




2022

## Identifying and Evaluating the Perceptions of Near-Miss Reporting within the Kentucky Transportation Cabinet

Seth Atkins

University of Kentucky, [atkinsseth@yahoo.com](mailto:atkinsseth@yahoo.com)

Author ORCID Identifier:

 <https://orcid.org/0000-0001-7402-6690>

Digital Object Identifier: <https://doi.org/10.13023/etd.2022.332>

[Right click to open a feedback form in a new tab to let us know how this document benefits you.](#)

### Recommended Citation

Atkins, Seth, "Identifying and Evaluating the Perceptions of Near-Miss Reporting within the Kentucky Transportation Cabinet" (2022). *Theses and Dissertations--Civil Engineering*. 123.  
[https://uknowledge.uky.edu/ce\\_etds/123](https://uknowledge.uky.edu/ce_etds/123)

This Master's Thesis is brought to you for free and open access by the Civil Engineering at UKnowledge. It has been accepted for inclusion in Theses and Dissertations--Civil Engineering by an authorized administrator of UKnowledge. For more information, please contact [UKnowledge@lsv.uky.edu](mailto:UKnowledge@lsv.uky.edu).

## **STUDENT AGREEMENT:**

I represent that my thesis or dissertation and abstract are my original work. Proper attribution has been given to all outside sources. I understand that I am solely responsible for obtaining any needed copyright permissions. I have obtained needed written permission statement(s) from the owner(s) of each third-party copyrighted matter to be included in my work, allowing electronic distribution (if such use is not permitted by the fair use doctrine) which will be submitted to UKnowledge as Additional File.

I hereby grant to The University of Kentucky and its agents the irrevocable, non-exclusive, and royalty-free license to archive and make accessible my work in whole or in part in all forms of media, now or hereafter known. I agree that the document mentioned above may be made available immediately for worldwide access unless an embargo applies.

I retain all other ownership rights to the copyright of my work. I also retain the right to use in future works (such as articles or books) all or part of my work. I understand that I am free to register the copyright to my work.

## **REVIEW, APPROVAL AND ACCEPTANCE**

The document mentioned above has been reviewed and accepted by the student's advisor, on behalf of the advisory committee, and by the Director of Graduate Studies (DGS), on behalf of the program; we verify that this is the final, approved version of the student's thesis including all changes required by the advisory committee. The undersigned agree to abide by the statements above.

Seth Atkins, Student

Dr. Gabriel Dadi, Major Professor

Dr. Mei Chen, Director of Graduate Studies

IDENTIFYING AND EVALUATING THE PERCEPTIONS OF NEAR-MISS  
REPORTING WITHIN THE KENTUCKY TRANSPORTATION CABINET

---

THESIS

---

A thesis submitted in partial fulfillment of the  
requirements for the degree of Master of Science in  
Civil Engineering in the College of Engineering  
at the University of Kentucky

By

Seth Atkins

Lexington, Kentucky

Director: Dr. Gabriel Dadi, Professor of Civil Engineering

Lexington, Kentucky

2022

Copyright © Seth Atkins 2022  
<https://orcid.org/0000-0001-7402-6690>

## ABSTRACT OF THESIS

### IDENTIFYING AND EVALUATING THE PERCEPTIONS OF NEAR-MISS REPORTING WITHIN THE KENTUCKY TRANSPORTATION CABINET

In the field of construction, most safety data and practices focus on preventing and mitigating serious incidents resulting in injuries or fatalities. However, on construction sites, near-miss events occur more frequently than said serious incidents and, under marginally different conditions, could potentially lead to damages, injuries, or fatalities. Therefore, near-miss reporting can serve as a useful tool for managing safety as it allows for workers to identify and managers to address potential risk factors within construction sites. While most construction companies have implemented some method for reporting near-miss events, many organizations, such as the Kentucky Transportation Cabinet (KYTC), struggle with a lack of near-miss reporting from employees.

Therefore, the purpose of this study is to address and improve upon this near-miss reporting deficiency. To accomplish this goal, potential factors that result in a lack of reporting are identified through the synthesis of existing literature, areas for improving existing near-miss reporting systems are discussed, and a survey study created by the author and fellow researchers is distributed to KYTC maintenance superintendents.

Results and analysis of this study suggest that many of the barriers that lead to a lack of near-miss reporting at KYTC stem from the managerial level. Some of these main barriers include a lack of knowledge on how to report a near-miss, a lack of training on how to report a near-miss, a lack of awareness of KYTC's web-based reporting tool and how to access it, and a lack of corrective actions from previous near-miss reports. Some initial recommendations to KYTC management in attempt to overcoming these barriers include providing and/or requiring more near-miss training, making the web-based reporting tool more well-known and accessible, and taking more visible action in correcting reported near-misses.

**KEYWORDS:** Construction Safety, Near-Miss, Reporting, Web Tool, Policy and Procedures

---

Seth Atkins

---

08/01/2022

---

Date

IDENTIFYING AND EVALUATING THE PERCEPTIONS OF NEAR-MISS  
REPORTING WITHIN THE KENTUCKY TRANSPORTATION CABINET

By  
Seth Atkins

Dr. Gabriel Dadi  
\_\_\_\_\_  
Director of Thesis

Dr. Mei Chen  
\_\_\_\_\_  
Director of Graduate Studies

08/01/2022  
\_\_\_\_\_  
Date

## ACKNOWLEDGMENTS

While it is an individual work, the following thesis benefits greatly from the support and direction of several people. First, I would like to thank my Director of Thesis, Dr. Gabriel Dadi. The completion of this thesis would not have been possible without his continuous support and direction in all aspects of my graduate career. In addition, I would like to thank my fellow researcher and PhD candidate, Ashtarout Ammar, for her constant assistance and feedback throughout my research and writing of this thesis. I would also like to thank the entire Thesis Committee, and outside reader, which consisted of Dr. Gabriel Dadi, Dr. Hala Nassereddine, Dr. Reginald Souleyrette, and Ashtarout Ammar, respectively. Their comments and insights are greatly appreciated as they aided in enhancing my thesis to its finished product.

Along with the uplifting technical support mentioned above, I received great assistance from the Kentucky Transportation Cabinet. I wish to thank the Kentucky Transportation Cabinet for funding this research project through KYSPR 21-608. Finally, I would like to thank the employees of the Kentucky Transportation Cabinet that served as the respondents of this study and who remain anonymous for confidentiality purposes. This research effort would not have been possible without their thoughtfulness and willingness to participate.

## TABLE OF CONTENTS

ACKNOWLEDGMENTS .....	iii
LIST OF TABLES .....	vi
LIST OF FIGURES .....	vii
CHAPTER 1. BACKGROUND .....	1
1.1 Introduction.....	1
1.2 Scope of Work .....	3
CHAPTER 2. LITERATURE REVIEW .....	5
2.1 Common Shortcomings of Near-Miss Reporting .....	5
2.2 Potential Solutions to Shortcomings.....	9
CHAPTER 3. METHODOLOGY .....	13
3.1 Investigating Near-Miss Programs of Other State DOTs .....	13
3.2 Documenting Current Near-Miss Program of KYTC.....	14
3.3 Identifying Perceptions of Current KYTC Near-Miss Program .....	15
CHAPTER 4. RESULTS .....	17
4.1 Investigating Near-Miss Programs of Other State DOTs .....	17
4.2 Documenting Current Near-Miss Program of KYTC.....	21
4.3 Identifying Perceptions of Current KYTC Near-Miss Program .....	24
4.3.1 Demographics and Overall Experience .....	24
4.3.2 Near-Miss Knowledge and Experience .....	28
4.3.3 Knowledge and Experience of KYTC’s Near-Miss Program.....	30
CHAPTER 5. FINDINGS AND ANALYSIS .....	37
5.1 Investigating Near-Miss Programs of Other State DOTs .....	37
5.2 Documenting Current Near-Miss Program of KYTC.....	39
5.3 Identifying Perceptions of Current KYTC Near-Miss Program .....	42
CHAPTER 6. CONCLUSIONS .....	54

APPENDICES .....	56
APPENDIX 1. KYTC NEAR-MISS REPORTING SURVEY .....	56
APPENDIX 2. STATISTICAL TESTS SPREADSHEET .....	62
REFERENCES .....	63
VITA.....	65



## LIST OF TABLES

Table 3.1: Blank State DOT's Near-Miss Information Table.....	14
Table 4.1: State DOT's Near-Miss Information .....	18
Table 4.2: Respondents' Recommendations for Web-Based Reporting Tool.....	35
Table 4.3: Respondents' Final Comments on Survey and Web-Based Reporting Tool...	36

## LIST OF FIGURES

Figure 3.1: Onset of KYTC Near-Miss Reporting Survey .....	16
Figure 4.1: Florida DOT Near Miss Incident Report Tool .....	19
Figure 4.2: Tennessee Notice of Alleged Safety or Health Hazards Tool.....	20
Figure 4.3: Sample KYTC Risk Report Form .....	22
Figure 4.4: KYTC Safety Opportunity Report Tool.....	23
Figure 4.5: Distribution of Respondents' Current Districts.....	25
Figure 4.6: Distribution of Respondents' Years of Experience with KYTC .....	25
Figure 4.7: Distribution of Respondents' Completed Safety Trainings .....	26
Figure 4.8: Distribution of Respondents' Rating of Safety Opportunity/Near-Miss Training .....	27
Figure 4.9: Distribution of Respondents' Awareness of Near-Miss Definition .....	28
Figure 4.10: Distribution of Respondents' Near-Miss Experience at KYTC .....	29
Figure 4.11: Distribution of Respondents' Rating of Near-Miss Reporting Importance .	29
Figure 4.12: Distribution of Respondents' Awareness of How to Report a Near-Miss ...	30
Figure 4.13: Distribution of Respondents' Awareness of Web-Based Reporting Tool ...	31
Figure 4.14: Distribution of Respondents' Use of Web-Based Reporting Tool.....	31
Figure 4.15: Distribution of Respondents' Rank of Preferred Reporting Method .....	33
Figure 4.16: Distribution of Respondents' Reasons for Not Reporting via Paper Form..	33
Figure 4.17: Distribution of Respondents' Reasons for Not Reporting via Web Tool.....	34
Figure 5.1: Inputs and Outputs for Near-Miss Definition Awareness .....	43
Figure 5.2: Inputs and Outputs for Near-Miss Experience .....	44
Figure 5.3: Inputs and Outputs for Near-Miss Awareness vs Near-Miss Experience .....	45
Figure 5.4: Inputs and Outputs for KYTC Web Tool Use.....	46
Figure 5.5: Inputs and Outputs for KYTC Web Tool Awareness .....	47
Figure 5.6: Inputs and Outputs for Web Tool Awareness vs Web Tool Use .....	48
Figure 5.7: Inputs and Outputs for Awareness of How to Report a Near-Miss.....	49
Figure 5.8: Inputs and Outputs for Web Tool Preference with Respect to Years of Experience.....	50

## CHAPTER 1. BACKGROUND

### 1.1 Introduction

In the field of construction, most safety data and practices focus on preventing and mitigating serious incidents resulting in injuries or fatalities. Such preventative practices include wearing proper safety equipment, providing safety training to all employees, and task-oriented training for skilled workers. Mitigative practices include training employees on how to promptly deal with safety hazards and perform basic medical procedures such as cardiopulmonary resuscitation (CPR). These practices along with many others are certainly important and are required for all construction organizations through guidelines set by the Occupational Safety and Health Administration (OSHA).

OSHA also requires that all fatalities and severe injuries that occur within the workplace be reported to OSHA by employers. Specifically, a fatality must be reported within eight hours while a severe injury resulting in an in-patient hospitalization, amputation, or eye loss must be reported within twenty-four hours. In addition, employers in the construction industry that have more than ten employees must also prepare and maintain records of serious occupational injuries and illnesses using OSHA Forms 300, 300A and 301. Much like the previously mentioned preventative and mitigative practices, these reporting practices are very important in efforts of improving safety on jobsites.

However, on construction sites, near-miss events occur more frequently than said serious incidents and, under marginally different conditions, could potentially lead to damages, injuries, or fatalities (Cambraia et al., 2009). From slips and trips to falling objects to narrow escapes, near-miss events happen rather frequently. Take for example a

missing label for a hazardous substance. While this condition itself is considered merely a safety hazard rather than a near-miss, if an employee is almost injured by the unlabeled substance, this event would be considered a near-miss. Near-miss events occur so often that nearly all workers have experienced at least one near-miss at some point in their construction career. Some events are not as evident as others, yet all should be considered significant as they accompany health risks.

Therefore, near-miss reporting can serve as a useful tool for managing safety as it allows for workers to identify and managers to address potential risk factors within construction sites. That being said, a construction organization's capability to control near-miss events in this way is dependent upon the cooperation of employees, who are responsible for accurately reporting said events, and managers, who are responsible for encouraging reporting (Winkler et al., 2019). If performed properly, reporting near-misses can prove to be as valuable, or even more valuable, as injury reporting.

Compared to the lagging indicator of reporting injuries after they occur, reporting near-misses can serve as a leading indicator of how to fix problems before injuries or fatalities occur (Aulin and Linderback, 2014). Reporting and investigating injuries within construction sites may provide a more detailed picture of events and alert organizations to a failure in an area of their safety and health programs or to the existence of a hazard. However, reporting near-misses can inform organizations whether their safety and health programs are efficient at preventing incidents.

While the benefits of reporting near-misses are evident and plentiful, it is not a requirement for employers to report all near-miss events to OSHA as it is with serious injuries and fatalities. However, OSHA does recommend workers to report near-miss

events to their immediate supervisor within their respective companies. To promote such reporting, OSHA has developed a standard “Near-Miss Incident Report Form” for all companies to use. That being said, most construction organizations have adopted the use of this form or have developed in-house systems for near-miss reporting including company specific forms and filing systems, online forms and databases, as well as visualization tools in building information modeling (BIM).

