

Oklahoma State Department of Health
"Creating a State of Health"



2016 Oklahoma EMS Health and Wellness Survey

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Purpose

Emergency Medical Services (EMS) is an integral part of the healthcare system in the United States. EMS professionals are a vital piece of the emergency pre-hospital care system and are exposed to a variety of hazards on a daily basis, which include exposure to hazardous or infectious agents, aggressive patients (assault), environmental extremes, and traumatic events. These hazards can lead to a variety of medical and mental issues. Previous studies have shown that EMS professionals have some of the highest rates of occupational injuries, obesity, and smoking along with a high prevalence of post-traumatic stress symptoms. Identifying factors that affect the physical and emotional health of EMS professionals in the State of Oklahoma is critical for maintaining an efficient statewide emergency services infrastructure. In this survey we sought to describe the workforce characteristics and health indicators for all active and licensed/certified EMS professionals in the State of Oklahoma.

The US Department of Labor reported that Emergency Medical Technicians (EMTs) and paramedics have one of the higher rates of injury resulting in days away from work at 8 injuries/100 workers with injury incident rates 1.8 to 2.5 times higher than the overall national injury incident rate.^{1,2}

2016 Oklahoma EMS Health and Wellness Survey

A postcard was sent to the home address of all licensed/certified EMS professionals in the State of Oklahoma with a link to a five page electronic survey (Survey Monkey). Home addresses were assessed for accuracy by utilizing U.S. Postal Service data and postcards were sent to EMS professionals with a valid home address. Names and addresses were utilized from the EMS licensure/certification database maintained by Oklahoma State Department of Health (OSDH), Emergency Systems staff. The survey contained fifty-five questions using variables from various validated surveys (DASS 21 survey, LEADS, Behavioral Risk Factor Surveillance System (BRFSS), and National Registry of Emergency Medical Technicians (NREMT)).²⁴⁻²⁸ Permission was obtained from the lead author of the NREMT survey to use their survey questions for our research study. E-mail addresses were pulled from the EMS licensure/certification database and follow-up e-mails were sent encouraging participation in the survey. EMS agencies were also contacted encouraging survey participation. To further encourage participation, the survey was also announced at various public meetings related to EMS in Oklahoma. Height, weight, year of birth, sex, race, and ethnicity was collected but no other personal information was required. Some questions were added to assess current Oklahoma EMS professional licensure/certification (state of licensure) and additional education (did respondent have any other higher level of education). Completion of the survey was voluntary, confidential, and anonymous and had no bearing on the status of an individual's state EMS certification. Informed consent was conveyed electronically before the respondent took the survey. The survey was approved by the OSDH Institutional Review Board.

DASS 21 Survey

The last section of the EMS health and wellness survey utilized the Depression, Anxiety, and Stress Scale (DASS 21) to assess risk factors for Post Traumatic Stress Disorder (PTSD). The DASS 21 is a 21 item questionnaire used to measure symptoms related to PTSD. The survey includes questions regarding depression, anxiety, and stress. The individual is required to indicate the extent of a symptom over the previous week. The DASS 21 is not intended for diagnosis but has been used in many studies to describe anxiety, stress, and depression. More information about the DASS 21 survey can be found by utilizing the following link: <http://www2.psy.unsw.edu.au/dass/>.

Statistical Methods

Means and proportions were used to summarize the data. Bi-variate assessments of associations of interest among individual categorical variables were assessed using Chi-square and Cochran-Mantel-Haenszel tests. Individual continuous variables were screened for between-group differences using t-tests or, for non-normally distributed variables, the Mann-Whitney U test. A significance level of alpha <.05 was used for all tests and all analyses were performed using SAS Version 9.4.

Multivariable logistic regression was used to obtain adjusted estimates of associations of covariates with occupational injury. Variables with a p value <.10 for bivariate comparisons were entered into the model. A backward elimination process by which variables with the highest p-values were removed one at a time was used to determine the final model. Where variables were significantly correlated, the variable providing the best discrimination and fit was kept in the model. Model discrimination and fit were assessed using the c statistic and Hosmer-Lemeshow goodness-of-fit test respectively.

Oklahoma Snap-Shot: Agency and EMS Personnel

The State of Oklahoma has 5 types of agency licensure: Basic Life Support (BLS), Intermediate Life Support (ILS), Paramedic Life Support (PLS), Specialty Care, and stretcher aid vans. Transporting ground and air ambulance agencies can have more than one license type (for example: PLS and Specialty Care) but all air services must have at least a PLS license (separate from a Specialty Care license). Oklahoma also has Emergency Medical Response Agencies (EMRA's), previously known as first responders, which are non-transporting agencies. The majority of the licensed transporting agencies in Oklahoma are BLS followed by PLS, ILS, Specialty Care, and stretcher aid van agencies ([Figure 1](#)). Ground agencies make up the majority of transporting services in Oklahoma followed rotor-wing (air) agencies.

At the time of this survey, the State of Oklahoma had 3 types of EMS personnel licensure and 1 certification level: Paramedic, Intermediate, Basic, and EMR (Emergency Medical Responder, certified level). Advanced Emergency Medical Technician (AEMT) was added later in 2016 to replace the Intermediate licensure level. Since 2010, all EMS licensure levels (EMR excluded) have to possess and maintain their National Registry Certification. The majority of EMS personnel in Oklahoma are Basics ([Table 1](#)).



Oklahoma Snap-Shot: Population Demographics

Geographically, almost half of the Oklahoma population lives in 5 counties with Oklahoma County (Region 8) having the highest percentage followed by Tulsa (Region 7), Cleveland (Region 6), Canadian (Region 6), and Comanche (Region 3) Counties ([Map 1](#)). According to the Center for Medicare and Medicaid Services, 32.9% of the 791 zip codes in Oklahoma were urban, 35.2% rural, and 31.9% were super rural in 2015. The majority of Oklahomans live in 4 of the 8 defined Homeland Security regions, 2, 6, 7, and 8. The median age for Oklahoma is 36 years with females being slightly older than males at 37 and 35 years, respectively ([Figure 2](#)). Approximately 75% of Oklahomans identified themselves as White followed by American Indian/Alaska Natives at 9.0% and Black/African Americans at 7.7%. Hispanic/Latino's made up 9% of the population between 2011 and 2015 ([Figure 3](#)).

Oklahoma population statistics were calculated using US census 2011-2015 population estimates for Oklahoma (www.census.gov). Urban/Rural analyses were calculated using zip codes for 2011-2015 with the urban/rural/super rural designation defined by the Centers for Medicare and Medicaid Services (CMS, www.cms.gov). Oklahoma Regions were defined using Homeland Security Regions.



Survey Results

Postcards were sent to 9,642 active, licensed /certified EMS professionals with 1,510 (15.7% response rate) completing the survey. The following analysis contains some basic demographic/workforce information reported by the survey respondents.

Respondent Demographics

- ◆ 73.1% of the survey respondents were male with a median age of 42 years ([Table 2](#)).
- ◆ Just over 50% of the respondents were between the ages of 31 and 50 with 18% between the ages of 51 and 60 ([Figure 4](#)).
- ◆ Female respondents were slightly older (45 years) than male respondents (42 years).
- ◆ The median height was 5ft. 8in. with males being taller than females (Table 1).
- ◆ Male respondents reported a median weight of 212, just over 30 pounds heavier than females (173 pounds).
- ◆ The majority of respondents reported their race as White, Non-Hispanic (78.3%) followed by American Indian/Alaska Natives at 9.1% (Table 2).

The respondent percentages for race and gender mirrored that of other EMS-related studies performed at the national/local level.

Workforce Characteristics

- ◆ Paramedics made up 39% of the respondents followed by Basics (38%, [Table 2](#)).
- ◆ 27% worked for 2 or more different EMS organizations with 12% licensed in two or more states.
- ◆ The vast majority reported a work status of “paid” (70.8%) with 12.7% working as a volunteer (9% “paid” and a volunteer).
- ◆ 40% of the respondents worked in fire-based agencies (very similar to other EMS studies) followed by City/County agencies (16%) and Private, For Profit agencies (15%).
- ◆ 72% worked in organizations located in either urban areas or urban clusters.
- ◆ The majority of EMRs worked in rural areas ([Figure 5](#)).
- ◆ Just over 41% of the respondents had been working in the EMS profession for 16 or more years ([Figure 6](#)).
- ◆ 78% were satisfied with their current EMS assignment/job while a smaller percentage (70%) were satisfied with the EMS profession as a whole ([Figure 7](#)).
- ◆ Dissatisfaction with the EMS profession increased to over 26% by the time a respondent reached 11 to 15 years in the field followed by those in the field 5 to 7 years (25%).

55% of the respondents were EMS licensed or certified with no other higher level of education (past high school).

- ◆ 59% received a flu shot during the current flu season, although only 34% were required to do so by their current employer.

Health Indicators

- ◆ 78% of the survey respondents categorized themselves as in excellent/good health ([Figure 8](#)).
- ◆ Just over 86% had healthcare coverage, although only 67% had coverage through their current EMS employer.
- ◆ 66% visited a healthcare professional in the last year for a routine check-up.
- ◆ Almost 30% were diagnosed with high blood pressure, 22% with high blood cholesterol, and 11% with asthma ([Figure 9](#)).
- ◆ 67% smoked cigarettes sometime in their lifetime while 21% never smoked.
- ◆ Of those who did smoke sometime in their lifetime, 18% still smoked every day/some days.
- ◆ Just over 71% participated in physical activity/exercise besides their job in the last 30 days.
- ◆ 77% of the respondents participated in at least 30 minutes of moderate-intensity physical activity at least 1 day/week.
- ◆ 55% participated in at least 60 minutes of moderate-intensity physical activity at least 1 day per week (34% 0 days/week, [Figure 10](#)).
- ◆ Just over 50% had a Body Mass Index (BMI) between 21 and 30 followed by the 31 to 40 group at 26%.
- ◆ According to the Centers for Disease Control (CDC) BMI recommendations, 69% of the respondents were in the overweight/obese category (of which 36% were in the overweight category, [Figure 11](#)).

Over 50% of the respondents did not meet the CDC recommendation of at least 2.5 hours of moderate-intensity aerobic activity per week.

Occupational Injury

Recent studies have looked at factors affecting EMS occupational injury and found self-reported general health, job satisfaction, a history of back problems, urban environment, call volume, and physical fitness to all be associated with occupational injury.³⁻⁷ However, health indicators (e.g., general health and physical fitness) can vary by state or region. All of the previously mentioned studies relating to occupational injuries for EMS professionals have been attempts to capture baseline data on a national level (Longitudinal Emergency Medical Technician Attributes and Demographics Study (LEADS)) or utilized smaller/targeted populations.^{8,9} As of the writing of this paper, we did not identify any studies assessing occupational injuries among EMS professionals from a strictly statewide level. The following analyses looks at occupational injury in Oklahoma based on the survey results.

