPA 1500: Standard for Occupational Health and Safety. Quincy, MA: NFPA.
- Omniflight. (2010, September 13). Flight time limitations and rest requirements.
- Randall, A. L. (2003). Napping on the job: Policies and benefits in extended hour's operations. Circadian Technologies, Inc.
- Rule, C.H. (1999, August). Shift change. *Fire Chief*, 43 (8), 62-63.
- Sirois, W.G. (2009). The myths & realities of fatigue: Reducing the costs, risks, and liabilities of fatigue in 24-hour operations. Circadian Technologies, Inc.
- Sloan, L.B., & Friedman, M.J. (2008). *After the war zone*. Philadelphia, PA: Perseus Books Group
- Taft, E. (2011, May). A discussion about Zetron alerting systems for the battalion chiefs' office. Fire Fighter / Paramedic & Radio Repair Specialist.
- U.S. Department of Forestry, National Interagency Fire Center. (2011). *Policies - interagency guides, redbook 2011*. Boise, ID:
- Vila, B. (2009). Sleep deprivation: what does it mean for public safety officers. *NIJ Journal*, (262), 26-30.
- Violet Township Fire Department. (2009) *Run data statistics*.
- Violet Township Fire Department. (2010) Local bargaining agreement between Violet Township IAFF Local 3558 and Violet Township effective dates January 1, 2010 – December 31, 2012.
- Welsh, B. (2010, June 18). The surprising toll of sleep deprivation. Retrieved from <http://www.Newsweek.com/2010/06/18/the-surprising-toll-of-sleep-deprivation.html>.
- Wendell, H.L. (2010, October). A discussion about sleep issues in the fire service. Accredited Transitional Work Developer.

Widmar, R. (2003, June). Sleep to survive: How to manage sleep deprivation. *Fire Engineering*, 156, 45-54.

Appendix 1 – Survey Results







Appendix 2 – Violet Township Fire Department Sleep Deprivation Internal Survey

- 1. On average, how many hours of uninterrupted sleep do you get each night while at the fire house?**
 - a. 1-2
 - b. 3-4
 - c. 5-6
 - d. 7-8
 - e. >8

- 2. On average, how many hours of uninterrupted sleep do you get each night while off duty?**
 - a. 1-2
 - b. 3-4
 - c. 5-6
 - d. 7-8
 - e. >8

- 3. Do you have trouble sleeping at night?**
 - a. At Home
 - b. At the fire House
 - c. Both
 - d. No Trouble Sleeping

- 4. Do you find yourself tired, run down or in need of frequent daytime naps? (Mark all that apply)**
 - a. Occasionally on Duty
 - b. Frequently on Duty
 - c. Occasionally Off Duty
 - d. Frequently Off Duty
 - e. Never

- 5. Do you feel that there is a correlation between the amount of sleep you get each night and your...?**
 - a. General Health
 - b. General Attitude
 - c. Both
 - d. Neither

- 6. Have you ever been diagnosed with...? (Check all that apply)**
 - a. Insomnia
 - b. Chronic Fatigue
 - c. High Blood Pressure
 - d. High Cholesterol
 - e. None of the above

- 7. Have you ever had the need for over the counter or prescription sleep aids?**
 - a. Yes
 - b. No

- 8. Do you consider yourself overweight?**
 - a. Yes
 - b. No

- 9. If you consider yourself overweight, do you attribute this to? (Mark all that Apply)**
 - a. Age
 - b. Lack of Exercise
 - c. Stress
 - d. General Fatigue
 - e. Does Not Apply

- 10. Do you frequently drink caffeinated beverages (ex. Coffee, Pop, Energy Drinks) for an energy boost?**
 - a. Yes
 - b. No

- 11. Have you ever been involved with an Accident or Close Call that you would attribute to fatigue?**
 - a. Yes
 - b. No

- 12. Do you feel that there are changes your Department could make to help alleviate Sleep Deprivation issues?**
 - a. Yes
 - b. No