## 1.2 Scope of Work

While most construction companies have implemented some method for reporting near-miss events, many organizations struggle with a lack of near-miss reporting from employees. Because near-misses result in no fatalities, injuries, or property damages, they leave little to no evidence that an event ever occurred. Therefore, workers may have no reason to believe that reporting such an event will be viewed positively or prove beneficial (Aulin and Linderback, 2014). As a result, reporting culture becomes inadequate, and the opportunities to prevent incidents decrease. This problem of reporting deficiency branches throughout the entire safety program resulting in additional problems such as poor data quality and insufficient analyzation of said data (Oswald et al., 2018).

In a report titled *Near Miss Reporting: A Missing Link in Safety Culture*, the author asks, “Does your organization receive about 50 near-miss reports for every minor injury suffered by workers?” The author suggests that if not, “several significant barriers within the organization’s culture may be preventing the organization from learning the lessons available from incidents that did not result in loss—at least not this time” (Williamsen, 2013). This idea goes to show how abundant near-misses are within jobsites and how

damaging a lack of reporting such near-misses can be for the safety record and culture of an organization.

One particular organization that struggles with a lack of near-miss reporting amongst its employees is the Kentucky Transportation Cabinet (KYTC). Therefore, the purpose of this study is to address and improve upon this near-miss reporting deficiency. In particular, the following objectives were set in order to achieve this overall purpose:

- Investigate near-miss programs used at other state departments of transportation (DOTs).
- Identify strategies KYTC can readily adopt to increase use of its existing near-miss program.
- Document administrative policy language and procedures to effectively use the near-miss program.

This portion of the study focuses on evaluating KYTC's current near-miss program and identifying the perceptions associated with it. To accomplish this goal, potential factors that result in a lack of reporting will be identified through the synthesis of existing literature. Also, areas for improving existing near-miss reporting systems and gaps in existing literature will be discussed. Next, a survey study created by the author and fellow researchers will be described. The results of this study will be presented and analyzed to generate findings specific to the KYTC. Finally, all ideas will be concluded in efforts of establishing key takeaways and recommendations to the proposed issue.

## CHAPTER 2. LITERATURE REVIEW

### 2.1 Common Shortcomings of Near-Miss Reporting

In order to increase the rate of valuable near-miss reporting within the construction industry, the shortcomings leading to a lack of reporting must be identified and analyzed. A recent case study was performed in efforts to determine these shortcomings. In this study, new employees of a construction company were provided near-miss training at their orientation. Upon completion of the training, in-depth discussions were carried out amongst the new employees and the safety team. After said discussions, the safety team established “Five Fatal Flaws” that they believe bury near-miss programs in the construction industry. These flaws include the following: “1) Upper management believes in the program and provides financial support, but managers are not engaged and do not know how to be. 2) Safety professionals, who have the technology to be successful, struggle to effectively teach the organization that which is intuitive to them. 3) Supervisors, who do not want workers to get injured, are overburdened and do not want more nonvalue-added (questionable worth) work forced on them. 4) Hourly employees, who want to be safe, wonder “what’s in it for me” for reporting a near-miss. 5) Data management can be red herring. When no or few reports are received, there are no data to analyze, and problems remain unknown.” (Williamsen, 2013). As they remain untreated, these general flaws slowly generate numerous specific barriers to near-miss reporting.

An initial barrier that is believed to add to the lack of near-miss reporting is the lack of common understanding and universal definition of near-miss among construction workers. Because a common definition is not consistently recognized, near-misses often

go unidentified by workers. According to a recent study, “Identification errors are those where personnel are exposed to an unsafe condition or behavior and simply did not realize the potential for harm. Interestingly, hazards not identified are one of the most commonly used root causes identified in incident investigations after the occurrence of recordable injuries” (Mckay, 2018). However, other studies suggest that construction workers are at least somewhat aware and have a basic understanding of near-misses. A study was performed to determine how well-informed construction employees are in regard to near-misses. In this study, a group of 37 construction workers were interviewed and the researchers drew conclusions from their conversations. Results indicated that majority of the interviewees are familiar with the definition of a near-miss and routines of reporting, yet the willingness to report near misses is still low (Aulin and Linderback, 2014). According to a focus group discussion study performed to understand and characterize the construct of near-misses, workers in the construction industry can make a clear-cut distinction between near-misses and injuries and believe their greatest protections from both stem from the employee level (Santiago et al., 2020). So, if most construction workers are familiar with the definition of a near-miss as well as their responsibility in reporting said events, there must be additional barriers contributing to the industry-wide lack of reporting.

Multiple studies have identified one of these additional barriers to be the fears instilled by supervisors and coworkers. Specific concerns include the fear of punishment, retaliation, and peer pressure. According to the previously mentioned case study performed by Williamsen, the new employee near-miss training revealed a genuine fear of punishment and retaliation. “Site managers and supervisors wondered how more near-misses would



make them look. Employees wondered whether supervisors think the reports make supervisors and employees look bad and what response might be expected” (Williamsen, 2013). Another study was performed to fill in the gap of the lack of comprehensive understanding on what near-miss information means within the context of construction safety management (Zhou et al., 2019). In this study, multiple research methodologies were utilized to develop eight stages of near-miss management. One of these stages discussed how to report near-misses. Looking at the findings of this study, the researchers identified one of the obstacles to the practice of reporting to be worrying about penalty after reporting (Zhou et al., 2019). Peer pressure from coworkers also plays a role in the fear of reporting near-misses. Reporting near-misses is typically viewed negatively by coworkers, especially when the report involves them. In turn, peers will frequently discourage reporting and call those who report names such as “management’s best friend” (Williamsen, 2013). Therefore, construction workers often neglect to report near-misses because they believe the benefits of reporting something that resulted in no injuries and nobody else knows about does not outweigh the risk of trouble.

Another barrier to near-miss reporting is the lack of recognition and feedback after reporting. This issue stems from the managerial level. Workers will not be encouraged to report if there are no changes in attempt to make the jobsite a safer place based on their input. “Management must take purposeful, intentional, and visible actions that demonstrate and prove that good outcomes happen when near-misses are reported. Nothing is more frustrating than to be told something is important, only to learn that no one gets a response or feedback for their efforts” (Williamsen, 2013). This issue was also identified as an obstacle to the reporting stage of near-miss management. It was determined that workers

do not think that near-miss reports are useful for safety because they have yet to see positive results from them (Zhou et al., 2019). This lack of recognition and feedback leads workers to question if completing a report is even worth their time.

Such questioning results in an added barrier to near-miss reporting: a desire to avoid work interruption and red tape. The construction industry is one of many moving parts and tight deadlines. That being said, near-misses are frequently occurring events. Workers have to decide whether a perceived risk or near-miss can wait or if immediate attention is necessary (Williamsen, 2013). Also, the amount of red tape that will entangle a worker if they turn in a report is put into question. How long it takes to complete a report is also a key factor for workers deciding whether or not to report a near-miss (Williamsen, 2013). More often than not, workers consider the reporting process to be too complex and time-consuming (Zhou et al., 2019). Combined with all the other barriers, the desire to save time and avoid any extra work can be attributed to nearly all cases where near-misses go unreported.

While identifying these factors that add to the lack of near-miss reporting is beneficial, major issues can also result from improper reporting. A recent study was performed on a construction project in the United Kingdom in which a safety observation reporting (SOR) system was implemented and encouraged everyone on site to report unsafe acts or conditions, either via computer or handwritten cards, for subsequent action by the health and safety team (Oswald et al., 2018). Due to improper motives of its implementation, problems arose from this reporting system. These problems included “significantly increased administration to deliver predictable data; poor data quality; an unwelcome focus on the number rather than content of the reports; their use as a tool to

ascribe individual or organizational blame; and the perception that the SOR forms were being censored before they reached the health and safety team, which ultimately eroded trust between the workforce and management” (Oswald et al., 2018). That being said, it is important near-miss reporting systems are appropriately designed to improve workplace safety by identifying and addressing accident risk factors. Simply seeking to increase reporting rates without the correct intentions proves to be insufficient for improving workplace safety.

## 2.2 Potential Solutions to Shortcomings

Given all the discussed shortcomings, in what ways can a company design or improve upon their near-miss reporting system? According to Williamsen (2013), a good starting point to overcome barriers to near-miss reporting is the utilization of the following six criteria of safety excellence: “1) Top management is visibly committed to the process. 2) Middle management is actively involved in the program. 3) Supervisor performance is focused. 4) Hourly employees are actively participating. 5) System is flexible to accommodate site culture. 6) System is perceived as positive by the hourly workforce.” Moving through these criteria can be helpful in determining the appropriateness of solutions for the lack of near-miss reporting in the construction industry. If a proposed solution meets all six of these criteria, it should be considered appropriate.

Specific solutions should be developed for specific barriers to near-miss reporting. To overcome the barrier of a lack of common understanding of near-miss, construction companies should choose a broad, all-encompassing definition. Companies should encourage their workers to report any unsafe event they encounter as a near-miss. To help

overcome the barrier of fear of punishment, retaliation, and peer pressure, companies should propose relevant regulations for the rewards and punishments about near-miss reporting (Zhou et al., 2019). Regulations should be put in place to not only prevent retaliation from management on those who report, but also to effectively incentivize proper reporting. In efforts of overcoming the barrier of lack of recognition and feedback, management should disseminate widely the importance of near-misses (Zhou et al., 2019). Workers should be made aware that their input is valued and meaningful for improving safety within their company. Finally, a key component in overcoming the barrier of a desire to avoid work interruption and red tape is making the near-miss reporting process simple and convenient for workers (Zhou et al., 2019). The more simplified and convenient the process is, the more quantity and quality reporting a company will receive from its workers.

An additional way to improve near-miss reporting rates is by implementing more technologically advanced, readily accessible, and easier to use reporting systems. For example, state transportation departments that are thought to be leaders in occupational safety including California, Florida, and Tennessee, have all implemented online forms and tools to create easy and convenient reporting as well as secure databases to store information and analyze trends. While statistics on the matter were inaccessible, the listed state transportation departments have indicated an increase in reporting and improved analyzation of near-misses with the implementation of these tools. Additional research has been done to provide a framework for near-miss data collection and visualization within a BIM platform (Shen and Marks, 2015). This framework allows workers to input details of their near-miss event and visualize it alongside other similar events. Managers are then

capable of pinpointing high-frequency and high-severity areas and events to adopt practical hazard removal techniques.

While understanding these presented shortcomings and the recommendations for improving them is certainly beneficial, further research is still necessary for maximizing the effectiveness of near miss-reporting in the construction industry. To date, many studies on the issue have been performed within individual companies. Therefore, results of these studies may be indicative of only the safety culture of the companies in question rather than the construction industry as a whole. To get a better understanding of the major industry-wide near-miss reporting issue, studies should sample numerous companies both individually and collectively and compare the findings. Additionally, future research should be performed to quantify the difference between near-misses that occur and near-misses that are reported. While it is evident that near-misses are going unreported, there is little research on how many events go unreported and how incidence rates change as the number of unreported events increase. Regardless of the reasons for not reporting, the inability to analyze 100% of near-misses limits the decisiveness of results and thus limits the potential for increased jobsite safety (Haas et al., 2020). Lastly, future research should be performed to get a better understanding of the role that demographics plays in near-miss reporting. For example, a greater risk tolerance is associated with longer tenures of workers in hazardous industries (Haas et al., 2020), such as the construction industry. Additional research that determines how tenure, as well as other worker demographics, affect near-miss reporting rates may be useful in defining and combating the problem at hand. “Being able to associate individual factors with the severity and actions of near-miss reports may

have further informed individual-level interventions that companies can use within their management systems” (Haas et al., 2020).

## CHAPTER 3. METHODOLOGY

There are many objectives of this research project. The main objectives within this portion of the project include investigating near-miss programs used at other state departments of transportation, documenting KYTC's current approach to near-miss reporting and tracking, and identifying perceptions of said current near-miss program. Such perceptions should include awareness of near-misses, value of the program, barriers to its use, etc. The subsequent sections of this report will describe the methodologies used in fulfilling these presented objectives.

### 3.1 Investigating Near-Miss Programs of Other State DOTs

The investigation of existing near-miss programs and tracking began with a search of other state DOT websites. The fifty state transportation agency websites were browsed for safety manuals that mentioned near-miss reporting and existing near-miss report forms. It was quickly discovered that most state DOTs neglect to discuss any form of a near-miss program or near-miss reporting form/tool. Therefore, the search was narrowed down to a few state DOTs who are thought to be leaders in the field of occupational safety. These states included California, Connecticut, Florida, New York, Pennsylvania, Tennessee, and Texas. Table 3.1 was created to properly organize and compare data from state to state. After creating Table 3.1, information regarding near-miss programs and/or reporting was gathered for each state in order to complete the table.

Table 3.1: Blank State DOT’s Near-Miss Information Table

<b>State</b>	<b>Near-Miss Policy and Procedure</b>	<b>Accessible Near-Miss Reporting Form/Tool?</b>	<b>Applicable Websites</b>
California			
Connecticut			
Florida			
New York			
Pennsylvania			
Tennessee			
Texas			

### 3.2 Documenting Current Near-Miss Program of KYTC

After compiling data on near-miss programs used at other state DOTs, the research team performed a similar investigation on KYTC’s current near-miss program. KYTC’s website was thoroughly browsed in efforts of collecting any information that KYTC provided on the topic of near-misses. Specifically, KYTC’s Employee Safety and Health Manual was reviewed to gather information on the existing near-miss program and near-miss reporting opportunities.