- ◆ 40% of the respondents had at least 1 occupational injury during their time as an EMS professional.
- ◆ 61% of those who had an occupational injury had an injury in the last 5 years.
- ◆ 31% experienced a back/lumbar injury followed by shoulder (16%) and knee (14%) injuries ([Figure 12](#)). The finding of frequent back/lumbar, shoulder, and knee injuries is similar to previous EMS injury studies.^{1, 3, 4, 29, 30}
- ◆ 35% of those who ever had an occupational injury had 2 or more injuries during their career.
- ◆ 36.8% of the respondents who had an occupational injury in the previous 12 months missed at least 1 day of work due to that injury ([Figure 13](#)).
- ◆ Respondents who reported their health as fair/poor were 2.1 times more likely to have an occupational injury than those who categorized themselves as being in excellent health ([Table 3](#)).
- ◆ Medics working in the EMS profession 5 years or more were 3 to 11 times more likely to ever have an occupational injury compared to medics working 4 or less years.
- ◆ Medics who performed 500 or more runs/year were 3 to 4 times more likely to have an occupational injury compared to medics who performed less than 500/year.
- ◆ Respondents who had a positive score for multiple PTSD risk factors (stress, anxiety, or depression) were 1.6 to 3 times more likely to have an occupational injury than those who scored no risk factors ([Table 3](#)).
- ◆ Paramedics were 2.5 times more likely to have an occupational injury compared to other certification levels.
- ◆ We did not find an association for job satisfaction, physical fitness, or urban environment with EMS occupational injury although physical fitness has been associated with general health in many other studies.^{3-6, 10, 31}

Call volume, years in service, general health, physical fitness, job satisfaction, and paramedic licensure level have all been linked to EMS occupational injury.³⁻⁷

Post Traumatic Stress Disorder (PTSD)

Previous studies regarding EMS professionals have shown a significant percentage having increased risk factors for PTSD.¹⁶⁻²³ One of the risk factors for PTSD is depression, which has been shown in many studies to decrease productivity during employment and has been linked as a possible outcome of occupational injury.^{20, 23, 32} To assess PTSD risk factors for Oklahoma EMS professionals, the last section of the survey focused on anxiety, stress, and depression, all risk factors for PTSD. The survey used the DASS 21 short form which asked 21 questions relating to the above mentioned risk factors.

- ◆ Between 18% and 23% of the survey respondents showed mild/moderate to severe/extremely severe risk factors for PTSD ([Figure 14](#)).
- ◆ 40% of respondents with risk factors for PTSD had at least mild to moderate scores for one risk factor followed by 32% with two risk factors ([Figure 15](#)).
- ◆ Paramedics had the highest percentage of respondents for all three risk factors.
- ◆ The majority of the survey respondents who had risk factors for PTSD had not been diagnosed by a healthcare professional with PTSD.
- ◆ Barriers to diagnosis included professional stigma (10%), confidentiality concerns (7%), and availability of treatment (6%).
- ◆ The majority of respondents (67%) with risk factors for PTSD simply stated that they didn't need help.
- ◆ 8.3% of the respondents had been diagnosed by a healthcare professional with PTSD.
- ◆ 75.9% of respondents who had been diagnosed with PTSD had a positive score for at least one PTSD risk factor in the survey.
- ◆ The 24% of respondents diagnosed with PTSD who scored negative for anxiety, stress, and depression in the survey can possibly be attributed to getting treatment through a healthcare professional or refusal to fill out the DASS 21 questions.
- ◆ 48.9% of the EMS professionals in the survey who performed 1,000 or more runs in a year scored positive for at least one PTSD risk factor ([Figure 16](#)).
- ◆ 26.6% of the respondents who scored positive for all three PTSD risk factors were dissatisfied with their current EMS assignment compared to only 4.1% with no risk factors.
- ◆ 42.7% of the respondents who scored positive for all three PTSD risk factors were dissatisfied with the EMS profession as a whole compared to only 11.3% with no risk factors ([Figure 17](#)).
- ◆ The percentage of respondents scoring positive for at least one PTSD risk factor was virtually the same when comparing EMS professionals working in the field 4 years or less to those in the field 21 or more years.
- ◆ 47.2% of the respondents involved with calls associated with traumatic injury/death, or severe life threatening conditions in the last 60 days (more than 16 calls) scored positive for at least one risk factor for PTSD ([Figure 18](#)).

Previous research has shown the prevalence of PTSD to be as low as 6% and as high as 22% among the EMS professional population.¹⁰⁻¹⁵

Job satisfaction and work place stressors (mental and physical) have been linked to EMS recruitment and retention .³⁷

Discussion

After reviewing the literature, it appears one of the challenges when studying the EMS workforce population is the low response rates to data collection efforts. For example, the Longitudinal Emergency Medical Technician Attributes and Demographics Study (LEADS), which has been utilized extensively for other EMS research studies, reported response rates between 23% and 40% during the study period.⁹ The Oklahoma survey reported a 15.7% response rate yet when comparing respondent EMS workforce demographics, the survey results were very similar to previous studies done in different settings. Studnek et. al. in their 2007 NREMT survey reported 72.9% of the respondents as male and 34.1% working for fire-based agencies.⁴ In comparison, 73.1% of the Oklahoma survey respondents reported their gender as male with 40.5% working for a fire-based agency. Sterud in their 2006 literature review showed that approximately 20% of ambulance workers in 5 of 7 studies showed a consistently high prevalence of PTSD symptoms.³³ According to our survey, 18.0% reported at least mild/moderate symptoms for stress and depression with 23.4% reporting anxiety symptoms. Just over 8% of the respondents in our survey self-reported they had been clinically diagnosed with PTSD, slightly higher than the national prevalence and within the range of previous EMS studies.^{34, 35}

Crowe et al. (2016) in their study looking at LEADS demographics showed that 83.5%-86.0% reported their race as White, similar to our survey results (78.3%).³⁶ Demographic comparisons were also performed between the survey results and the Oklahoma EMS licensure/certification database. We found that the age and gender distributions between the survey and registry database were very similar, although the survey slightly over sampled respondents in the 31 to 40 and 41 to 50 age groups. Race is not collected as a part of EMS licensure/certification in Oklahoma therefore no demographic comparison was assessed using racial categories. A unique difference between the Oklahoma EMS Health and Wellness Survey and previous studies is the break-down by certification level. The majority of studies we reviewed utilized samples that were skewed towards Paramedics or Basics while the Oklahoma survey had an even break down between Basics and Paramedics (38.7% and 39.2%, respectively).^{3-6, 10, 12, 15}

Limitations

There are several limitations with this survey including those inherent to a cross-sectional design. The temporal relationship of any association is unknown. Because the survey was completely anonymous there was no way to assess non-response bias. Nonetheless, we felt anonymity was important to gain honest responses to the DASS 21 questions. The proportion of paramedics (39.2%) and basics (38.7%) responding to the survey differed from the proportions in the Oklahoma EMS licensure/certification database (26.7% and 48.3%, respectively) therefore generalizability of the results back to the Oklahoma EMS professional population should be performed with caution. Since this was the first attempt to describe occupational injury among EMS professionals in Oklahoma there were no prior data available for comparison. Therefore our survey results were compared to other studies with different geographic study populations.

Caution was taken during comparisons to previously published studies as EMS systems and populations vary by state. However, when comparing our survey results to other published studies, the EMS workforce demographics were very similar. Moreover, comparing studies using the national LEADS survey data, workforce characteristics and associations with occupational injuries were very similar to our survey as well.

Conclusion

According to the survey, Oklahoma EMS professionals had a high prevalence of smoking, obesity, occupational injury, and PTSD risk factors. EMS occupational injuries were most strongly associated with the measures of exposure run volume and years in the field. Moreover, general health, Paramedic licensure level, and risk factors for PTSD were independently associated with EMS-related occupational injury. PTSD risk factors were shown to have a high prevalence ranging from 18% to 23%, on par with previous research related to the EMS professional population. As a vital piece of the emergency pre-hospital care system, the health and productivity of EMS professionals is of public health importance. Identifying risk factors that affect the physical and emotional health of EMS professionals in the State of Oklahoma is critical for maintaining an efficient statewide emergency services infrastructure. The survey results could also be used to inform additional studies, support EMS workforce planning, and help to streamline intervention efforts to those EMS professionals at highest risk for occupational injury and PTSD risk factors.

Acknowledgements

We thank Thomas Thomson at the Oklahoma Department of Mental Health Substance Abuse Services (ODMHSAS) for their help with the electronic consent form used in the Oklahoma EMS Health and Wellness Survey. We also thank Melissa Bentley, Director of Research at NREMT for permission to use select 2007 NREMT survey questions.

Institution and Ethics Approval and Informed Consent

The work was performed at the Oklahoma State Department of Health, Emergency Systems Division. Informed consent was conveyed electronically before the respondent took the Oklahoma EMS Health and Wellness Survey. The survey was approved by the OSDH Institutional Review Board.

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Appendix

Figures

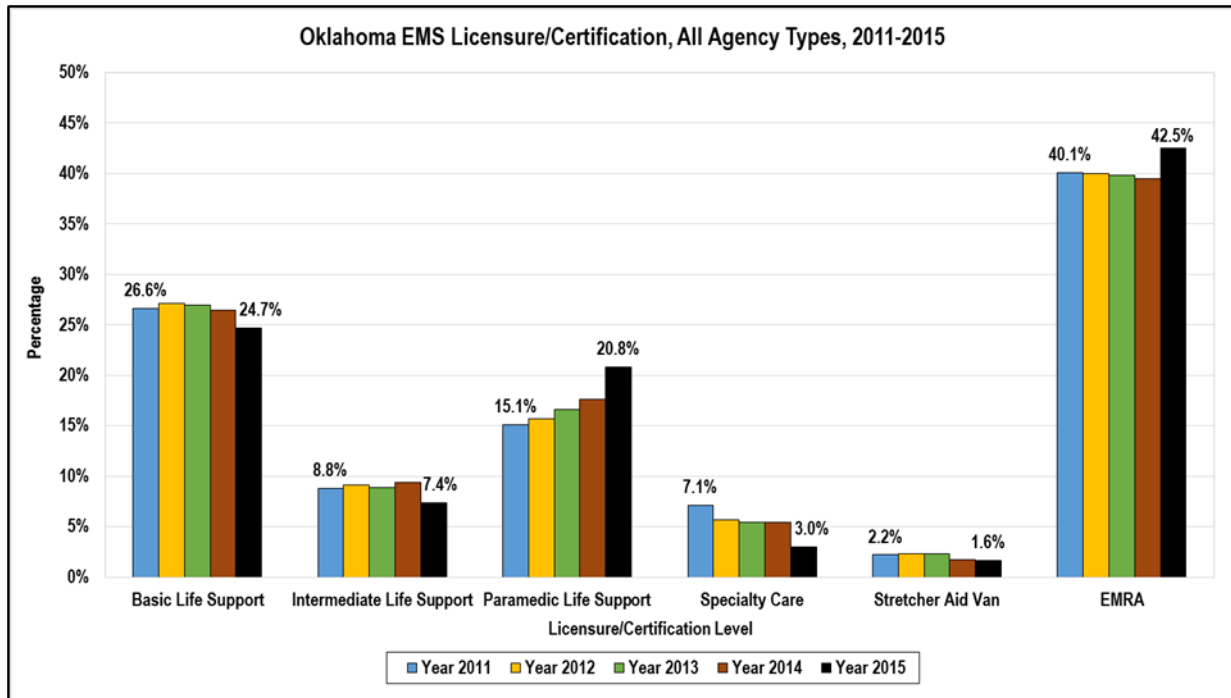


Figure 1: Oklahoma agency types, 2011-2015.