- 13. Some possible changes a Department could make to help combat sleep deprivation include, but are not limited to the following. Do you feel that any of the below options would improve your situation? (Mark all that apply and/or add you own suggestions)**
 - a. Limit Number of consecutive Work Hours
 - b. Change Shift Patterns (ex. 10 hr. days / 14 hour Nights, 48 on 72 off, etc.)
 - c. Designated rest time during day
 - d. Change Shift Times
 - e. No Action Needed
 - f. Other (please specify)

- 14. What is your age?**
 - a. 18-24

- b. 25-34
- c. 35-44
- d. 45-55
- e. 56 or Older

15. How many years do you have in the Fire Service?

- a. 0-4
- b. 5-9
- c. 10-14
- d. 15-19
- e. 20-24
- f. 25 or greater

16. What is your Fire Department work schedule?

- a. Full Time 24 hr. Shift
- b. Full Time 40 hrs.
- c. Part Time
- d. Volunteer

17. Would you describe the fire service as your...

- a. Primary Job, I have no other employment
- b. Primary Job, I am employed elsewhere Part Time
- c. Part Time Job, I have other Full Time employment
- d. Part Time Job, I have other Part Time employment
- e. Volunteer Position, I have other employment
- f. Other (please specify)

18. Are you employed by the Violet Township Fire Department?

- a. Yes
- b. No

19. Thank You for taking the time to participate in this Survey! Please feel free to leave any additional comments below.

Appendix 3 – Violet Township Fire Department Sleep Deprivation External Survey

These demographic questions were asked of the external pool in addition to questions in

Appendix 1.**1. Is your department...?**

- a. Full Time Paid
- b. Part Time Paid
- c. Combination (Combined Full Time, Part Time or Volunteer)
- d. Volunteer

2. What type of area does your department serve...?

- a. Urban
- b. Suburban
- c. Rural

3. What is the population your department serves?

- a. 100,000 or Greater
- b. 75,000 – 99,999
- c. 50,000 – 69,999
- d. 25,000 – 49,999
- e. 10,000 – 24,999
- f. 5,000 – 9,999
- g. Less than 5,000

4. What is your estimated departmental yearly run volume?

- a. 15,000 or greater
- b. 10,000 – 14,999
- c. 7,500 – 9,999
- d. 5,000 – 7,499
- e. 3,000 – 4,999
- f. 1,500 – 2,999
- g. 1,000 – 1,499
- h. Less than 1000

5. How many stations does your department operate?

- a. 15 or more
- b. 10 to 14
- c. 6 to 9
- d. 4 to 5
- e. 3
- f. 2
- g. 1

- 6. Does your department provide...?**
 - a. Fire Protection Only
 - b. Fire and First Response EMS (ALS or BLS)
 - c. Fire and Transport EMS (ALS or BLS)
 - d. EMS Only
 - e. Other

- 7. What is Typical Staffing for an Engine Company?**
 - a. 5 or greater
 - b. 4
 - c. 3
 - d. 2
 - e. 1
 - f. Does Not Apply

- 8. What is Typical Staffing for a Ladder Company?**
 - a. 5 or greater
 - b. 4
 - c. 3
 - d. 2
 - e. 1
 - f. Does Not Apply

- 9. What is Typical Staffing for a Heavy Rescue Truck?**
 - a. 5 or greater
 - b. 4
 - c. 3
 - d. 2
 - e. 1
 - f. Does Not Apply

- 10. What is Typical Staffing for an ALS Transport Unit?**
 - a. 4 or greater
 - b. 3
 - c. 2
 - d. Does Not Apply

- 11. What is Typical Staffing for a BLS Transport Unit?**
 - a. 4 or greater
 - b. 3
 - c. 2
 - d. Does Not Apply

- 12. Do you Cross Staff Multiple Trucks out of a Single Station?**
 - a. Yes
 - b. No