Additional information on KYTC’s current near-miss program was documented from conversations that the research team had with KYTC administration and safety personnel. Such conversations provided the research team with supplemental information that is not easily accessible with an internet search. The author was also able to provide additional input on the current near-miss program based on his previous work experience with KYTC.



### 3.3 Identifying Perceptions of Current KYTC Near-Miss Program

The research team decided to create and distribute a survey to KYTC maintenance personnel on their experience with the agency's near-miss reporting program. This research method was considered ideal for this project as it allowed the research team to gather a large amount of data in both time-effective and cost-effective manners. This survey method allowed the researchers to present questions and prompts in multiple formats including multiple choice, sliding scale, free response, etc. This method also allowed for conditional questions and prompts based on the respondent's answers to previous questions.

The survey, titled KYTC Near-Miss Reporting Survey, was distributed via Qualtrics to all KYTC maintenance Superintendents I and Superintendents II. The superintendents' contact information was acquired by KYTC safety coordinators throughout the state and forwarded to the research team. Respondents were informed at the beginning of the survey that all of their answers would remain anonymous. The survey was completed by 73 respondents from KYTC's 12 districts. Responses were used to calculate summary statistics at the district and statewide levels in order to identify trends and pinpoint common employee perceptions that could warrant greater attention from KYTC.

When creating the survey, the researchers wrote questions and prompts that can be grouped into three general categories. The first of these categories includes questions pertaining to demographics and overall experience. These questions help to establish the respondent's geographical location of work, years of experience with KYTC, and safety training experience. The second category of questions pertains to the respondent's near-miss knowledge and experience. Questions in this category help to determine if the

respondent knows what a near-miss is, how to report a near-miss and the importance of doing so, and if the respondent has ever experienced a near-miss. The final category concerns the respondent’s knowledge and experience with KYTC’s current near-miss program. Within this category, questions are asked to get a better understanding of the respondent’s knowledge of KYTC’s near-miss reporting methods, their experience with said methods, and their perceptions and recommendations of improving the methods.

An image of the first page of the survey including the onset along with the demographic/overall experience questions is shown below in Figure 3.1. The entirety of the survey can be found in Appendix 1.

**University of Kentucky**

---

**UK**

**KYTC Near-Miss Reporting Survey**

This anonymous and confidential survey is intended to capture your perception of near-miss/close call reporting within KYTC. Your answers will be completely anonymous and will not be linked to you personally. To the degree identifiable questions are asked, they are strictly intended to understand information about where these perceptions originate generally. Your answers will directly go to researchers at the Kentucky Transportation Center at the University of Kentucky and no one from KYTC will be able to see them. When results are presented, they will be aggregated and anonymous, so that we, again, protect your confidentiality. Please complete and submit this survey as soon as possible. We estimate that it should take no more than 10 minutes to complete. If you have any questions or problems with operation or access to the survey, please contact the project lead, Gabe Dadi, at (859) 257-5416 or at gabe.dadi@uky.edu. Thank you for your time and expertise in completing this survey. This will help us advise KYTC on how to better capture near-miss information to help avoid incidents from occurring in the future.

Please select the district that you currently work in.

▼

Please select how many years of work experience you have with KYTC.

- 0-2 years
- 2-5 years
- 5-10 years
- 10-20 years
- More than 20

What safety training programs have you completed before? (Check all that apply).

- OSHA 10 Hour
- OSHA 30 Hour
- Work Zone Safety Control
- Leadership Training
- Safety Opportunity / Near Miss Reporting
- Other (Please Specify)

Figure 3.1: Onset of KYTC Near-Miss Reporting Survey

## CHAPTER 4. RESULTS

The methodologies described in the previous chapter lead to unique sets of data. These data sets can in turn be used in attempting to accomplish the many objectives and overall goal of the project at hand. The subsequent sections of this report will present the results that were gathered throughout this portion of the project.

### 4.1 Investigating Near-Miss Programs of Other State DOTs

As mentioned in the previous chapter, most state DOTs neglect to discuss any form of a near-miss program or near-miss reporting form/tool. This suggests that many other state DOTs, much like KYTC, struggle with creating a satisfactory near-miss program and/or documenting administrative policy language and procedures for effective use of such a program. That being said, the research team determined that KYTC is likely to benefit most from the investigation of near-miss programs of state DOTs that are considered leaders in occupational safety. Also previously mentioned, these states that are leaders in occupational safety include California, Connecticut, Florida, New York, Pennsylvania, Tennessee, and Texas. The information obtained during this investigation is presented in Table 4.1 below.

Table 4.1: State DOT's Near-Miss Information

State	Near-Miss Policy and Procedure	Accessible Near-Miss Reporting Form/Tool?	Applicable Websites
California	As described in Chapter 2, "Safety Meetings," of the Caltrans <i>Safety Manual</i> , "close-call incidents are incidents that did not result in contact, injury, or damage." Close calls are reported via the mobile app for the Major Construction Incident Notification form using a smart phone or tablet and then tracked in a database where information is collected and stored.	Yes	Online Reporting Tool Employee Safety Manual
Connecticut	No information found on near-miss or near-miss reporting.	No	N/A
Florida	No policy or procedure found on near-miss or near-miss reporting in FDOT Highway Safety Manual. However, FDOT does provide an online tool for reporting near-misses directly on their website. Reporting tool link provided.	Yes	Online Reporting Tool
New York	Employees shall also report to supervisors all "near-miss" accidents which could have resulted in an injury, death and/or property damage. The only difference between an accident and a "near-miss" is the consequences. Management must know about "near misses" to identify and correct safety problems that could have led to more serious consequences, but fortunately did not.	No	Employee Safety Manual
Pennsylvania	A near miss is an event that was observed to have had the potential to be categorized as an accident, but did not result in property damage, an injury or illness requiring professional medical attention, or a fatality. This may include, but is certainly not limited to, work zone intrusions that do not result in an accident. The Accident Investigation Report (P-25) and witness statement forms shall be completed to document near misses.	Yes	Reporting Form
Tennessee	No state unique policy and procedure found on near-miss or near-miss reporting. TDOT references the Occupational Safety and Health Act (OSHA) of 1972 which provides employees and/or their representatives the right to file complaints and request inspections if concerned with the possible existence of safety and health hazards. However, TDOT does provide online tools for reporting near-misses directly on their website. Reporting tool links provided.	Yes	Online Reporting Tool Employee Safety Manual
Texas	Near-Miss Events are unplanned events involving Department personnel, equipment, or operations that clearly demonstrate the potential for injury or property damage but that do not produce these results. All near-miss events are those incidents in which equipment failures or deficiencies are known, or suspected cause factors exist. Report all incidents to OCC. Reporting other types of near-miss events to OCC is encouraged but not mandatory.	No	Employee Safety Manual

The content of near-miss reporting forms and tools vary from state to state. Therefore, the research team reviewed each accessible reporting form and tool in order to get a better understanding of the differences between them. The following Figures 4.1 and 4.2 are images of the online reporting tools utilized by Florida DOT and Tennessee DOT respectively.

# Near Miss Incident Report

---

## Near Miss Incident Report

Complete the form below

---

1) Report Type  
- Select -

2) Date Occurred (MM/DD/YYYY)  
Enter the date here

3) Time (HH:MM AM/PM)  
Enter the time here

4) County  
-Select-

5) Employee Type  
-Select-

6) Attachments  
Choose File | No file chosen

7) Location  
Enter the general location where accident occurred

8) Functional Section  
-Select-

9) Employee's Name (Optional)  
Last, First, MI

10) Describe fully how and where the incident occurred.  
Enter details here

11) Likelihood of Exposure  
- Select -

12) Incident Severity  
- Select -

**SUBMIT**

Figure 4.1: Florida DOT Near Miss Incident Report Tool

### Hazard Description

Briefly describe the hazard(s) which you believe exist.

1. Include approximate number of employees exposed to or threatened by each hazard and  
 2. the specific building or worksite location where each alleged violation exists.

**Approximate Number of Employees Exposed \***

**Specific Building or Worksite Location \***

**Brief Description \***

Example: An employee is working 40 feet above the ground with no fall protection. Workforce is in a room with asbestos flaking off of the ceiling.

Has the condition been brought to the attention of the employer?  
 Yes  
 No

Has the condition been brought to the attention of another government agency?  
 Yes  
 No

How are you aware of this hazard?

### Establishment Information

**Employer/Establishment Name \***

**Site Address \***

**City, State, ZIP Code \***

City State ZIP Code

Same as above

**Mailing Address**

**City, State, ZIP Code**

City State ZIP Code

**Business Phone \***

**Type of Business \***

Figure 4.2: Tennessee Notice of Alleged Safety or Health Hazards Tool

## 4.2 Documenting Current Near-Miss Program of KYTC

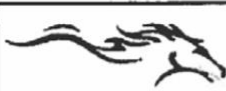
In browsing KYTC's website, the only information found on near-miss and/or near-miss reporting was in the KYTC Employee Safety and Health Manual. However, this manual provides minimal policy and procedure on the subject. The only information provided about near-misses in the manual reads as follows:

“Safety risk reports establish a process for workers to report close calls/near misses, hazards, and other safety and health concerns. Reports may be submitted anonymously, if preferred; however, employees are advised that it is illegal for employers to take any action against employees in reprisal for exercising their rights to report safety issues.

KYTC employees should complete a TC 25-164 form, Safety Risk Report, to report an observed safety risk within their assigned work area that could potentially result in an injury or that has resulted in a near miss to themselves or a co-worker (SHA-9013).

Completed forms shall be forwarded to the district safety coordinator or regional safety administrator. The district safety coordinator shall share the risk report with their immediate supervisor.”

A sample Safety Risk Report form, TC 25-164, that is referenced in the Employee Safety and Health Manual can be seen in Figure 4.3 below.



**SAFETY RISK REPORT**

*Instructions: KYTC employees are to use this form to report an observed safety risk within their assigned work area that could result in an injury or has resulted in a near miss to themselves or a co-worker. The Employee Safety & Health Branch staff will evaluate the safety risk and determine if safety enhancements are needed. Forward completed forms to the District Safety Coordinator or Safety Administrator. You may also mail forms to the KYTC Employee Safety & Health Branch, 200 Mero Street, 6<sup>th</sup> Floor, Frankfort, KY, 40601, or send by fax to (502)564-6683. Forms may be submitted anonymously, if preferred. However, employees are advised that it is illegal for employers to take any action against employees in reprisal for exercising their rights to report safety issues.*

**SECTION 1: EMPLOYEE INFORMATION**

<b>LAST NAME</b> Highway	<b>FIRST NAME</b> Jerry	<b>MI</b> Z	<b>JOB TITLE</b> Design Tech 7
<b>PHONE</b> 111-111-1111	<b>EMAIL</b> jerry.highway@kyt.gov	<b>DEPARTMENT</b> Design Maintenance	
<b>DISTRICT</b> 15	<b>DIVISION/FACILITY/LOCATION</b> Maintenance / David County		

**SECTION 2: SAFETY RISK/NEAR MISS DESCRIPTION** *(Be specific. Include date, time, and location.)*

I observed a KYTC inspector and contractor personnel in a trench at least 20 feet deep. Trench was 3 feet wide and no trench box was being used. This was on US 9999 mile marker 2 close to the US post office.

Has this matter been reported to your supervisor?  Yes  No

**SECTION 3: SUGGESTED SAFETY IMPROVEMENTS** *(Describe how you believe this safety risk/near miss could be eliminated.)*

Inspector and contractor need to be contacted and advised proper procedures for trench work.

**FOR KYTC USE ONLY**

DATE RECEIVED	COMMENTS	DATE CLOSED
<input type="checkbox"/> Safety Risk  <input type="checkbox"/> Near Miss		Corrective Action <input type="checkbox"/> Yes <input type="checkbox"/> No

Figure 4.3: Sample KYTC Risk Report Form



In conversations with KYTC administration and safety personnel, the research team discovered that KYTC has also created an online web tool for employees to report near-miss events, much like Florida DOT and Tennessee DOT discussed in section 4.1. The reporting tool was created using the ArcGIS Survey123 program and is titled “KYTC Safety Opportunity Report”. An image of the online tool is shown in Figure 4.4 below.

The image shows two side-by-side screenshots of the KYTC Safety Opportunity Report tool. The left screenshot shows the main form interface with the following sections:

- KYTC Safety Opportunity Report** (Header)
- SECRETARY'S OFFICE OF SAFETY** (Logo)
- A tool for reporting KYTC Safety Opportunities for correcting unsafe conditions, learning from unplanned incidents, and suggesting improvements.** (Description)
- Type of Opportunity you want to report\*** (Section header)  
Select the type of opportunity you want to report.
  - Opportunity to learn from a close-call or incident
  - Opportunity to improve safety in general in our work
  - Opportunity to correct a specific unsafe condition
- Would you like to follow up on this incident?\*** (Section header)
  - Yes
  - No
- KYTC District / CO\*** (Section header)  
Select a District or Central Office.  
-Please Select- (Dropdown menu)
- If this was an incident, when did it occur?\*** (Section header)  
6/23/2022 (Date field)  
04:37 PM (Time field)

The right screenshot shows a map interface for reporting an incident location:

- If this was an incident, where did it occur?\*** (Section header)  
Place the pin on the map where the incident occurred
- Map with search bar: Find address or place
- Map controls: Zoom in (+), Zoom out (-), Home, Refresh, Full Screen, Print
- Map data: Mapbox, Powered by Esri
- Coordinates: Lat: [ ] Lon: [ ]
- Tell us about the incident or condition\*** (Text area, 1000 characters)
- Tell us what was learned or your improvement idea\*** (Text area, 1000 characters)
- Have you talked to your supervisor about this?\*** (Section header)
  - Yes, in the past
  - Yes, at the time of this report
  - Not yet
  - I'm not comfortable doing so
- Photos help, submit them here** (Section header)  
Select image file (File selection button) [Camera icon]
- For assistance while completing this form, please contact the GIS Help Desk via [email](#).
- Submit** (Button)

Figure 4.4: KYTC Safety Opportunity Report Tool

### 4.3 Identifying Perceptions of Current KYTC Near-Miss Program

The KYTC Near-Miss Reporting Survey received some interesting responses and results from KYTC employees. These results can be used to help identify trends and determine common employee perceptions of KYTC's current near-miss program. Such information will later be used to improve upon the existing near-miss program and create appropriate policies and procedures for near-miss reporting.