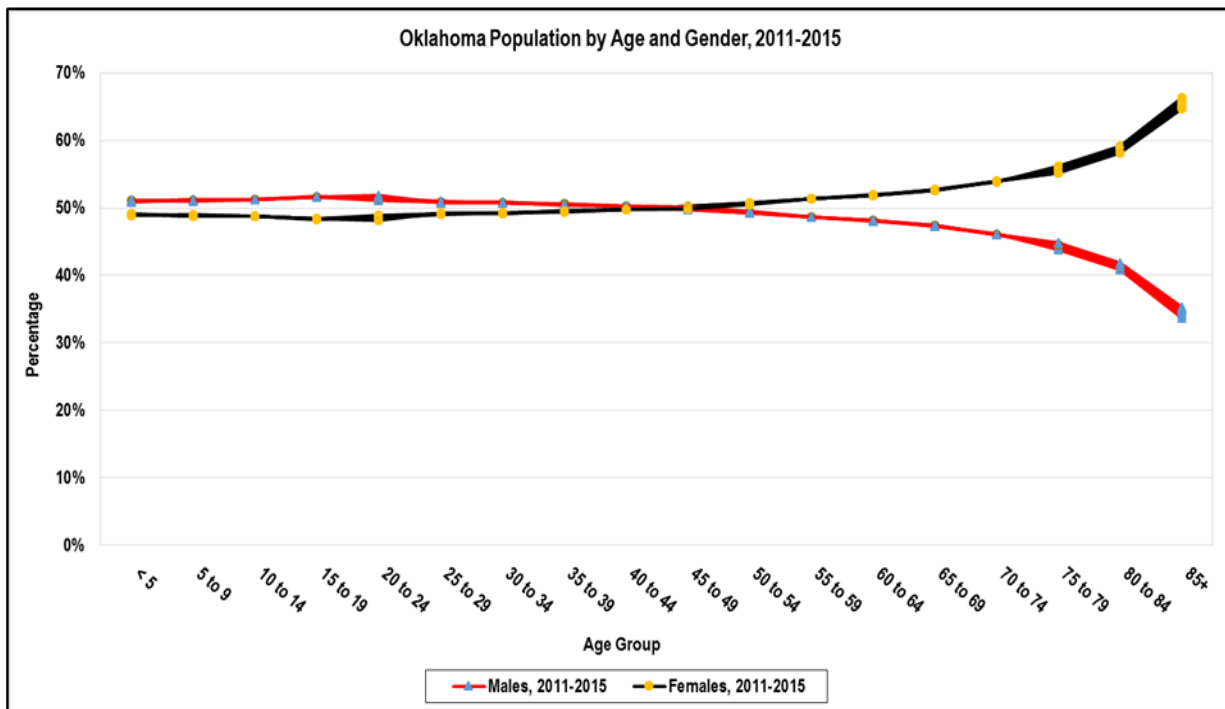


Figure 2: Oklahoma population by age and gender, 2011-2015.

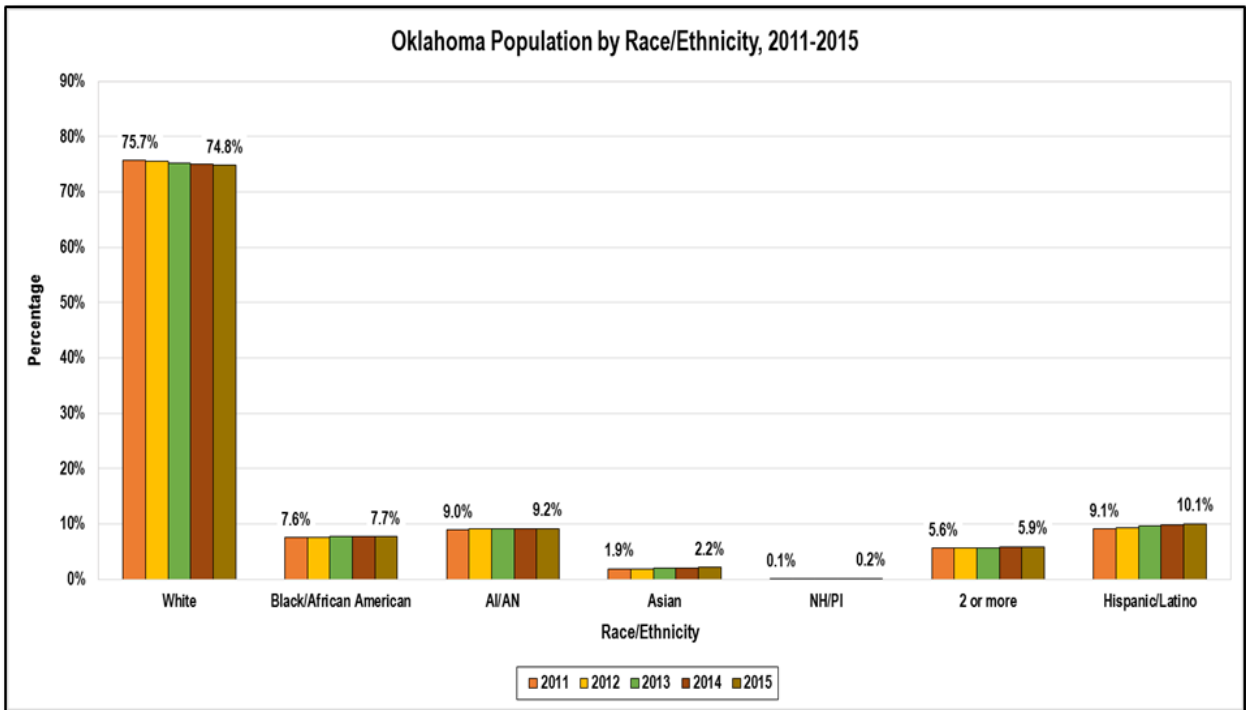


Figure 3: Oklahoma population by race/ethnicity, 2011-2015.

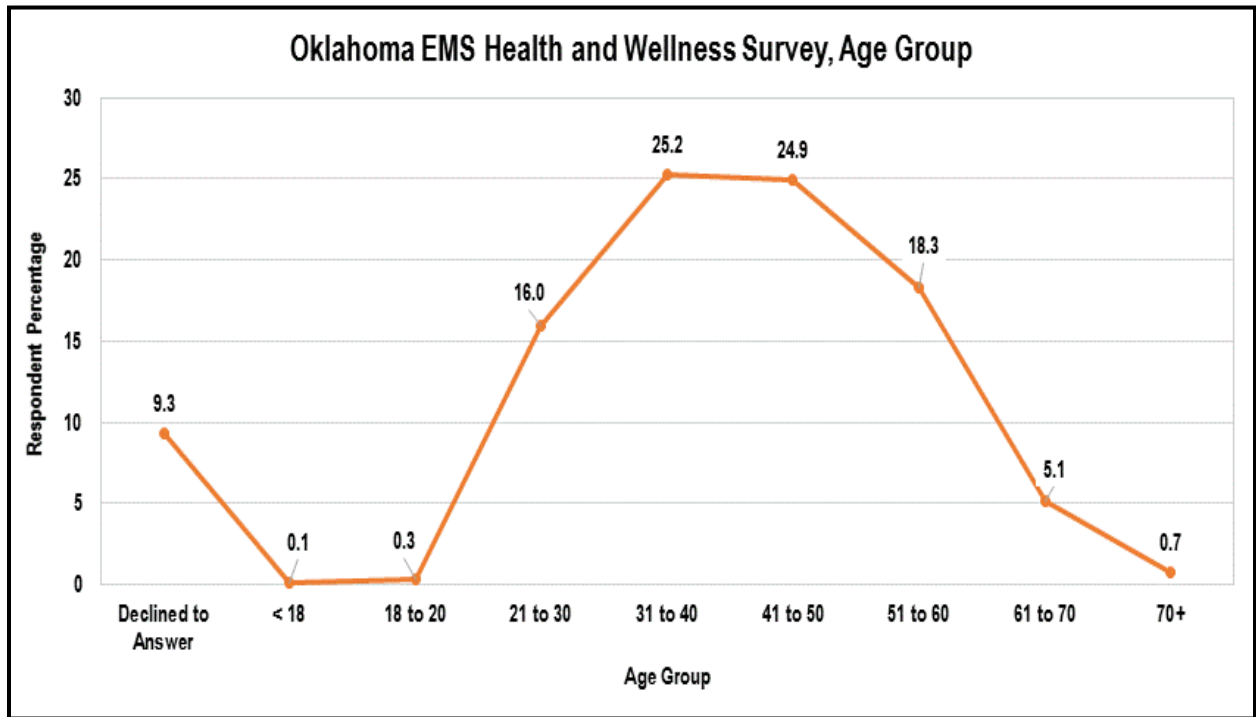


Figure 4: Respondent demographics, age group.

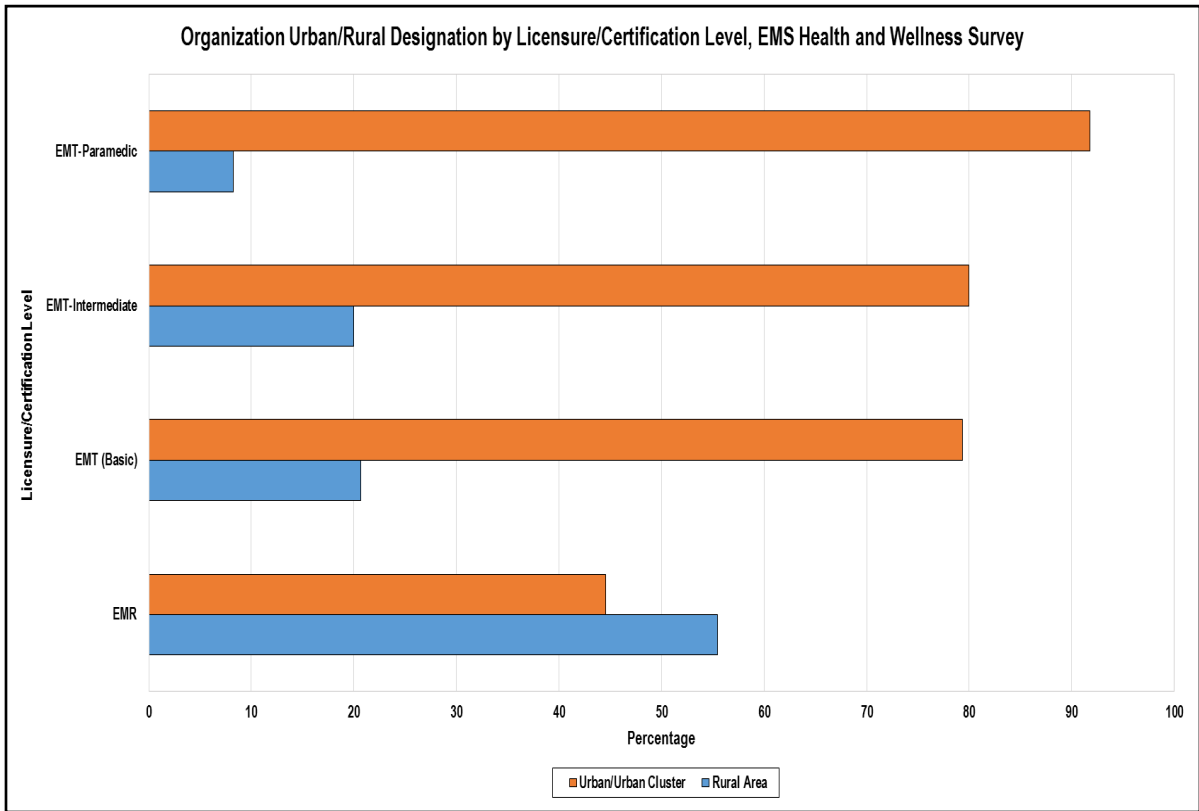


Figure 5: Workforce characteristics, work location and EMS licensure/certification level.

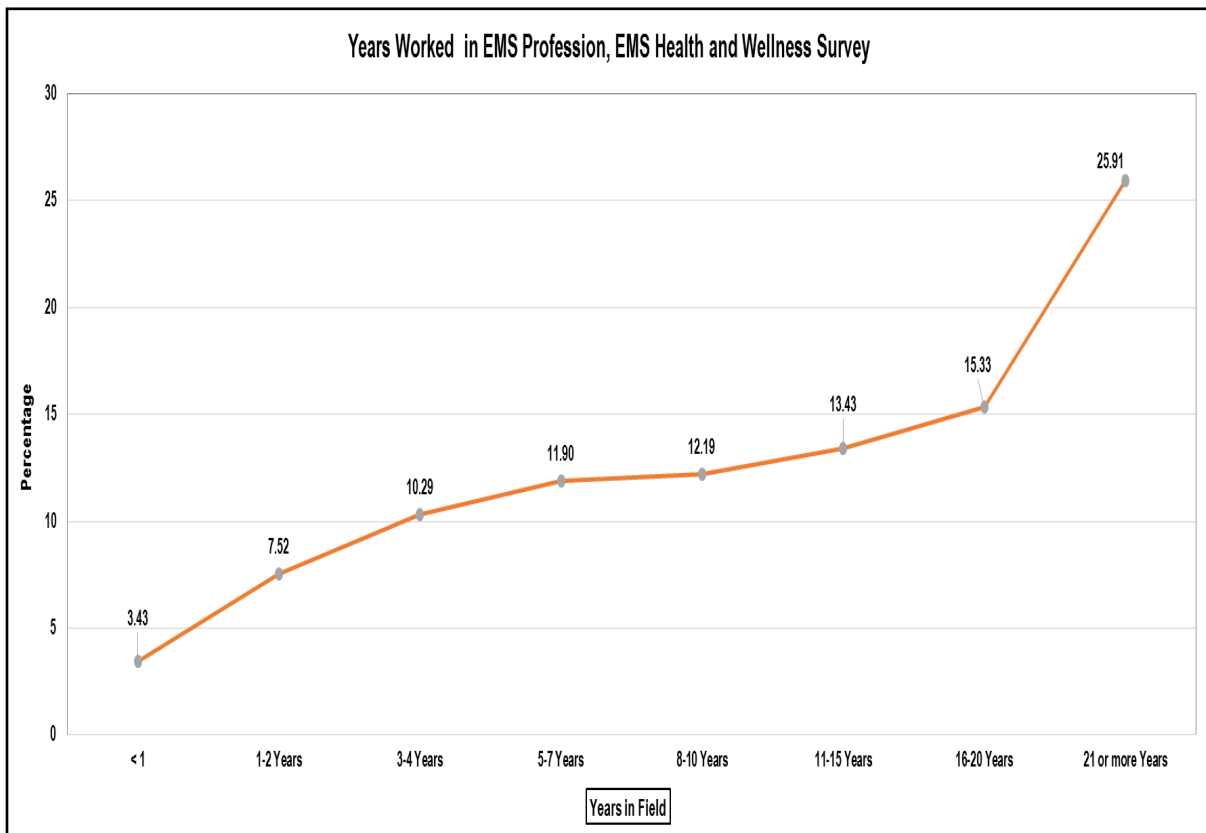


Figure 6: Workforce characteristics, years worked in the EMS profession.

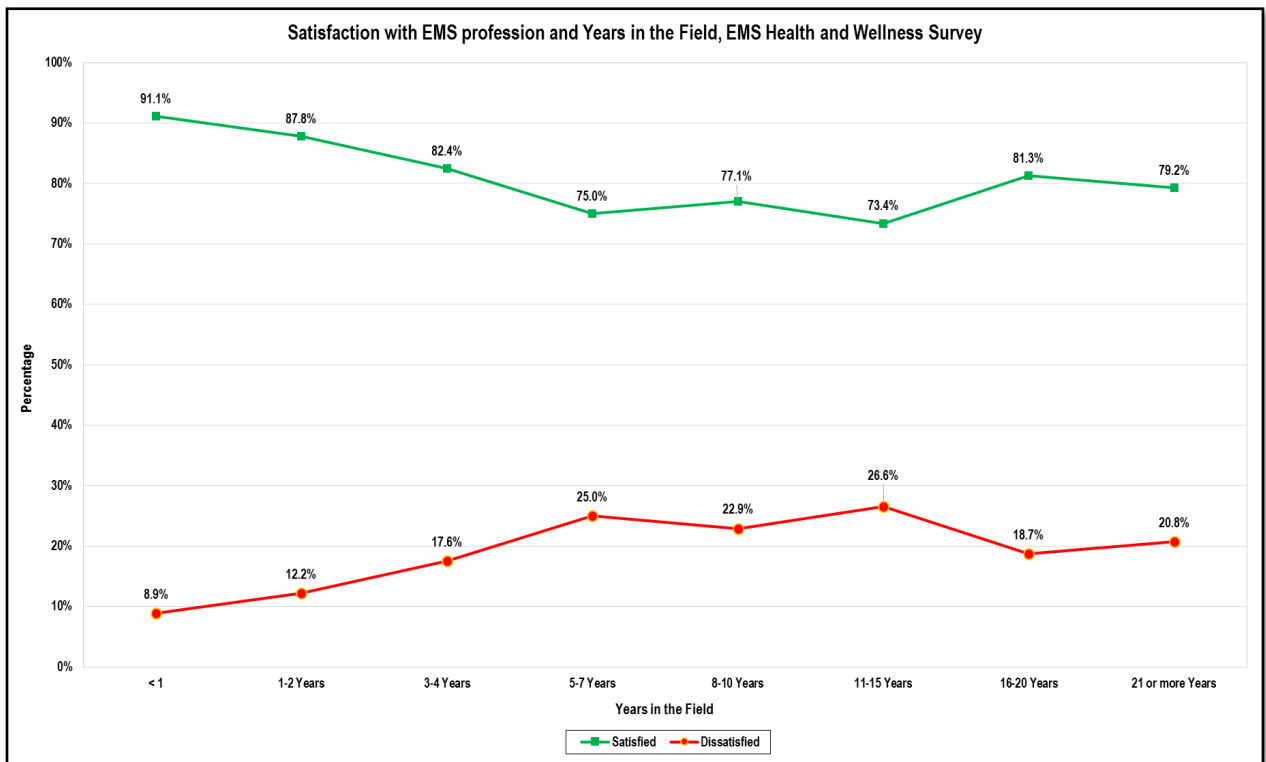


Figure 7: Workforce characteristics, years in the field and job satisfaction with EMS profession.