As previously stated, the survey was completed by 73 respondents. However, the respondents were not required to complete any questions in order to complete the survey. Therefore, some of the questions may not have received responses from 100% of the survey respondents. The following subsections will present the results of each question and prompt of the survey based on the three general categories of questions and prompts described in Chapter 3 Section 3.3. The first subsection will present results of questions and prompts pertaining to demographics and overall experience. The next subsection will present results of questions and prompts pertaining to respondents' near-miss knowledge and experience. The final subsection will present results of questions and prompts pertaining to the respondent's knowledge and experience with KYTC's current near-miss program.

#### 4.3.1 Demographics and Overall Experience

The first category of questions and prompts pertains to demographics and overall experience. The first of these prompts requires the respondent to select which district of the cabinet that they currently work in. As shown below in Figure 4.5, all districts had at

least two respondents complete the survey with the district yielding the largest number of respondents being District 6.

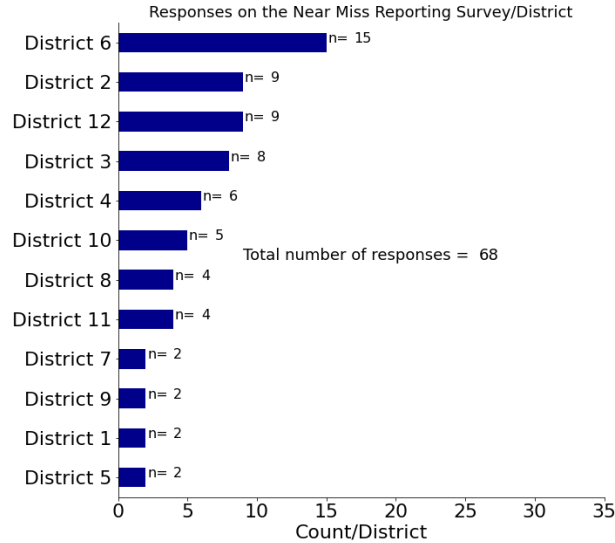


Figure 4.5: Distribution of Respondents' Current Districts

The second prompt requires the respondent to select the years of work experience that they have with KYTC. As shown below in Figure 4.6, each experience range had at least one respondent complete the survey. However, a majority of the respondents have more than 20 years of experience with KYTC.

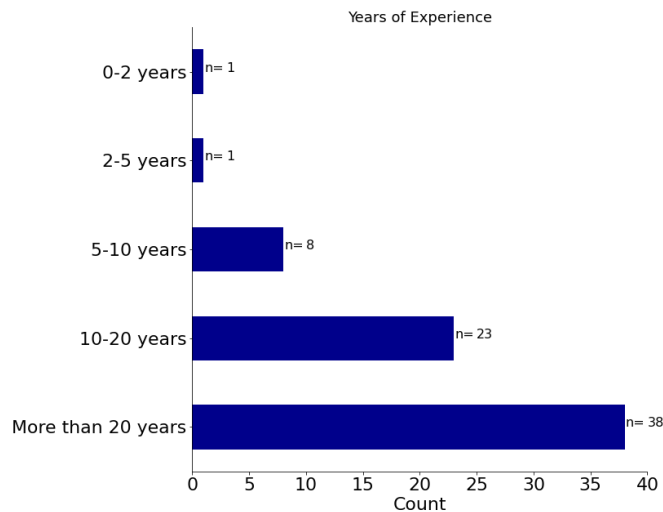


Figure 4.6: Distribution of Respondents' Years of Experience with KYTC

The next question asks the respondent to identify all training programs that they have completed. As shown below in Figure 4.7, each provided training program has been completed by a significant number of respondents. Being the training program of most concern for this study, the Safety Opportunity / Near-Miss Reporting Training has been completed by 25 respondents.



Figure 4.7: Distribution of Respondents' Completed Safety Trainings

The final two prompts within this category were created using conditional branching. These prompts would only appear for respondents who identified that they had completed the Safety Opportunity / Near-Miss Reporting Training in the previous question. The first of these prompts asks the respondent to rate the overall quality of the Safety Opportunity / Near-Miss Reporting Training. As shown below in Figure 4.8, each rating of the training received at least two responses. However, a majority of the respondents found the training to be somewhat adequate or extremely adequate.

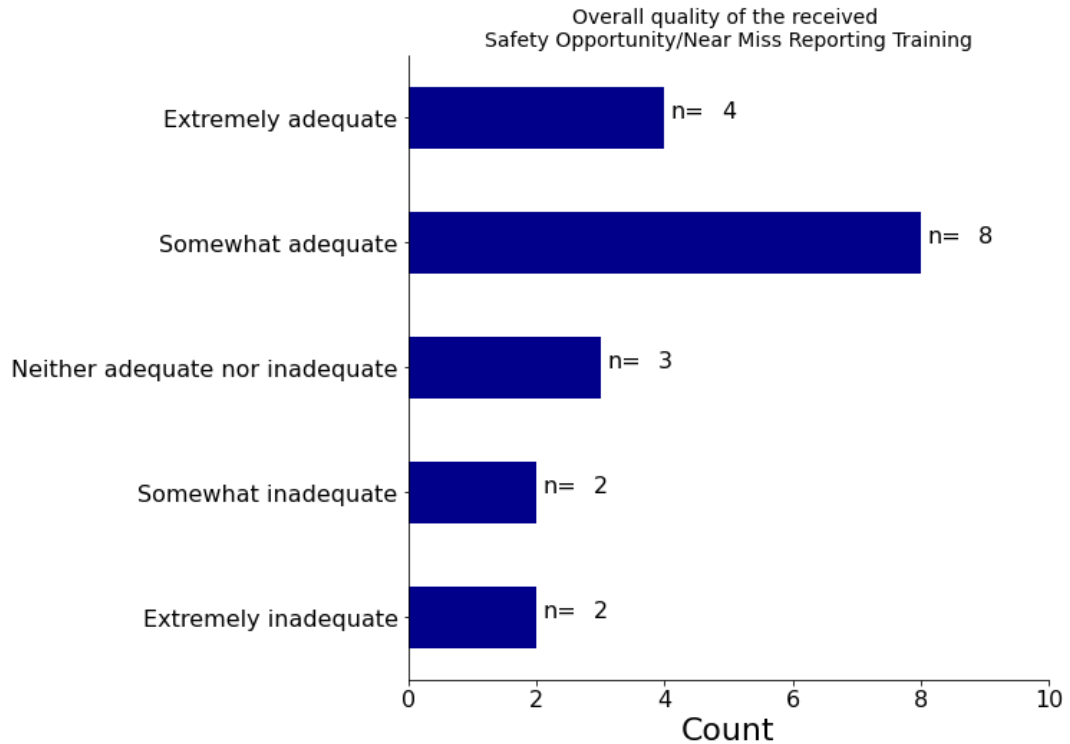


Figure 4.8: Distribution of Respondents' Rating of Safety Opportunity/Near-Miss Training

The final prompt of this category is an open-ended prompt that allows respondents to express their opinions in their own words. This prompt asks the respondents to provide any strengths and/or opportunities for improvement with the Safety Opportunity / Near-Miss Training. The only two unique responses to this prompt are quoted and listed below.

- “As far as my experience with safety reporting is that it’s not done because nothing is ever done about it. In my facility alone there has been several, what I think is hazards reported and yet nothing is done.”
- “It is a good program, as it is.”

### 4.3.2 Near-Miss Knowledge and Experience

The next category of questions and prompts pertains to respondents' near-miss knowledge and experience. The first of these questions asks the respondent if they are aware of the definition of a near-miss or close call event. As shown below in Figure 4.9, over three-fourths of the respondents claim that they are aware of the definition of a near-miss while only six percent of respondents claim to not be. The remaining respondents indicated that they may be aware of the definition of a near-miss. Following this question in the survey, respondents are provided with a general definition and similar terms to near-miss.

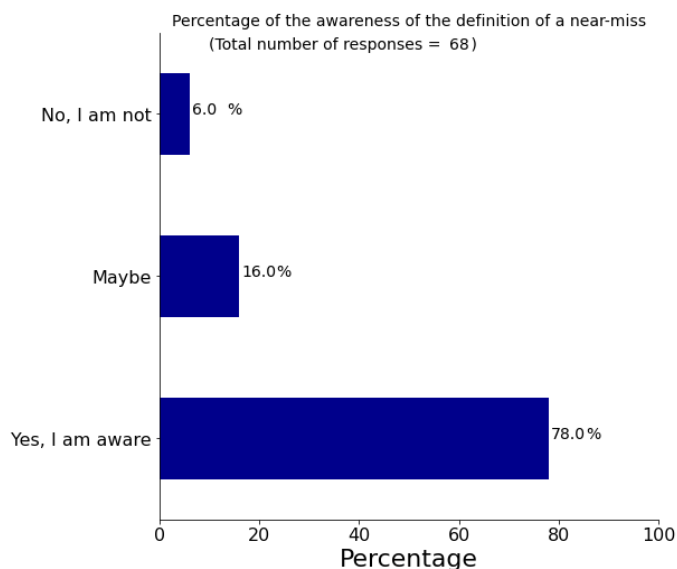


Figure 4.9: Distribution of Respondents' Awareness of Near-Miss Definition

The next question asks the respondent if they have ever experienced a near-miss while working with KYTC. As shown below in Figure 4.10, a majority of respondents claimed to have experienced a near-miss while working at KYTC, but only once or twice. Less than ten percent of respondents claimed to have never experienced a near-miss while at KYTC.

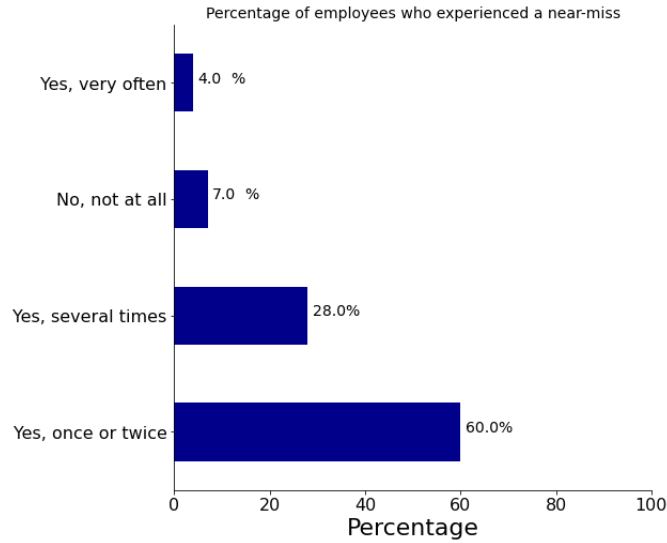


Figure 4.10: Distribution of Respondents' Near-Miss Experience at KYTC

The next question utilizes a sliding scale format and asks the respondent to rank the importance of reporting every near-miss (where 1 is not important and 5 is extremely important). As shown below in Figure 4.11, the largest percent of respondents consider reporting every near-miss event to be extremely important while only two respondents (three percent) consider such reporting to be not important whatsoever.

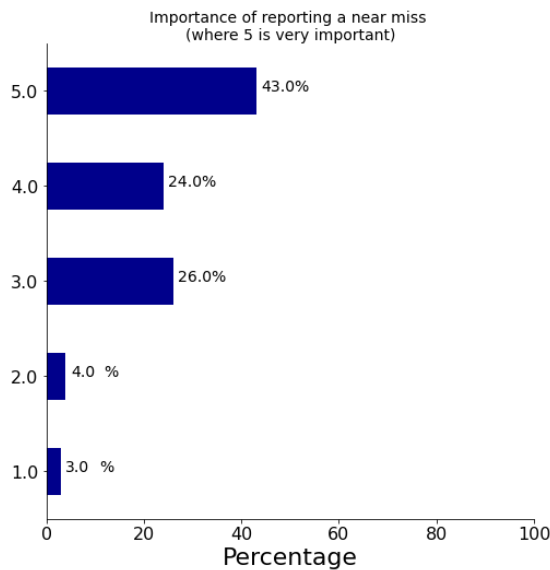


Figure 4.11: Distribution of Respondents' Rating of Near-Miss Reporting Importance

### 4.3.3 Knowledge and Experience of KYTC's Near-Miss Program

The final category of questions and prompts pertains to respondents' knowledge and experience of KYTC's near-miss program. The first of these questions asks the respondent if they know how to report a near-miss or close-call event at work. As shown below in Figure 4.12, a majority of respondents claimed to know how to report a near miss. Yet approximately a fifth of the respondents claimed that they do not know how to report a near-miss at work.