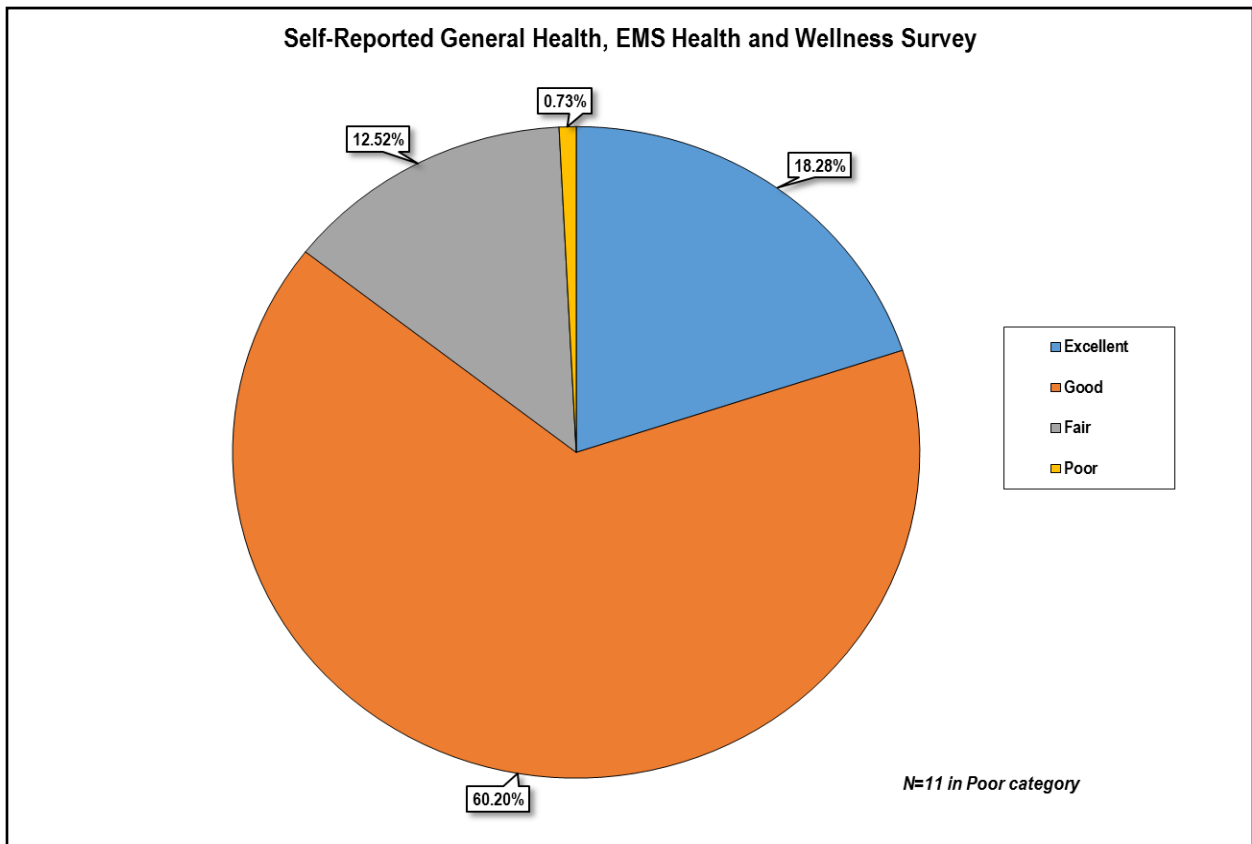


Figure 8: Health indicators, general health.

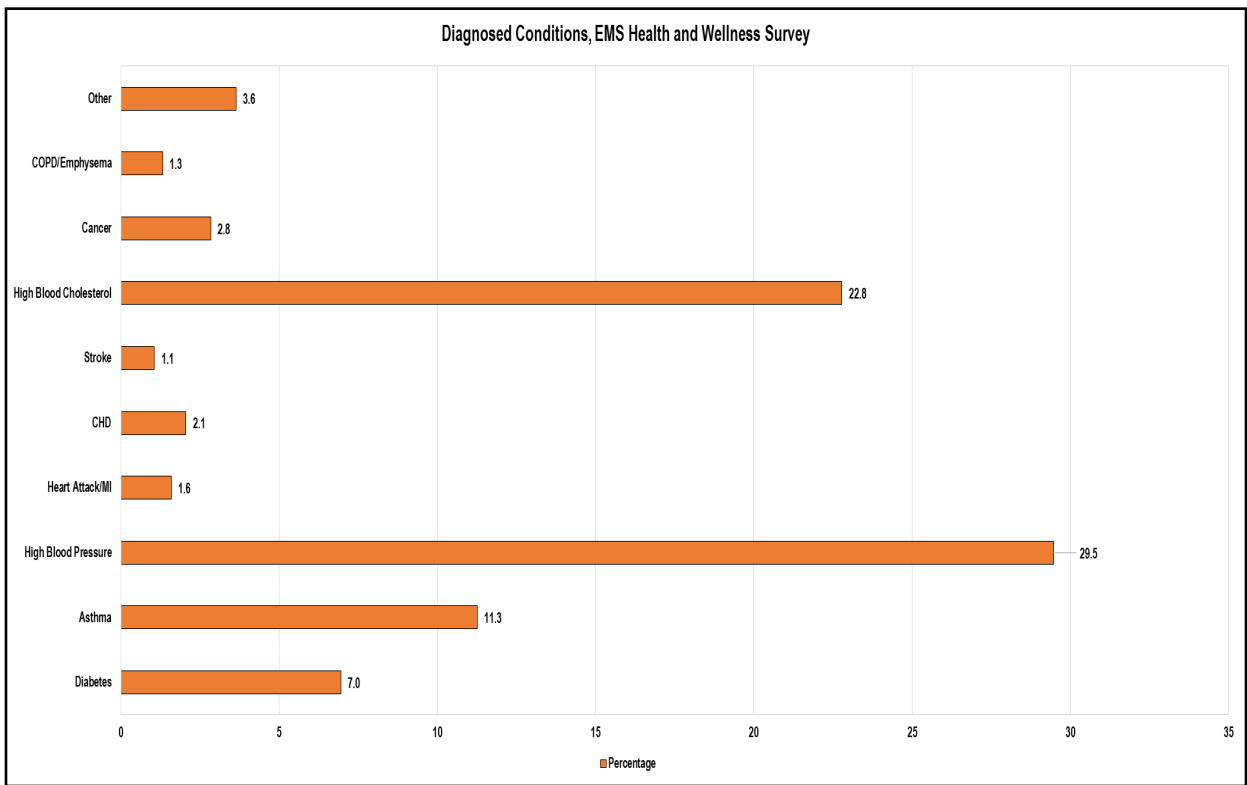


Figure 9: Health indicators, diagnosed conditions by healthcare professional.

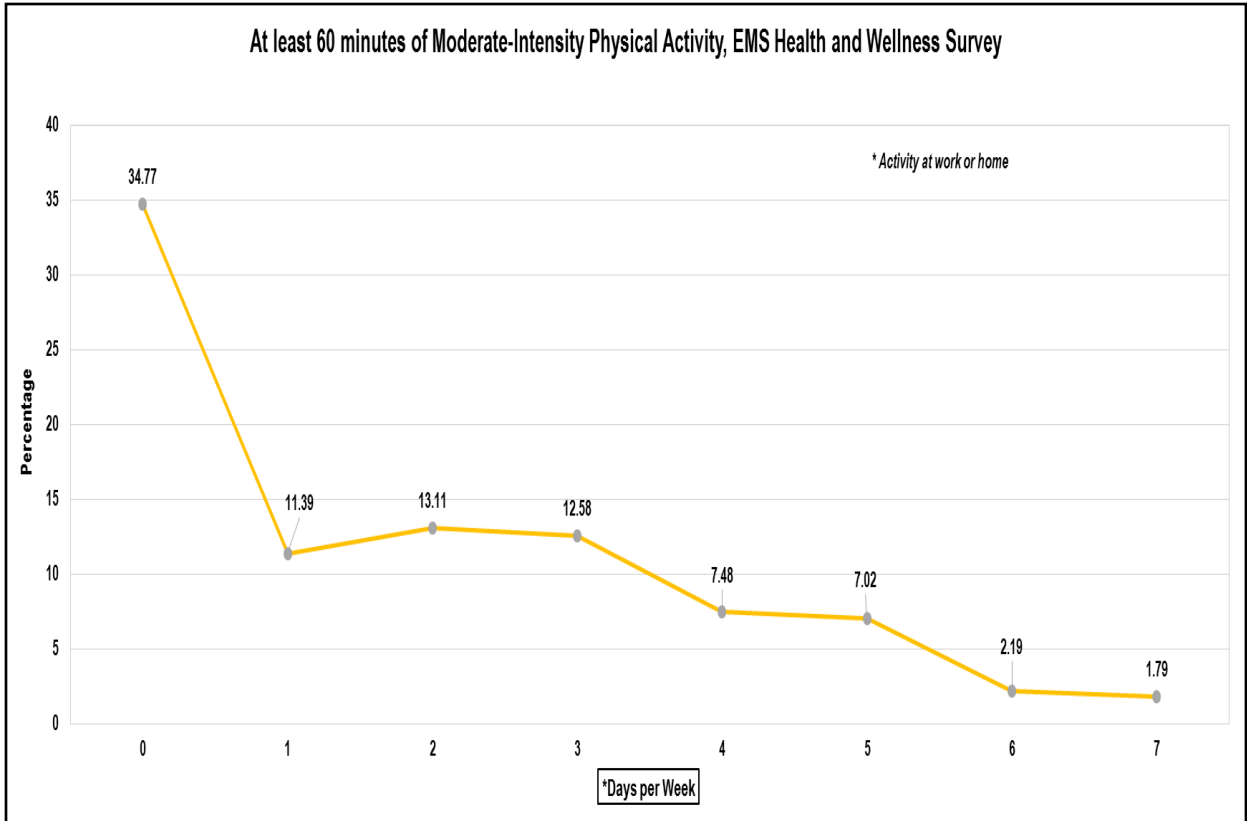


Figure 10: Health indicators, at least 60 minutes of moderate-intensity physical activity.

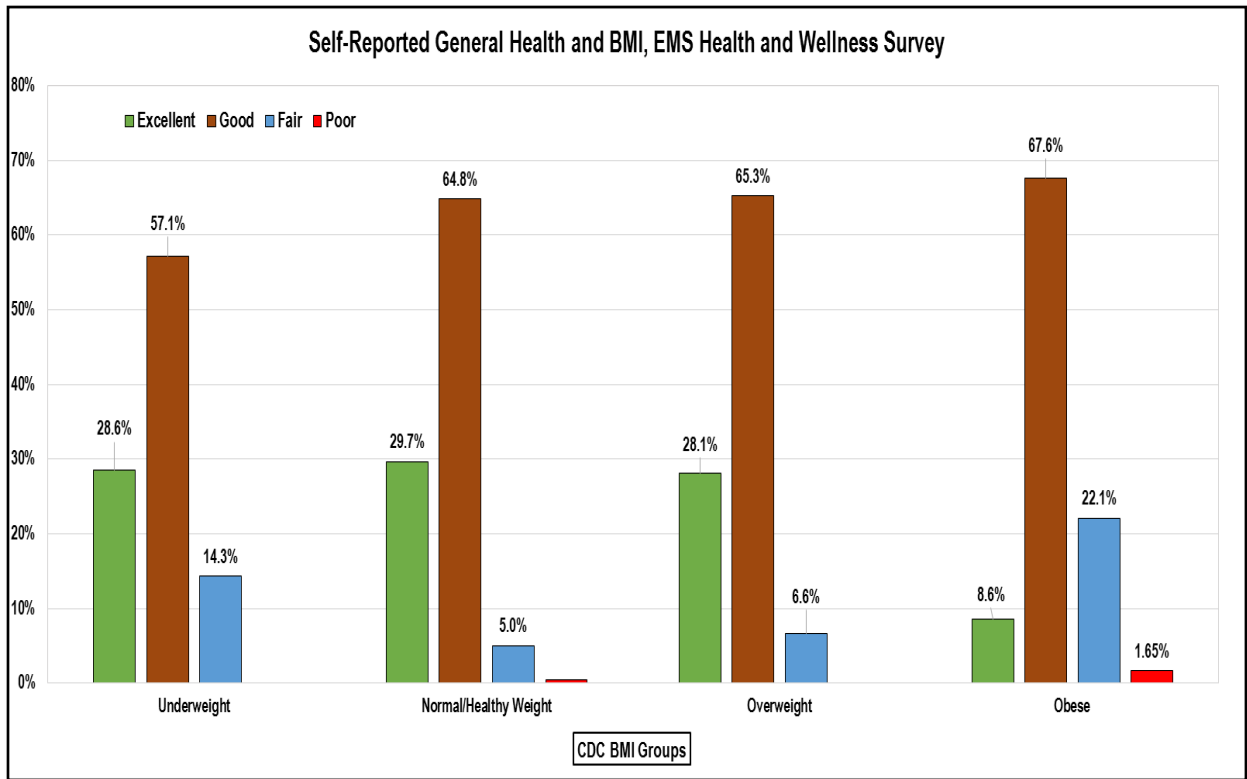


Figure 11: Health indicators, self-reported general health and Body Mass Index (BMI).

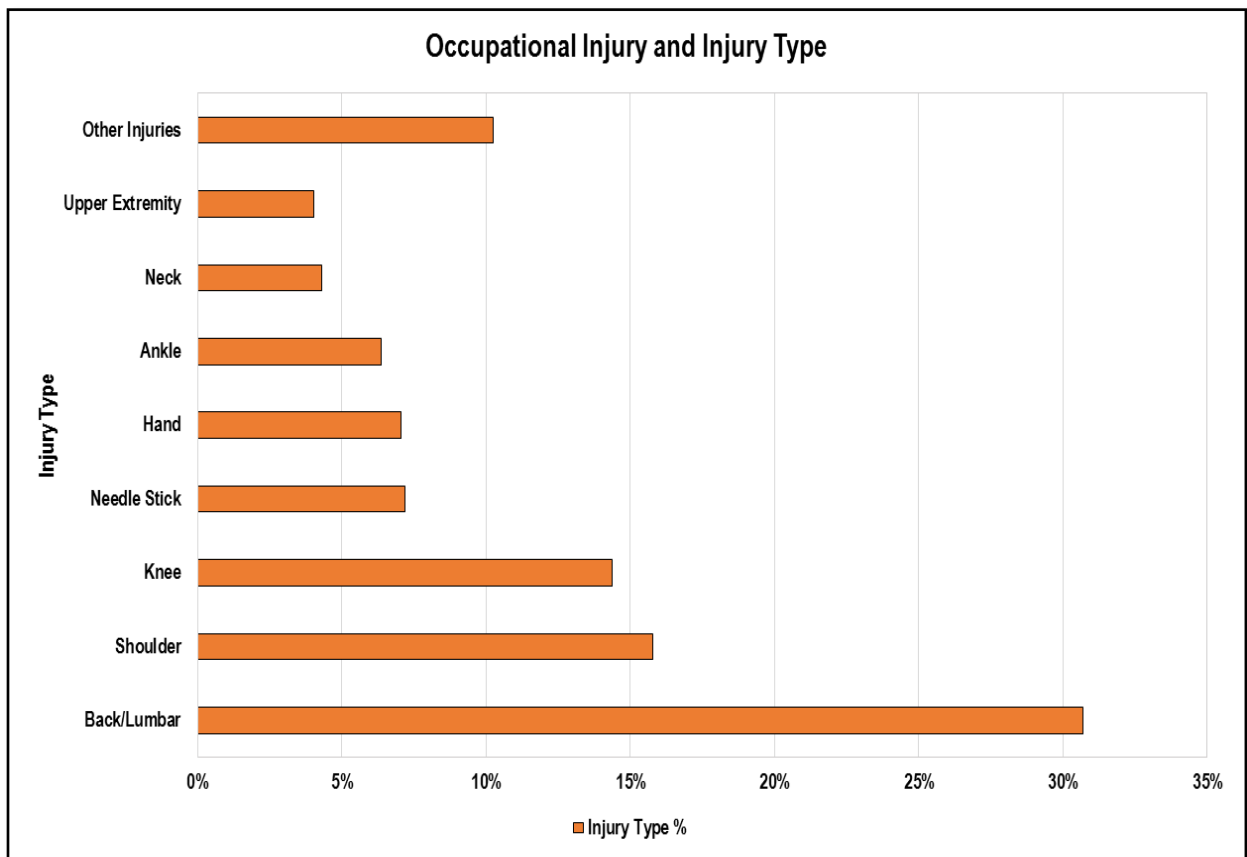


Figure 12: Occupational injury, injury type.

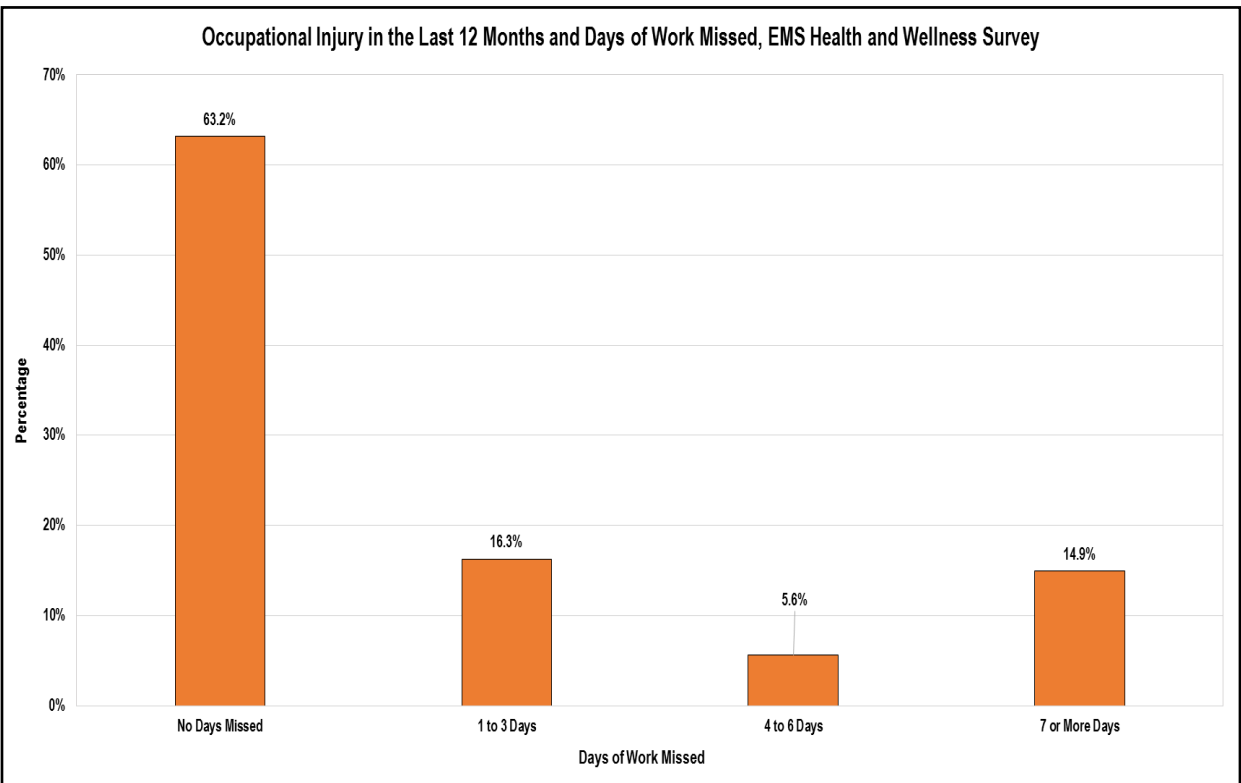


Figure 13: Occupational injury, injury in the last 12 months and days of work missed.

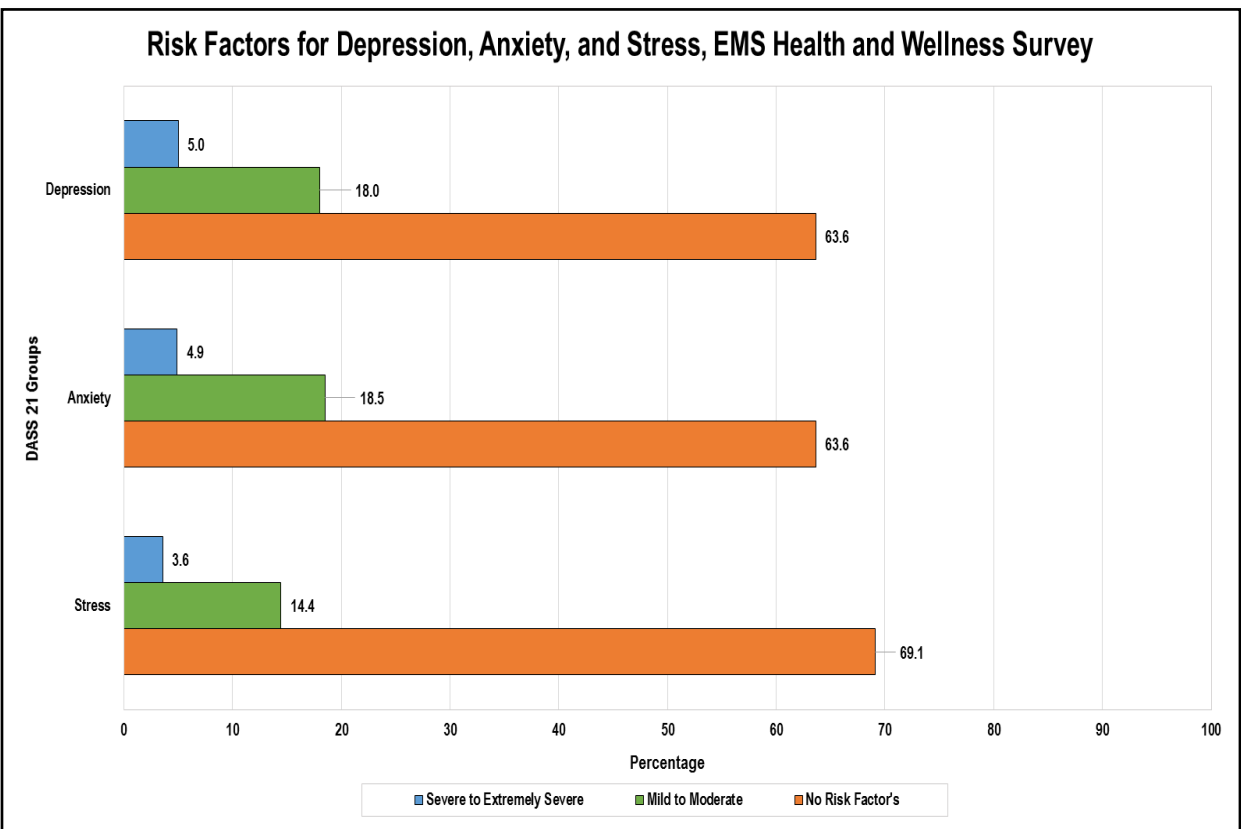


Figure 14: PTSD risk factors, anxiety, stress, and depression.