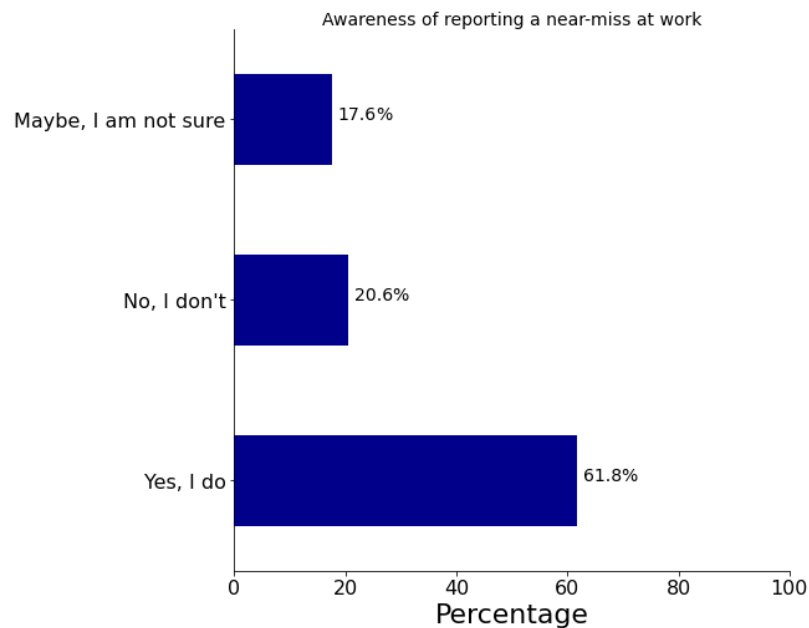


Figure 4.12: Distribution of Respondents' Awareness of How to Report a Near-Miss

The next question asks the respondent if they are aware of KYTC's web tool for reporting near-miss events. A screenshot of the web tool is provided along with this question to remind respondents of the tool's appearance. As shown below in Figure 4.13, a slight majority of respondents claimed that they are aware of KYTC's web tool for reporting near-misses. Nearly thirty percent of respondents claimed to not be aware of the web-based reporting tool.



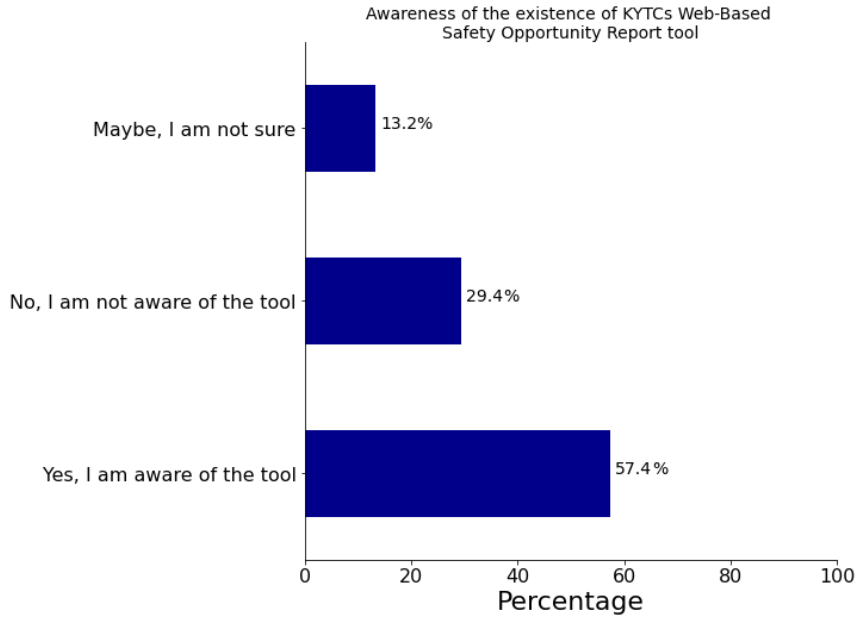


Figure 4.13: Distribution of Respondents' Awareness of Web-Based Reporting Tool

The next question asks the respondent if they have ever used the web tool to report a near-miss. As shown below in Figure 4.14, a vast majority of respondents have never used the web-based tool to report a near-miss at KYTC.

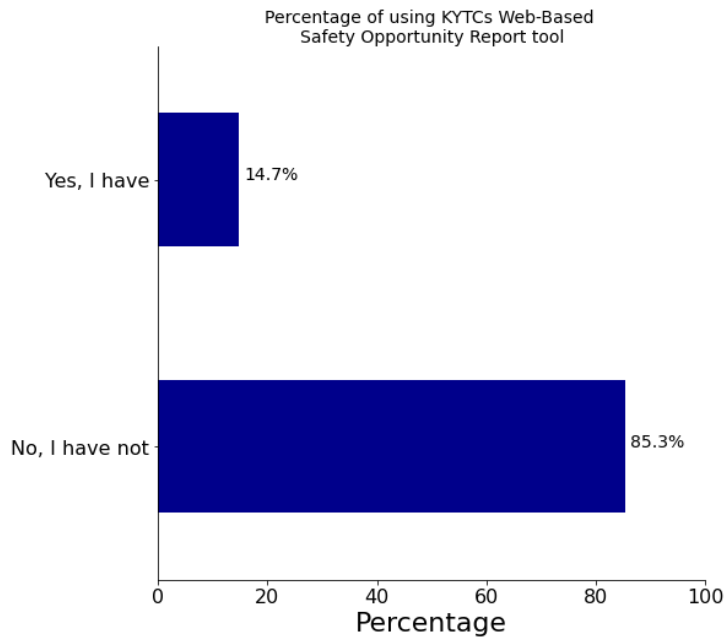


Figure 4.14: Distribution of Respondents' Use of Web-Based Reporting Tool

The next prompt is an open-ended prompt that allows respondents to express their opinions in their own words. This prompt asks respondents who have utilized the web-based reporting tool to share what they liked and/or disliked about the tool. A list of the responses to this prompt is shown below.

- Easy to use
- I appreciate the information is shared at the highest level of KYTC
- Easy to navigate
- The ability to report an unsafe act or near miss from a personal cell phone.
- Very easy to use and you could give precise location with pictures with my iPhone
- Train everyone on the uses and importance
- All info can be entered in one place.
- It helps focus on the areas we need to watch to prevent accidents
- Easy to use but nothing is done about it.

The next question utilizes a drag and list format for ranking options. This question asks respondents to rank their preferred method for reporting near-miss events. As shown below in Figure 4.15, most respondents ranked the web tool as their first preferred choice for reporting near-misses. The next top preferred choice for reporting was in-person using a paper form. However, reporting in-person using a paper form was also ranked the least preferred option by the most respondents. This question also provided an ‘other’ option where respondents could provide other methods that they prefer for reporting near-miss events. The three unique responses for this field included always informing safety coordinator, using an app, and none of the above.

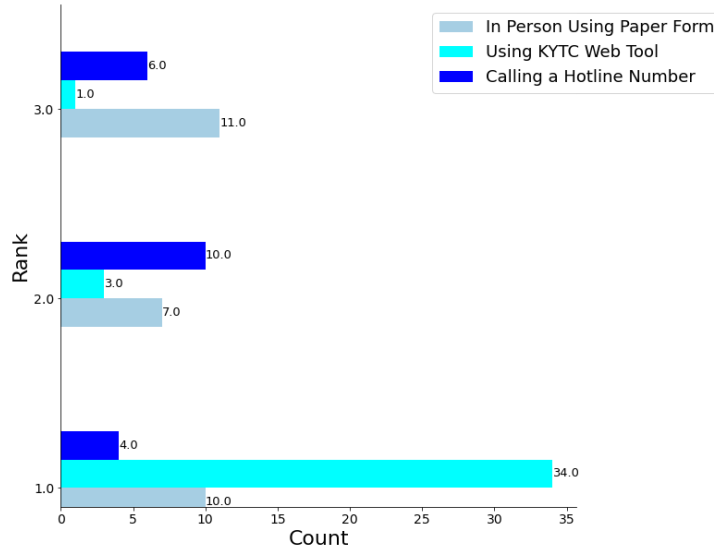


Figure 4.15: Distribution of Respondents' Rank of Preferred Reporting Method

The next prompt utilizes a check all that apply format. This prompt asks the respondent to select all the reasons that prevent them from reporting a near-miss using the paper form. As shown below in Figure 4.16, all seven reasons for not reporting using the paper form received selections from multiple respondents. A lack of corrective actions from past suggestions was the most selected reason, being selected by nearly 40% of respondents. A lack of anonymity was the least chosen reason for not using the paper form.

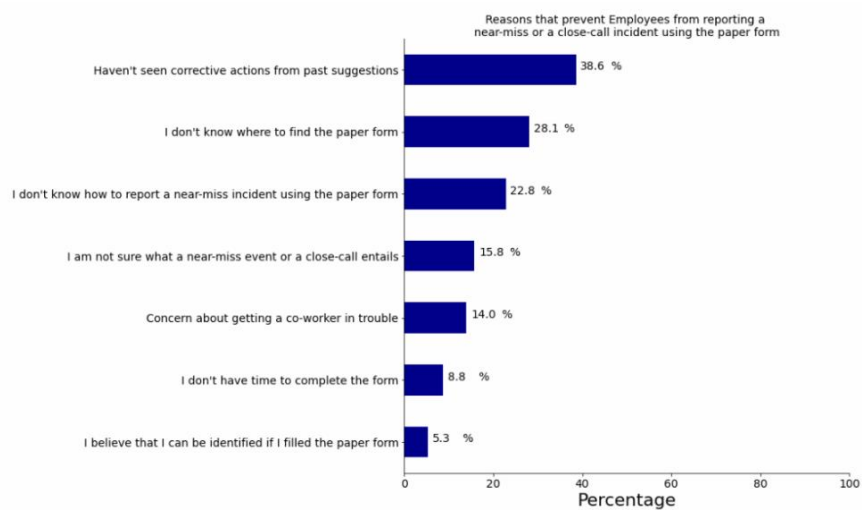


Figure 4.16: Distribution of Respondents' Reasons for Not Reporting via Paper Form

The next prompt also utilizes a check all that apply format. This prompt asks the respondent to select all the reasons that prevent them from reporting a near-miss using the web tool. As shown below in Figure 4.17, all seven reasons for not reporting using the web tool received selections from multiple respondents. A lack of corrective actions from past suggestions was again the most selected reason, being selected by over 30% of respondents. Not having time to complete the form was the least chosen reason for not using the web tool. Distributions of respondents' reasons for not reporting was similar for both forms.

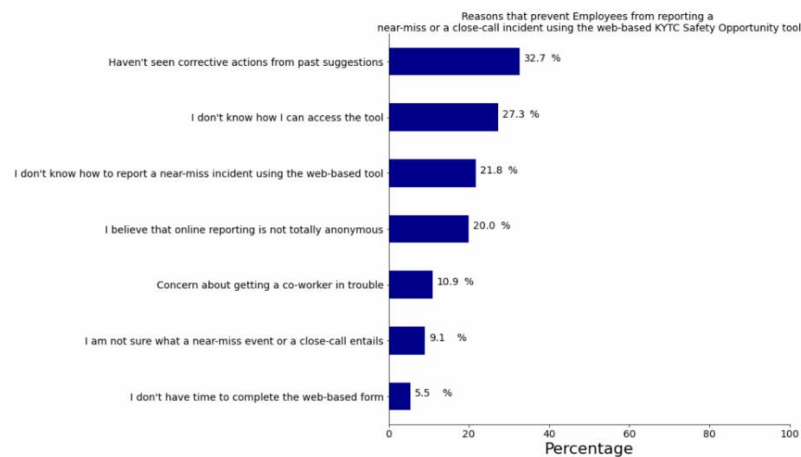


Figure 4.17: Distribution of Respondents' Reasons for Not Reporting via Web Tool

Other reasons provided by respondents for not using both the paper form and web tool included being told to report near-misses directly to supervisor, observing too many near-misses to report, not experiencing a near-miss since the web tool's creation, etc.

The final two questions of the survey are open-ended questions that allow the respondent to express their opinion in their own words. The first of these questions asks the respondent what improvements they believe can be made with the KYTC Safety Opportunity Tool. The responses for this question along with the number of times in which they were received are presented below in Table 4.2.

Table 4.2: Respondents' Recommendations for Web-Based Reporting Tool

<b>Recommendation</b>	<b>Count</b>
Nothing	11
Have more accessible	1
Good	2
Not all people are comfortable using a computer or web-based things and don't want to use them they prefer a phone call or paper form.	1
A line item for the weather conditions at time of near miss	2
You would become a target from office if you went outside of their Protocol.	1
Make the knowledge of it more available	3
Don't know	1
People have to know how to do it	1
Training people how to use the program and basic information on what a near miss is	1
Action Items created	1
More specific training on importance to report every incident	2
No answer	3
Leave off the map section, since it supposed to be completely anonymous anyways.	1
Showing near miss incidents from all districts will help employees be proactive in same situations	1
Accountability by those it's reported to if nothing is done.	1
First time seeing this	1
I think we have become fixated on safety talks and checking boxes all that the crew's aren't hearing what's being said. I believe the stand down for was a really good talk but I believe it fell on a lot of deaf ears again because of daily tasks safety briefings weekly bimonthly it loses its importance to people.	1
We need to hold employees and supervisors accountable for all safety, real punishment for employees that don't follow guidelines! Reward those who do	1
Improved communication from front line supervisors encouraging employees to use the Safety Opportunity App	1
Including what the weather was like	1

The final question asks the respondent if they have any other comments or feedback on the survey or the web tool. The responses for this question along with the number of times in which they were received are presented below in Table 4.3.