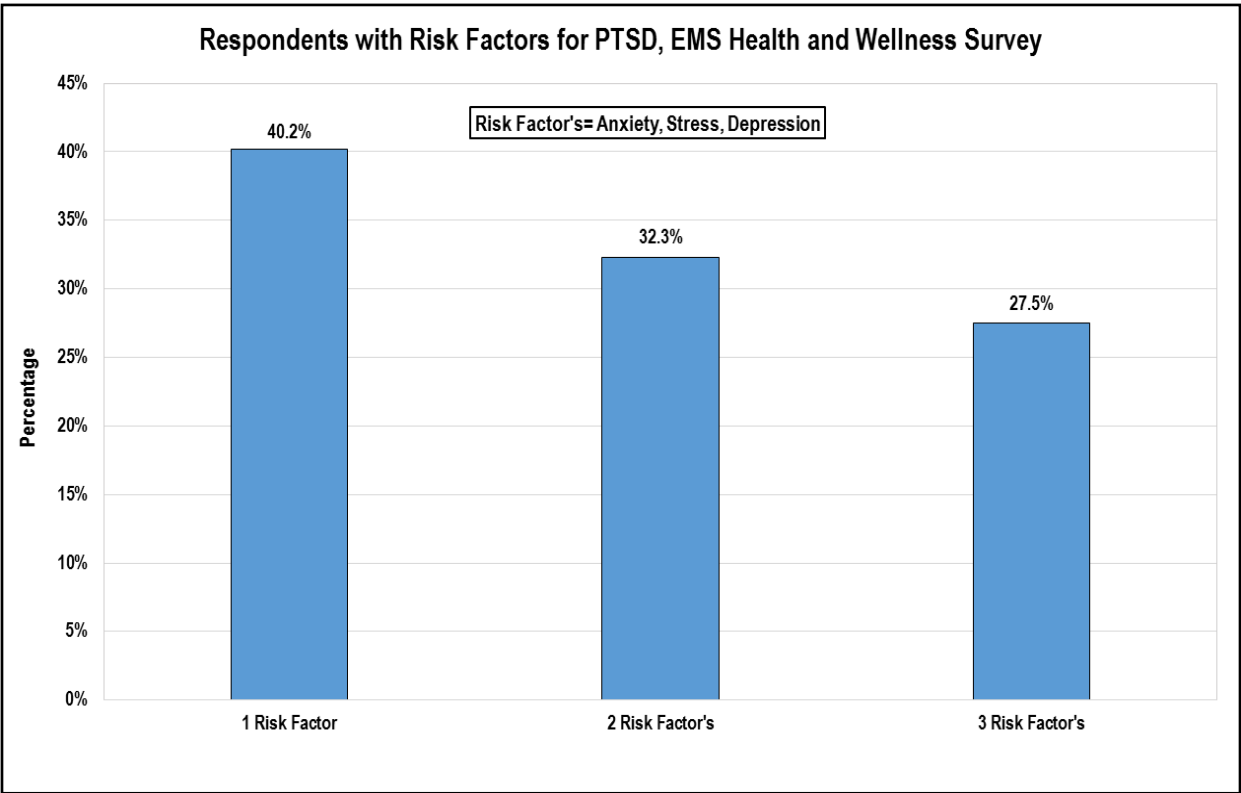


Figure 15: PTSD risk factors, respondents with positive DASS 21 scores.

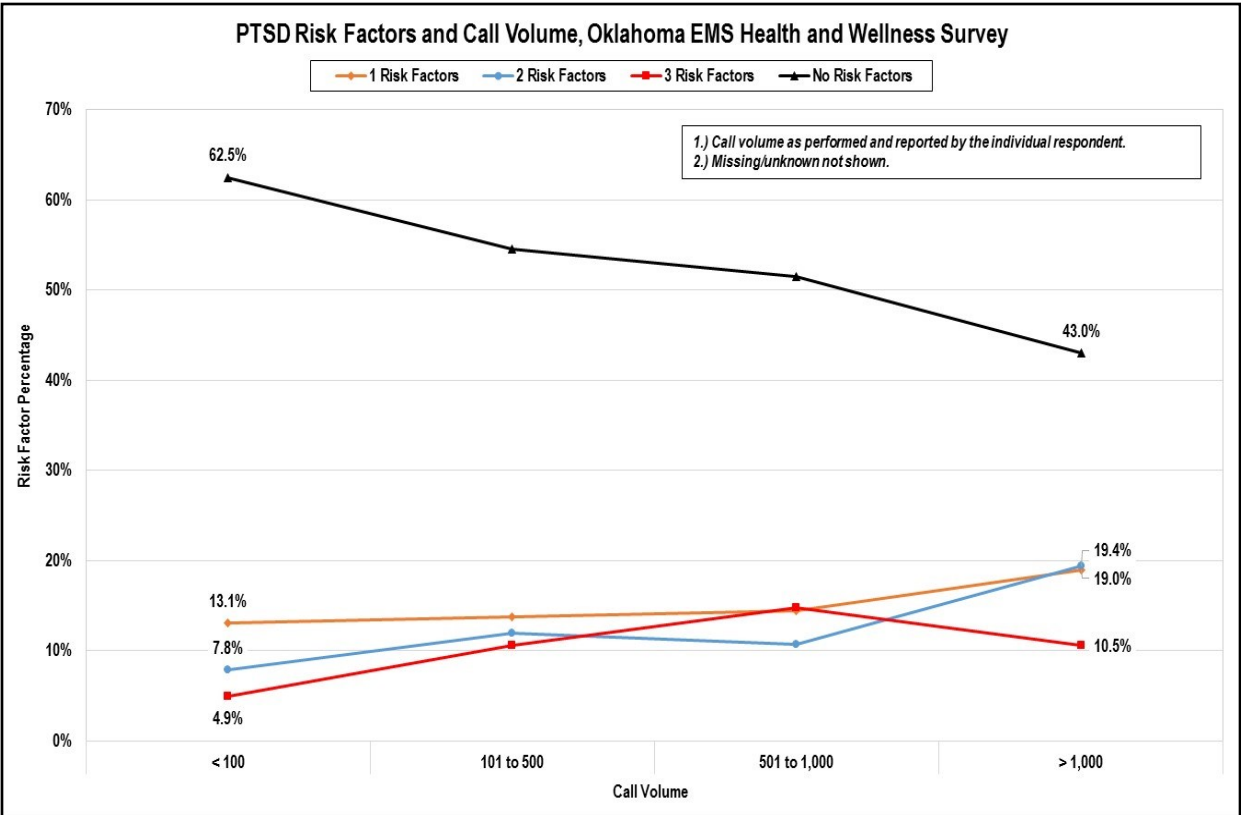


Figure 16: PTSD risk factors, call volume.

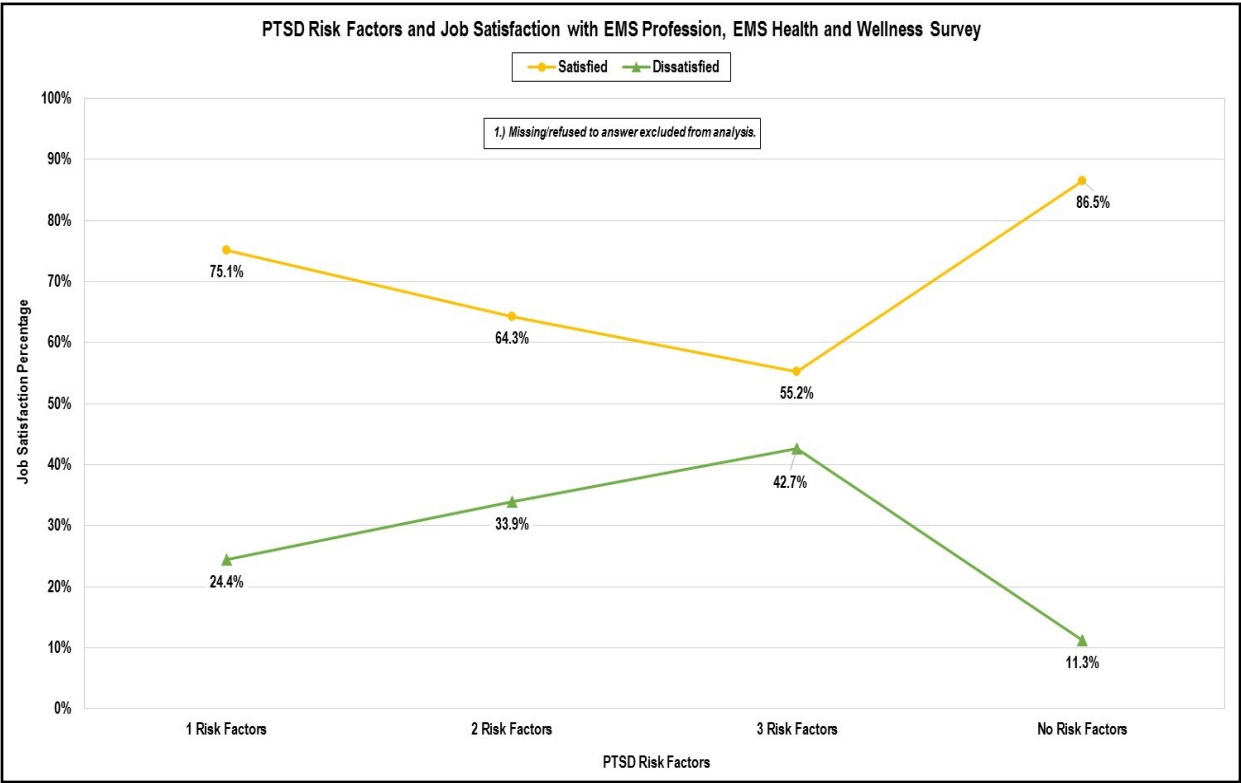


Figure 17: PTSD risk factors, job satisfaction with the EMS profession.