Table 4.3: Respondents' Final Comments on Survey and Web-Based Reporting Tool

<b>Recommendation</b>	<b>Count</b>
None	16
I believe the tool works well as it is	1
Training	1
I think safety in all forms is very important. I just don't think that sentiment is carried by those in policy making positions. I think that safety takes a back seat to cost.	1
Safety precautions should be shared throughout the state. Near miss situations can be prevented with the correct training. Examples of near miss situations that have already happened can educate employees, make them aware and be more proactive.	1
I like it, but a lot of the people at KYTC are older and do not know how to use that advance of technology	1
Put access to this in KHRIS and the App that a lot of employees use.	1

## CHAPTER 5. FINDINGS AND ANALYSIS

The results presented in the previous chapter are analyzed to generate findings. These findings are used in attempting to accomplish the many objectives and overall goal of the project at hand. The subsequent sections of this report will discuss the significant findings that were formed throughout this portion of the project.

### 5.1 Investigating Near-Miss Programs of Other State DOTs

The main purpose of investigating near-miss programs of other state DOTs was to simply review and document other strategies for near-miss reporting and tracking that may prove beneficial for KYTC. That being said, up to this point in the project, the research team is not entirely ready to implement these strategies into policy language and procedures for KYTC's near-miss program. However, there are multiple significant takeaways from the results of this objective to be considered.

As previously mentioned, one significant takeaway is that many state DOTs do not have or do not provide public access to any near-miss program or policy. Therefore, it can be difficult to discover common near-miss program strategies and policy language. This in turn results in a small sample size of state DOT near-miss programs and inability to establish trends in said qualitative data. However, some larger states and states that are considered leaders in occupational safety do utilize and provide information on near-miss reporting programs.

Another significant takeaway is that most of the reviewed state DOTs include a definition of near-miss within their policy and procedures. As discussed in Chapter 2, one

of the barriers that leads to a lack reporting is the lack of common understanding and universal definition of near-miss. Therefore, many state DOTs provide a general definition of near-miss within their policy and procedures for employees to reference. The definition of near-miss varies only slightly from state to state.

The next significant takeaway involves the methods in which state DOTs utilize for reporting near-misses. Some state DOTs, such as New York and Texas, require employees to report near-misses directly to their supervisor or safety coordinator. This method of reporting allows near-misses to be handled internally within a crew or department. This may prove beneficial for promptly dealing with unsafe conditions without having to expend multiple efforts and resources. However, given its verbal communicative nature, this method leads to many near-misses going undocumented. If near-misses are not documented, it is nearly impossible to collect data and identify common trends of near-miss events within an organization.

Other state DOTs, such as Pennsylvania, rely solely on paper forms for near-miss reporting. There are advantages to using paper forms including documentation and recordkeeping, ease of process, and anonymity. While paper forms allow for documentation and recordkeeping, such forms are susceptible to getting “lost” and never reaching the hands of proper management. Also, while employees normally appreciate ease of process and anonymity, filling out additional paperwork is often considered a waste of time and thus near-miss events may go unreported.

Other state DOTs, such as Florida and Tennessee, have moved to utilizing online near-miss reporting tools. Some state DOTs, such as California, have created mobile apps specifically for reporting near-miss events. Within such online tools and mobile apps, near-



misses can be tracked in a database where information is collected, stored, and analyzed. A major advantage to these reporting tools is their accessibility. In theory, because online tools and mobile apps can be accessed at nearly all times, more near-miss events can be reported in real time. In general, it is thought that online reporting conserves time, money, and energy. However, online reporting tools may be a barrier for older and/or less technologically advanced employees.

An uncertainty remains with the near-miss programs of other state DOTs. While many of the states investigated in this study are considered leaders in occupational safety, it is unclear how often the employees within these DOTs actually utilize their near-miss reporting programs. Therefore, further investigation should be done to determine reporting rates from state to state to get a better idea of which near-miss programs have the greatest success. Yet, the takeaways in this section should be considered later in the project when revising KYTC's current near-miss program and policy language.

## 5.2 Documenting Current Near-Miss Program of KYTC

In searching KYTC's website and talking with some of their administration and safety personnel, it was discovered that KYTC currently has little policy language on near-misses and offers both a paper form and online tool for reporting near-misses. Compared to most states which provide no information on near-miss reporting, KYTC's current near-miss program is somewhat tolerable. However, there are many areas for improvement within this existing program. Some of these areas can be improved upon in referencing other state DOTs near-miss programs discussed in the previous section.

One area for improvement involves providing a standard definition of near-miss. While KYTC's Employee Safety and Health Manual provides a few paragraphs on how to report a near-miss, it neglects to define the term near-miss. As previously mentioned, the lack of common understanding and universal definition of near-miss is a barrier that leads to a lack of reporting. Revising the policy language of the Employee Safety and Health Manual to define near-miss may educate more employees on the topic and in turn increase reporting rates.

Additional revisions to the policy and procedures provided in the Employee Safety and Health Manual may need to be made based on the reporting method(s) that KYTC elects to proceed with. The manual currently includes procedures for reporting near-misses via the Safety Risk Report paper form only. Therefore, if KYTC administration and safety personnel elect to utilize only the online Safety Opportunity Report tool or both the paper form and online tool, revisions to the Employee Safety and Health Manual to include procedures for reporting near-misses via the online tool will likely be necessary.

There are noticeable advantages and disadvantages to both of the existing reporting methods. The paper form allows an employee to provide as little or as much detail as they prefer. This in turn lets the employee remain anonymous if desired. While the online tool does not ask for an employee name, it does require the employee to provide the district in which they work, the date and time in which the near-miss occurred, and a pinpoint location on a map of where the near-miss occurred. Providing all of these details may make an employee think that they will be easily identifiable. This could potentially lead to a discouragement of reporting.

That being said, the online tool allows for instant storage and analyzation of information upon submission. In contrast, the paper form may take time to reach the proper desk in order to be considered and acted upon. As mentioned in the last section, paper forms also often get “lost” in this journey to the proper desk and results in no corrective action. No corrective action may also lead to a discouragement of reporting.

The prompts and questions provided on both reporting methods are relatively the same. Each method asks the employee to describe the near-miss and suggestions for improvement. The online tool does present a few more minor questions compared to the paper form. As previously mentioned, one big addition the online tool provides is the ability to place a pinpoint location on a map of where to near-miss event occurred. The online tool also allows the employee to directly upload pictures of the near-miss condition if applicable. In order to provide these additional items with a paper form, copies of maps and photos would have to be attached to the form, requiring much more effort and time. The online reporting tool utilized by KYTC is also very similar to FDOT’s and TDOT’s online tools with minor differences in their written language.

Common perceptions of the current KYTC near-miss program will be identified in the next section by analyzing the results of the survey that the research team distributed. These perceptions will help to determine particular advantages and disadvantages of the existing near-miss program as conveyed by KYTC employees.

### 5.3 Identifying Perceptions of Current KYTC Near-Miss Program

Once the KYTC Near-Miss Survey was concluded, the results were analyzed using fundamental statistical analysis tests. Such tests were performed in order to determine the statistical significance of the collected results of the survey. Two different tests were utilized to analyze the results of multiple questions from the survey. These tests included the Chi-Square of Equal Likelihood Test and the Chi-Square Contingency Table Test. An alpha value of 0.05, yielding a 95% confidence interval, will be used for all tests performed in this portion of the project. All survey question results were run through an online chi-square calculator on iCalcu's website in order to compute the desired chi square values, degrees of freedom, and p-values. When using this calculator for a Chi-Square of Equal Likelihood Test, a singular row or column of survey result numbers are copied from excel and pasted into the text box. In this test, the null hypothesis ( $H_0$ ) is that each question response has an equal likelihood. The alternative hypothesis ( $H_1$ ) is that all responses do not have an equal likelihood. When using this calculator for a Chi-Square Contingency Table Test, at least two rows and two columns of survey result numbers are copied from excel and pasted into the text box. In this test, the null hypothesis ( $H_0$ ) is that the row variable and column variable are independent of each other. The alternative hypothesis ( $H_1$ ) is that the row and column variables are dependent upon each other. A screenshot of the excel spreadsheet used to determine and organize the statistical tests being performed is provided in Appendix 2.

The first test performed was a Chi-Square of Equal Likelihood Test on the respondent's awareness of the definition of near-miss. The null hypothesis ( $H_0$ ) for this test is that the likelihood that the respondent is aware of the definition of near-miss is equal to

the likelihood that the respondent is not aware of the definition. The alternative hypothesis ( $H_1$ ) is that the likelihood that the respondent is aware of the definition of near-miss is not equal to the likelihood that the respondent is not aware of the definition. In the survey, 53 respondents answered that they were aware of the definition while 15 respondents were either unaware or unsure if they were aware of the definition and were grouped together for the purpose of this test. These responses were entered into the chi-square calculator in a singular column of two rows. The calculator generated a chi-square value of 21.2353 with one degree of freedom, and an associated p-value of 0.000004. Given the  $p < 0.05$ , the null hypothesis can be rejected, and the alternative hypothesis is accepted. This indicates, with 95% confidence, that employees are more likely to be aware of the definition of near-miss than those who are not aware. Therefore, lack of awareness of near-miss definition is likely not the biggest barrier to near-miss reporting at KYTC. The inputs and outputs of this test are shown below in Figure 5.1.

The screenshot shows a web-based chi-square calculator interface. At the top, there is a large text input area containing the numbers '53' and '15' on separate lines. Below this input area are two buttons: 'Calculate' (orange) and 'Reset' (blue). Underneath the buttons, there are four rows of output data, each with a label and a value in a light blue box:

- Chi-square Value: 21.235294117647
- Degrees of Freedom: 1
- P value: 0.00000406215
- Rows X Columns: 2 X 1

Figure 5.1: Inputs and Outputs for Near-Miss Definition Awareness

The next test performed was also a Chi-Square of Equal Likelihood Test on the respondent's near-miss experience. The null hypothesis ( $H_0$ ) for this test is that the likelihood that the respondent has experienced a near-miss at least once is equal to the likelihood that the respondent has not experienced a near-miss. The alternative hypothesis

( $H_1$ ) is that the likelihood that the respondent has experienced a near-miss at least once is not equal to the likelihood that the respondent has not experienced a near-miss. In the survey, 63 respondents answered that they had experienced a near-miss at least once while 5 respondents had never experienced a near-miss. These responses were entered into the chi-square calculator in a singular column of two rows. The calculator generated a chi-square value of 49.4706 with one degree of freedom, and an associated p-value of  $2e-12$ . Given the  $p < 0.05$ , the null hypothesis can be rejected, and the alternative hypothesis is accepted. This indicates, with 95% confidence, that employees are more likely to have experienced a near-miss than those who have not. Therefore, a lack of near-miss events occurring is likely not a major barrier resulting in a lack of near-miss reporting at KYTC. The inputs and outputs of this test are shown below in Figure 5.2.

The screenshot shows a web-based calculator interface. At the top left, there is a text input field containing the numbers '63' and '5' stacked vertically. Below this field are two buttons: 'Calculate' (orange) and 'Reset' (blue). Underneath the buttons are four output fields, each with a label and a value:

- Chi-square Value: 49.470588235294
- Degrees of Freedom: 1
- P value: 2e-12
- Rows X Columns: 2 X 1

Figure 5.2: Inputs and Outputs for Near-Miss Experience

The next test performed was a Chi-Square Contingency Table Test. This test was performed to determine the association between the respondent's awareness of the definition of near-miss and the respondent's near-miss experience. The null hypothesis ( $H_0$ ) for this test is that the respondent's awareness of the definition of near-miss and their near-miss experience are independent of each other. The alternative hypothesis ( $H_1$ ) is that the respondent's awareness of the definition of near-miss and their near-miss experience

are dependent upon each other. In the survey, 48 respondents answered that they were aware of the definition of near-miss and that they had experienced a near-miss at least once. Five (5) respondents answered that they were aware of the definition of near-miss but had never experienced a near-miss. Fifteen (15) respondents answered that they were not aware of the definition of near-miss but they had experienced a near-miss at least once. Finally, zero respondents answered that they were not aware of the definition of near-miss and had never experienced a near-miss. These responses were entered into the chi-square calculator in a two row by two column matrix. The calculator generated a chi-square value of 1.5274 with one degree of freedom, and an associated p-value of 0.2165. Given the  $p > 0.05$ , the null hypothesis cannot be rejected. This indicates, with 95% confidence, that an employee's experience of near-miss events does not depend upon their awareness of the definition of near-miss and vice versa. Therefore, most employees are likely able to tell when they have experienced a near-miss without full knowledge of its definition. The inputs and outputs of this test are shown below in Figure 5.3.

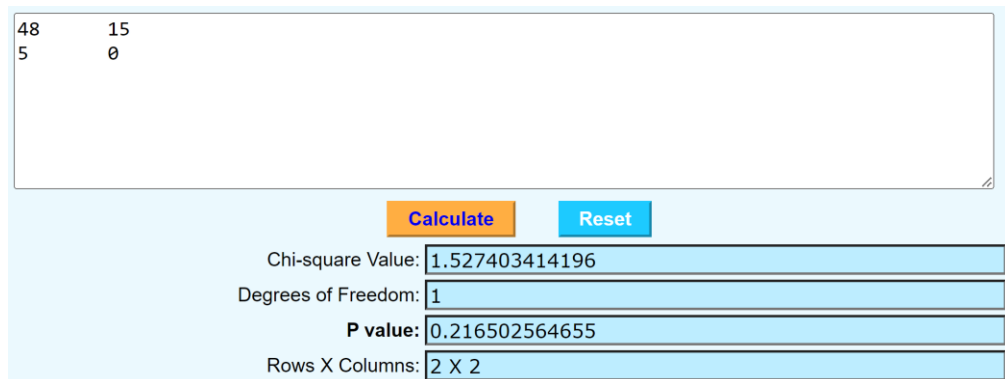


Figure 5.3: Inputs and Outputs for Near-Miss Awareness vs Near-Miss Experience

The next test performed was another Chi-Square of Equal Likelihood Test on the respondent's use of the KYTC web tool. The null hypothesis ( $H_0$ ) for this test is that the

likelihood that the respondent has used the web tool is equal to the likelihood that the respondent has not used the web tool. The alternative hypothesis ( $H_1$ ) is that the likelihood that the respondent has used the web tool is not equal to the likelihood that the respondent has not used the web tool. In the survey, 10 respondents answered that they had used the web tool before while 58 respondents had never used the web tool. These responses were entered into the chi-square calculator in a singular column of two rows. The calculator generated a chi-square value of 33.8824 with one degree of freedom, and an associated p-value of 5.9e-9. Given the  $p < 0.05$ , the null hypothesis can be rejected, and the alternative hypothesis is accepted. This indicates, with 95% confidence, that employees are more likely to have not used the web-based near-miss reporting tool than those who have. Therefore, there is statistical evidence of a lack of near-miss reporting via the KYTC web tool. The inputs and outputs of this test are shown below in Figure 5.4.

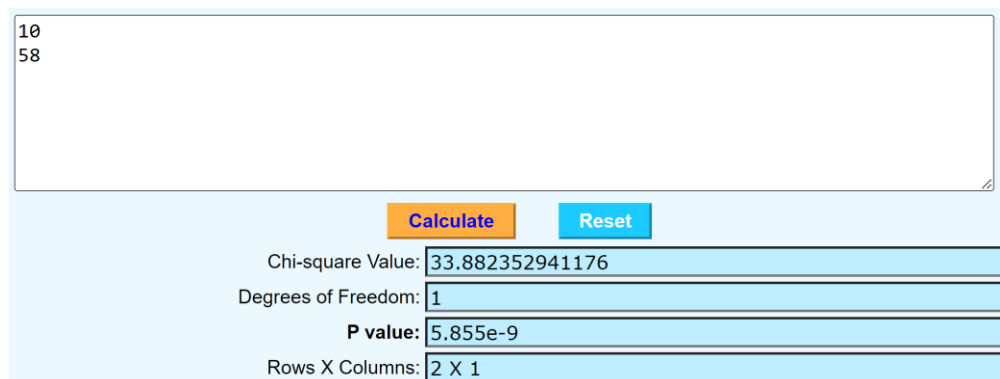


Figure 5.4: Inputs and Outputs for KYTC Web Tool Use

The next test performed was also a Chi-Square of Equal Likelihood Test focused on the respondent's awareness of the KYTC web tool. The null hypothesis ( $H_0$ ) for this test is that the likelihood that the respondent is aware of the web tool is equal to the likelihood that the respondent is not aware of the web tool. The alternative hypothesis ( $H_1$ ) is that the likelihood that the respondent is aware of the web tool is not equal to the



likelihood that the respondent is not aware of the web tool. In the survey, 39 respondents answered that they were aware of the web tools existence while 29 respondents were either unaware or unsure if they were aware of the web tool and were grouped together for the purpose of this test. These responses were entered into the chi-square calculator in a singular column of two rows. The calculator generated a chi-square value of 1.4706 with one degree of freedom, and an associated p-value of 0.2253. Given the  $p > 0.05$ , the null hypothesis cannot be rejected. This indicates, with 95% confidence, that employees are just as likely to not be aware of the web tool's existence as they are to have such awareness. Therefore, a lack of awareness of the web tool's existence is likely a barrier contributing to the lack of near-miss reporting at KYTC. The inputs and outputs of this test are shown below in Figure 5.5.

The screenshot shows a web-based chi-square calculator. At the top, there is a large input field containing the numbers '39' and '29' stacked vertically. Below this field are two buttons: 'Calculate' (orange) and 'Reset' (blue). Underneath the buttons, the calculator displays the following results in a light blue box:

- Chi-square Value: 1.470588235294
- Degrees of Freedom: 1
- P value: 0.225252906361
- Rows X Columns: 2 X 1

Figure 5.5: Inputs and Outputs for KYTC Web Tool Awareness

The next test performed was a Chi-Square Contingency Table Test. This test was performed to determine the association between the respondent's awareness of the KYTC web tool and the respondent's use of said web tool. The null hypothesis ( $H_0$ ) for this test is that the respondent's awareness of the web tool's existence and their use of the web tool are independent of each other. The alternative hypothesis ( $H_1$ ) is that the respondent's awareness of the web tool and their use of the web tool are dependent upon each other. In

the survey, 10 respondents answered that they were aware of the web tool’s existence and that they had used the web tool before. Zero respondents answered that they were not aware of the web tool’s existence but had used the web tool before. Twenty-nine (29) respondents answered that they were aware of the web tool’s existence, but they never utilized the web tool. Finally, 29 respondents answered that they were not aware of the web tool’s existence and had never utilized the tool. These responses were entered into the chi-square calculator in a two row by two column matrix. The calculator generated a chi-square value of 8.7179 with one degree of freedom, and an associated p-value of 0.0032. Given the  $p < 0.05$ , the null hypothesis can be rejected, and the alternative hypothesis is accepted. This indicates, with 95% confidence, that an employee’s use of the KYTC web tool is dependent upon their awareness of the web tool’s existence. Therefore, many employees are likely to not be utilizing the web tool because they are unaware of its existence. The inputs and outputs of this test are shown below in Figure 5.6.

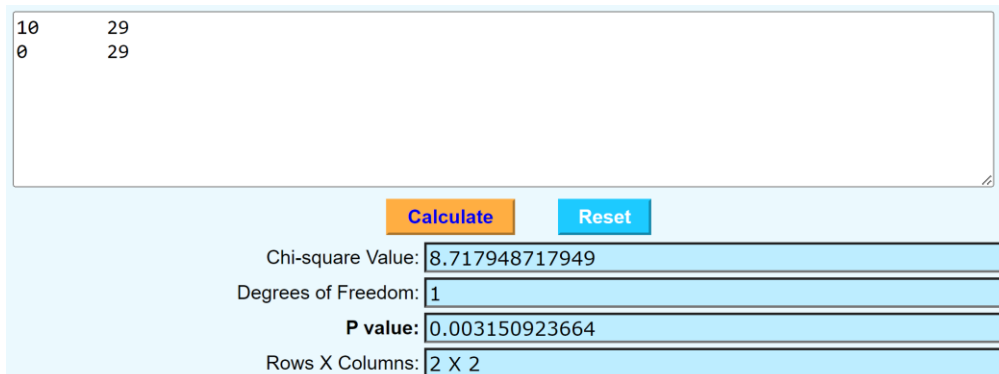


Figure 5.6: Inputs and Outputs for Web Tool Awareness vs Web Tool Use

The next test performed was another Chi-Square of Equal Likelihood Test focused on the respondent’s knowledge of how to report a near-miss. The null hypothesis ( $H_0$ ) for this test is that the likelihood that the respondent is aware of how to report a near-miss is equal to the likelihood that the respondent is not aware of how to do so. The alternative

hypothesis ( $H_1$ ) is that the likelihood that the respondent is aware of how to report a near-miss is not equal to the likelihood that the respondent is not aware of how to do so. In the survey, 42 respondents answered that they were aware of how to report a near-miss while 26 respondents were either unaware or unsure if they were aware of how to report a near-miss and were grouped together for the purpose of this test. These responses were entered into the chi-square calculator in a singular column of two rows. The calculator generated a chi-square value of 3.7647 with one degree of freedom, and an associated p-value of 0.0523. Given the  $p > 0.05$ , the null hypothesis cannot be rejected. This indicates, with 95% confidence, that employees are just as likely to not be aware of how to report a near-miss as they are to be aware of how to do so. Therefore, there is statistical evidence of a lack of awareness and knowledge of how to report a near-miss amongst KYTC employees. The inputs and outputs of this test are shown below in Figure 5.7.

The screenshot shows a web-based calculator interface. At the top, there is a large text input area containing the numbers '42' and '26' stacked vertically. Below this input area are two buttons: 'Calculate' (orange) and 'Reset' (blue). Underneath the buttons, there are four rows of output fields, each with a label and a value:

Chi-square Value:	3.764705882353
Degrees of Freedom:	1
P value:	0.052345063271
Rows X Columns:	2 X 1

Figure 5.7: Inputs and Outputs for Awareness of How to Report a Near-Miss

The final test performed was also a Chi-Square of Equal Likelihood Test focused on the respondent's preference of reporting near-misses via the KYTC web tool with respect to years of experience at KYTC. Originally, this test was planned to be a Chi-Square Contingency Table Test to determine the association between years of experience and preference of web tool or paper form. However, so few respondents selected the paper

tool as their preference that there was not a large enough frequency to include the paper form in the test. The null hypothesis ( $H_0$ ) for this test is that the likelihood that the respondent prefers near-miss reporting via the web tool is equal amongst all years of experience groups. The alternative hypothesis ( $H_1$ ) is that the likelihood that the respondent prefers near-miss reporting via the web tool is not equal amongst all years of experience groups. In the survey, 5 respondents who preferred the web tool for reporting have 0-10 years of experience at KYTC. Thirteen (13) respondents who preferred the web tool for reporting have 10-20 years of experience at KYTC. Lastly, 16 respondents who preferred the web tool for reporting have more than 20 years of experience at KYTC. These responses were entered into the chi-square calculator in a singular column of three rows. The calculator generated a chi-square value of 5.7059 with two degrees of freedom, and an associated p-value of 0.0577. Given the  $p > 0.05$ , the null hypothesis cannot be rejected. This indicates, with 95% confidence, that the three years of experience groups have the same likelihood of preferring the web tool for reporting near-misses. Therefore, there is no statistical evidence to suggest that longer tenured employees would prefer not to switch to using the web tool for reporting. The inputs and outputs of this test are shown below in Figure 5.8.

The image shows a screenshot of a web-based chi-square calculator. At the top, there is a text input field containing the numbers 5, 13, and 16, each on a new line. Below the input field are two buttons: 'Calculate' (orange) and 'Reset' (blue). Underneath the buttons, there are four rows of output data, each with a label and a value in a light blue box:

- Chi-square Value: 5.705882352941
- Degrees of Freedom: 2
- P value: 0.057674440466
- Rows X Columns: 3 X 1

Figure 5.8: Inputs and Outputs for Web Tool Preference with Respect to Years of Experience

There are some key takeaways to be noted from the combination of survey results and findings of the statistical analyses. There appears to be minimal issues when it comes to respondents' years of experience and knowledge of the definition of near-miss. While most of the respondents of the survey have over 20 years of experience with KYTC, these respondents are just as likely to prefer using the web tool for reporting as those who have been with KYTC for 0-10 years and 10-20 years. Also, while existing research shows that many organizations struggle with near-miss definition awareness, this is not an evident barrier with KYTC as employees are significantly more likely to be aware of the definition of near-miss than those who are not aware. Another reason where employees may be responsible for a lack of reporting is the unwillingness to take the time to do so. When answering the questions related to reasons that prevent employees from reporting, this issue of time insufficiency was selected by few respondents for both the paper form and web tool. This time issue was also mentioned by a respondent in one of the surveys open-ended questions. While these barriers may be present on a small scale, they are likely not the leading difficulties resulting in a lack of near-miss reporting at KYTC.

Results of the survey and statistical tests suggest that many of the main barriers preventing employees from near-miss reporting stem from the managerial level. According to statistical analysis, KYTC employees are just as likely to not know how to report a near-miss as they are to know how to do so. In order to improve reporting rates, the likelihood of an employee knowing how to report a near-miss should be greater than the likelihood that an employee does not. This issue is also very evident in the survey as it was a top three reason preventing employees from reporting using both the paper form and web tool. Such lack of knowledge was also reiterated multiple times by respondents in the open-ended

questions of the survey. A solution to this issue may include management providing and/or requiring more employee training on near-miss reporting. Within this training, proper reporting should be focused upon as many responses suggested that their supervisors advise them not to report a near-miss and rather just inform them when one occurs. This recommendation of increased training was also given multiple times by respondents in the open-ended questions of the survey. Also, when looking at the completed trainings question, only 25 respondents have completed the Safety Opportunity/ Near-Miss training. This is a relatively small amount of the respondents who completed the survey.

Another major barrier leading to a lack of near-miss reporting is employees' unawareness of the web-based reporting tool and how to access it. The statistical analysis of the web tool awareness question indicates that employees are just as likely to not be aware of the web tool's existence as they are to have such awareness. Also, it was determined that an employee's use of the KYTC web tool is dependent upon their awareness of the web tool's existence. As previously mentioned, many employees are likely to not be utilizing the web tool because they are unaware of its existence. This issue is also evident in the results of the survey question that asks for reasons that prevent respondents from reporting using the web tool, as not knowing how to access the tool was the second greatest selected response. One recommendation that may aid in overcoming this barrier that was suggested by a respondent is management providing access to the web-based reporting tool on employees' KHRIS accounts where they all have access and perform many other tasks.

A final barrier to near-miss reporting at KYTC is the lack of corrective action from previous reports. This was the top selected reason preventing respondents from reporting

using both the paper form and the web tool. This issue was also reiterated multiple times by respondents in the open-ended questions of the survey. In order to see a rise in near-miss reporting rates from employees, it seems as if management must begin to make visible changes in attempt to correct reported incidents and hazards.

## CHAPTER 6. CONCLUSIONS

Near-miss events are rather abundant in the field of construction and maintenance. While such events do not result in any injuries or property damage, they certainly have the potential to under slightly different circumstances. Therefore, near-miss reporting can serve as a useful tool for managing safety as it allows for workers to identify and managers to address potential risk factors within construction sites. Also, compared to the lagging indicator of reporting injuries or property damages, reporting near-misses serves as a leading indicator that allows organizations to fix problems before injuries or damages occur. That being said, taking advantage of near-miss events in this way requires the utmost participation and cooperation from both employees and management. Without an employee's willingness to accurately report all near-miss events along with management's effort to encourage reporting and make changes based on said reports, a near-miss reporting program will be inadequate and likely fail.