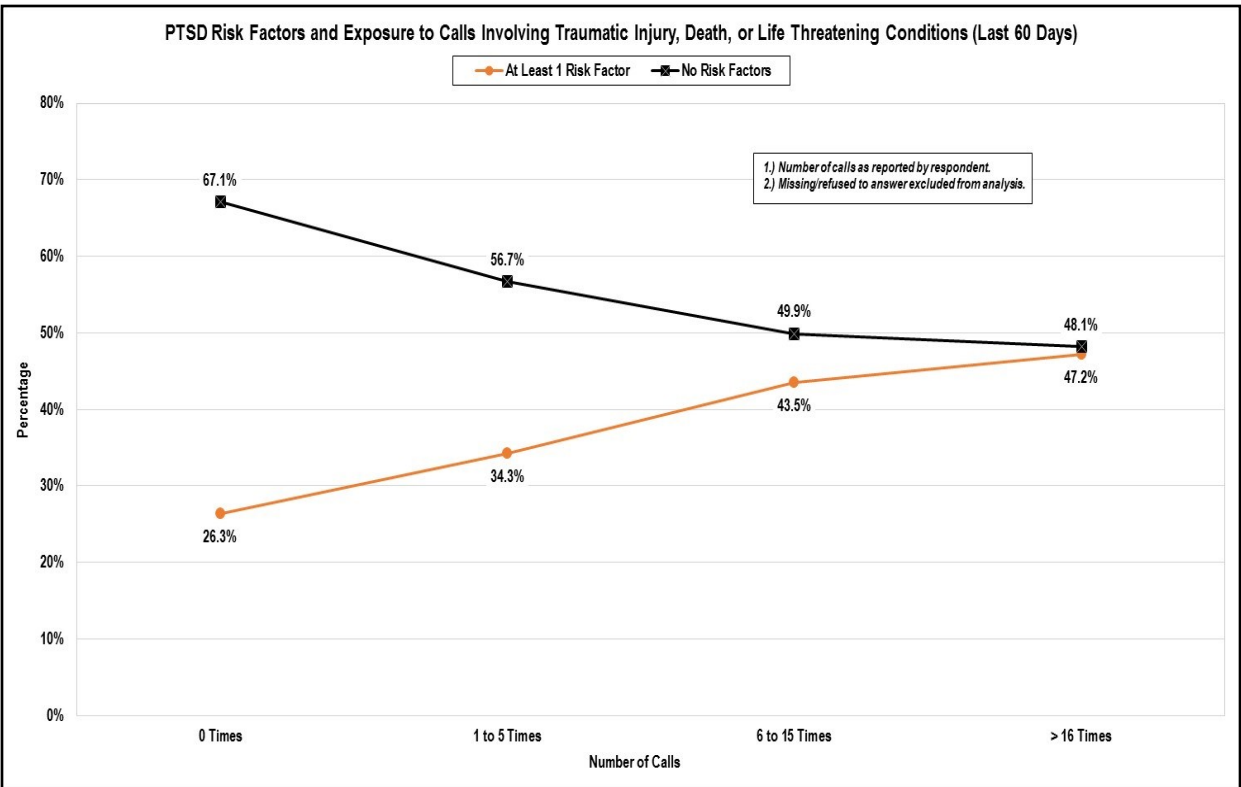
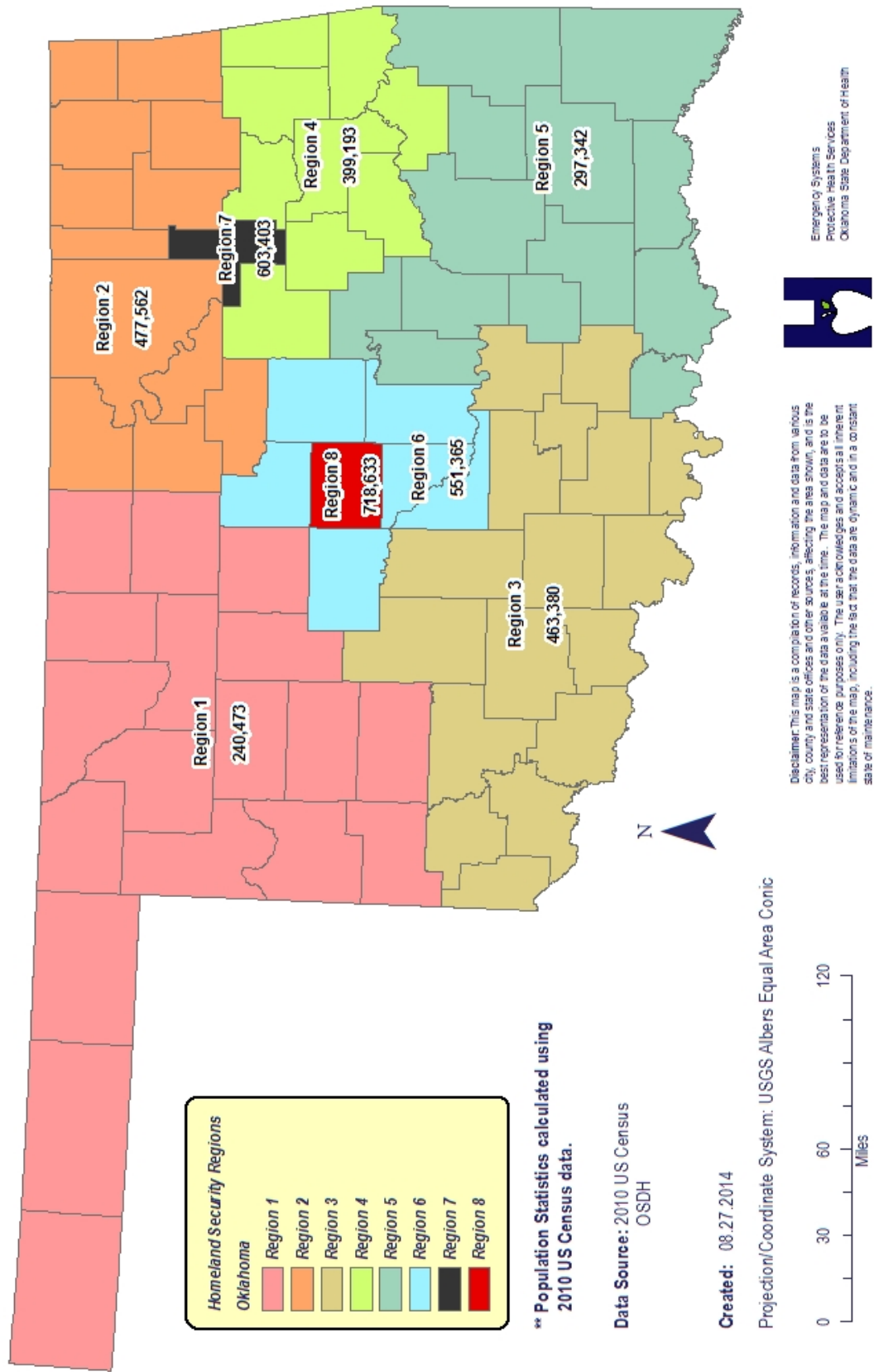


Figure 18: PTSD risk factors, exposure to calls involving traumatic injury, death, or life threatening conditions in the last 60 days.

Oklahoma Homeland Security Regions by Population



Map 1: Oklahoma homeland security regions by population, 2010 census.

Tables

Self-Reported Race/Ethnicity	Respondent %	Missing observations not shown.
*AI/AN	9.1%	
**NH/PI	0.1%	
Asian	0.1%	
Hispanic	1.5%	
Black/African American, Non- Hispanic	1.1%	
White, Non-Hispanic	78.3%	
<i>*AI/AN= American Indian/Alaska Native</i>		
<i>**NH/PI= Native Hawaiian/Pacific Islander</i>		
State EMS Licensure Level	Respondent %	EMS Registry %
EMR	10.7%	17.9%
EMT-Basic	38.7%	48.3%
EMT-Intermediate	7.0%	7.1%
EMT-Paramedic	39.2%	26.7%
<i>EMS registry % taken from State EMS Licensure Registry, N= 10,136.</i>		

Table 1: Respondent demographics for self-reported race/ethnicity and state licensure/certification level.

Demographics	Total N	*Missing	Mean	Median	Mode	Minimum	Maximum	Std Dev	*Missing observations excluded from analysis	
Height (feet/inches)	1,307	203	5.8	5.8	6	4.1	6.7	0.3		
Age	1,369	141	42.5	42	46	17	76	11.6		
Weight	1,326	184	209.3	205	200	50	418	48.6		
Demographics by Gender	Total N	Variable	N	*Missing	Mean	Median	Mode	Minimum	Maximum	Std Dev
Male	1,104	Height	1,040	64	5.9	5.9	6	4.8	6.7	0.2
		Age	1,082	22	41.8	42	46	17	76	11.3
		Weight	1,055	49	217.4	212	215	50	418	45.4
Female	276	Height	253	23	5.4	5.4	5.5	4.9	6.1	0.2
		Age	275	1	44.5	45	36	21	72	12.1
		Weight	255	21	176.2	173	200	56	315	45.4

Table 2: Respondent demographics by gender, age, weight, and height.

Table 3: Occupational Injury, Final Multivariable Logistic Regression Model

Multivariable Logistic Regression Model, Occupational Injury		
<i>Variable</i>	<i>OR (95% CI)¹</i>	<i>p-Value</i>
Licensure/Certification Level		0.017
EMR ³	Referent	
Basic	1.7 (0.9-3.5)	
Intermediate	2.2 (0.9-5.1)	
Paramedic	2.5 (0.9-5.1)	
General Health		0.013
Excellent	Referent	
Good	1.6 (1.1-2.3)	
Fair/Poor	2.1 (1.3-3.5)	
Years Worked in EMS		< .0001
4 or Less	Referent	
5-10	3.0 (1.9-4.9)	
11-20	6.4 (4.1-10.0)	
21 or more	11.8 (7.3-19.2)	
Run Volume ²		< .0001
< 100	Referent	
101-500	1.9 (1.2-2.8)	
501-1,000	3.5 (2.2-5.5)	
> 1,000	4.1 (2.5-6.8)	
PTSD Risk Factors¹		< .0001
None (Normal)	Referent	
1 Risk Factor ⁴	1.4 (0.9-2.1)	
2 Risk Factors	1.6 (1.0-2.4)	
3 Risk Factors	3.0 (1.8-4.9)	

¹CI= Confidence Interval; OR= Odds Ratio; PTSD= Post Traumatic Stress Disorder.

²Self-reported individual run volume performed in the last 12 months.

³EMR= Emergency Medical Responder (basically first responder).

⁴Risk Factor= scored positive on DASS 21 survey portion for anxiety, stress, or depression.