The Kentucky Transportation Cabinet (KYTC) struggles with such a lack of near-miss reporting from employees and thus currently endures an inadequate near-miss reporting program. By investigating other state DOT websites for near-miss programs, documenting KYTC's current near-miss policy and procedures, and administering a survey to KYTC maintenance superintendents, this research project was able to identify attributes of successful near-miss programs and perceptions of KYTC's current near-miss program. These attributions and perceptions along with ideas from existing literature will later to be used to make recommendations in efforts of improving KYTC's near-miss program.

Results and analysis suggest that many of the barriers that lead to a lack of near-miss reporting stem from the managerial level. Some of these main barriers include a lack



of knowledge on how to report a near-miss, a lack of training on how to report a near-miss, a lack of awareness of the web-based reporting tool and how to access it, and a lack of corrective actions from previous near-miss reports. Some initial recommendations to KYTC management in attempt to overcoming these barriers include providing and/or requiring more near-miss training, making the web-based reporting tool more well-known and accessible, and taking more visible action in correcting reported near-misses.

Future work related to near-miss reporting within KYTC may include updating the near-miss training module by researching and investigating other successful near-miss training modules. Also, priority should be taken to identifying who receives and how often this near-miss training is provided. Another area of future work may include implementing the suggestion of providing the web-based reporting tool within the employees' KHRIS accounts. Making the web tool into a mobile application that is easily accessible for all employees may also be an area of future work to aid in improving employees' awareness and use of the web tool. A final area of future work includes further investigation and conversation with other state DOTs' safety administration. While the information gathered on other states' near-miss policy and programs may be a beneficial reference for improving upon KYTC's current policy and program, the near-miss reporting rates of other state DOTs is unknown. Also, much like KYTC's web-tool for reporting near-misses, state DOTs may be utilizing systems or doing things to promote near-miss reporting that are not accessible through public-facing websites. Therefore, it is important that this additional information be identified to determine what makes up a successful near-miss program. This information along with all of the results and findings presented in this study should be used to make recommendations for improving KYTC's near-miss program.

# APPENDICES

## APPENDIX 1. KYTC NEAR-MISS REPORTING SURVEY



### KYTC Near-Miss Reporting Survey

This anonymous and confidential survey is intended to capture your perception of near-miss/close call reporting within KYTC. Your answers will be completely anonymous and will not be linked to you personally. To the degree identifiable questions are asked, they are strictly intended to understand information about where these perceptions originate generally. Your answers will directly go to researchers at the Kentucky Transportation Center at the University of Kentucky and no one from KYTC will be able to see them. When results are presented, they will be aggregated and anonymous, so that we, again, protect your confidentiality. Please complete and submit this survey as soon as possible. We estimate that it should take no more than 10 minutes to complete. If you have any questions or problems with operation or access to the survey, please contact the project lead, Gabe Dadi, at (859) 257-5416 or at [gabe.dadi@uky.edu](mailto:gabe.dadi@uky.edu). Thank you for your time and expertise in completing this survey. This will help us advise KYTC on how to better capture near-miss information to help avoid incidents from occurring in the future.

Please select the district that you currently work in.

Please select how many years of work experience you have with KYTC.

0-2 years

2-5 years

5-10 years

10-20 years

More than 20

---

**What safety training programs have you completed before? (Check all that apply).**

OSHA 10 Hour

OSHA 30 Hour

Work Zone Safety Control

Leadership Training

Safety Opportunity / Near Miss Reporting

Other (Please Specify)

**Are you aware of the definition of a near-miss or a close-call event?**

Yes, I am aware

Maybe

No, I am not

**A near miss event is defined as "an unplanned event that did not result in injury, illness, or damage to a person(s), equipment, or property– but had the potential to do so". Similar terms are "close call", "narrow escape", "near collision", or a "near hit".**

---

**Have you ever experienced a near-miss or a close-call event while working with KYTC?**

Yes, once or twice

Yes, several times

Yes, very often

No, not at all

---

In your opinion on a scale from 1 to 5 (where 1 is not important and 5 is extremely important), how important is it that every near-miss or a close-call event be reported?

1                      2                      3                      4                      5

Please select

---

Do you know how to report a near-miss or a close-call event at work?

Yes, I do

Maybe, I am not sure

No, I don't



Are you aware that KYTC has a web-based Safety Opportunity Report tool (screenshot above) that can be used on any device by any worker anonymously to report a near-miss event, close-call, or incident?

Yes, I am aware of the tool

Maybe, I am not sure

No, I am not aware of the tool

---

Have you used the KYTC Safety Opportunity Tool to report a near-miss event that happened to you or to one of your coworkers during your work with KYTC?

Yes, I have

No, I have not

How would you prefer to report a near-miss or a close-call incident? Please drag and rank with your most preferred option (1) to your least preferred option.

Items	Preferred reporting method
In person using a paper form	
Using the web-based KYTC Safety Opportunity tool	
By phone, calling into a reporting hotline number	
Other (please elaborate) <input data-bbox="282 598 544 640" type="text"/>	

Please select all the reasons that prevent you from reporting a near-miss or a close-call incident using the paper form (please select all that apply).

- I am not sure what a near-miss event or a close-call entails
- I don't know where to find the paper form
- I don't know how to report a near-miss incident using the paper form
- I don't have time to complete the form
- I believe that I can be identified if I filled the paper form
- Concern about getting a co-worker in trouble.
- Haven't seen corrective actions from past suggestions
- Other (Please elaborate)

Please select all the reasons that prevent you from reporting a near-miss or a close-call incident using the web-based KYTC Safety Opportunity tool (please select all that apply).

I am not sure what a near-miss event or a close-call entails

I don't know how I can access the tool

I don't know how to report a near-miss incident using the web-based tool

I don't have time to complete the web-based form

I believe that online reporting is not totally anonymous

Concern about getting a co-worker in trouble.

Haven't seen corrective actions from past suggestions

Other (Please elaborate)

**Type of Opportunity you want to report\***  
Select the type of opportunity you want to report

Opportunity to learn from a close-call or incident

Opportunity to improve safety in general in our work

Opportunity to correct a specific unsafe condition

**Would you like to follow up on this incident?\***

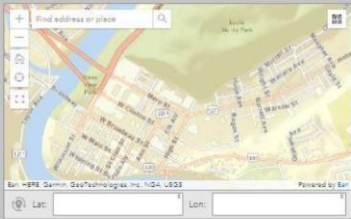
Yes

No

**KYTC District / CO\***  
Select a District or Central Office

**If this was an incident, when did it occur?\***

**If this was an incident, where did it occur?\***  
Place the pin on the map where the incident occurred



**Tell us about the incident or condition\***

**Tell us what was learned or your improvement ideas\***

**Have you talked to your supervisor about this?\***

Yes, in the past

Yes, at the time of this report

Not yet

I'm not comfortable doing so

**Photos help, submit them here**

**In your opinion, what do you think is missing or could be improved with the KYTC Safety Opportunity tool?**

---

**Do you have any other comments or feedback on the survey or the KYTC Safety Opportunity tool?**

## APPENDIX 2. STATISTICAL TESTS SPREADSHEET

<b>Awareness of Definiton of Near-Miss</b>			<b>Test</b>			<b>Hypothesis</b>		
<b>Index</b>	<b>Count</b>		Chi-Square of Equal Likelihood			<b>H0:</b> The two responses have the same likelihood. <b>H1:</b> The two resonses have a different likelihood.		
Yes, I am aware	53							
No, I am not	15							
<b>Experienced a Near-Miss at Least Once</b>			<b>Test</b>			<b>Hypothesis</b>		
<b>Index</b>	<b>Count</b>		Chi-Square of Equal Likelihood			<b>H0:</b> The two responses have the same likelihood. <b>H1:</b> The two resonses have a different likelihood.		
Yes	63							
No	5							
<b>Awareness of Definiton of Near-Miss and Experienced a Near-Miss</b>			<b>Test</b>			<b>Hypothesis</b>		
<b>Experienced</b>	<b>Aware</b>	<b>Not Aware</b>	Chi-Square Contingency Table			<b>H0:</b> There is no association between experiencing a near miss and awareness of the definition. <b>H1:</b> There is an association between experiencing a near miss and awareness of the definition.		
Yes	48	15						
No	5	0						
<b>Use of the KYTC Web Tool</b>			<b>Test</b>			<b>Hypothesis</b>		
<b>Index</b>	<b>Count</b>		Chi-Square of Equal Likelihood			<b>H0:</b> The two responses have the same likelihood. <b>H1:</b> The two resonses have a different likelihood.		
Yes, I have	10							
No, I have not	58							
<b>Awareness of Existence of KYTC Web Tool</b>			<b>Test</b>			<b>Hypothesis</b>		
<b>Index</b>	<b>Count</b>		Chi-Square of Equal Likelihood			<b>H0:</b> The two responses have the same likelihood. <b>H1:</b> The two resonses have a different likelihood.		
Yes, I am aware of the tool	39							
No, I am not aware of the tool	29							
<b>Awareness of Existence of KYTC Web Tool and Use of the Web Tool</b>			<b>Test</b>			<b>Hypothesis</b>		
<b>Awareness</b>	<b>Use</b>	<b>Not Use</b>	Chi-Square Contingency Table			<b>H0:</b> There is no association between experiencing a near miss and awareness of the definition. <b>H1:</b> There is an association between experiencing a near miss and awareness of the definition.		
Yes, I am aware of the tool	10	29						
No, I am not aware of the tool	0	29						
<b>Knowledge on Reporting a Near-Miss</b>			<b>Test</b>			<b>Hypothesis</b>		
<b>Index</b>	<b>Count</b>		Chi-Square of Equal Likelihood			<b>H0:</b> The two responses have the same likelihood. <b>H1:</b> The two resonses have a different likelihood.		
Yes, I do	42							
No, I don't	26							
<b>Years of experience and Preferable Reporting Tool</b>			<b>Test</b>			<b>Hypothesis</b>		
<b>Years of Exp.</b>	<b>KYTC Web Tool</b>	<b>Paper Based</b>	Chi-Square of Equal Likelihood			<b>H0:</b> The three years of experience groups have the same likelihood of preferring the web tool. <b>H1:</b> The three years of experience groups have a different likelihood of preferring the web tool.		
0-10 Years	5	4						
10-20 Years	13	2						
More than 20 Years	16	4						



## REFERENCES

- Aulin, R., & Linderbäck, E. (2014, June). "Near-miss reporting among construction workers." Retrieved April 21, 2022, from <https://lup.lub.lu.se/search/publication/c0cbdc67-9a04-4697-ad8b-f87d6a7a24d9>
- Cambráia, F. B., Saurin, T. A., & Formoso, C. T. (2009, July 30). "Identification, analysis and dissemination of information on near misses: A case study in the construction industry." *Safety Science*. Retrieved April 21, 2022, from <https://www.sciencedirect.com/science/article/pii/S0925753509001155>
- Haas, E. J., Demich, B., & McGuire, J. (2020, January 22). "Learning from workers' near-miss reports to improve organizational management." *Mining, metallurgy & exploration*. Retrieved April 21, 2022, from <https://pubmed.ncbi.nlm.nih.gov/32875278/>
- Mckay, B. (2018, June). "Measures of Effect: Near Miss Reporting on Construction Site Injuries." Retrieved April 22, 2022, from [https://www.researchgate.net/publication/325923664\\_Measures\\_of\\_Effect\\_Near\\_Miss\\_Reporting\\_on\\_Construction\\_Site\\_Injuries](https://www.researchgate.net/publication/325923664_Measures_of_Effect_Near_Miss_Reporting_on_Construction_Site_Injuries)
- Oswald, D., Sherratt, F., & Smith, S. (2018, April 24). "Problems with safety observation reporting: A Construction Industry Case Study." *Safety Science*. Retrieved April 21, 2022, from <https://www.sciencedirect.com/science/article/pii/S0925753516304581>
- Santiago, K., Yang, X., Ruano-Herrera, E. C., Chalmers, J., Cavicchia, P., & Caban-Martinez, A. J. (2020, February 1). "Characterising near misses and injuries in the temporary agency construction workforce: Qualitative Study Approach." *Occupational & Environmental Medicine*. Retrieved April 21, 2022, from <https://oem.bmj.com/content/77/2/94>
- Shen, X., & Marks, E. (2015, December 16). "Near-miss information visualization tool in BIM for Construction Safety." *Journal of Construction Engineering and Management*. Retrieved April 21, 2022, from <https://ascelibrary.org/doi/10.1061/%28ASCE%29CO.1943-7862.0001100>
- Williamsen, M. (2013, May). "Near-miss reporting: A missing link in safety culture." Retrieved April 21, 2022, from <https://www.semanticscholar.org/paper/Near-Miss-Reporting%3A-A-Missing-Link-in-Safety-Williamsen/7e1604baa6ee3086c116f7a24646a40d30a794dc>
- Winkler, M., Perlman, Y., & Westreich, S. (2019, May 2). "Reporting near-miss safety events: Impacts and decision-making analysis." *Safety Science*. Retrieved April 21, 2022, from <https://www.sciencedirect.com/science/article/pii/S0925753518315054>

Zhou, Z., Li, C., Mi, C., & Qian, L. (2019, February 27). "Exploring the potential use of near-miss information to improve construction safety performance." *MDPI*. Retrieved April 21, 2022, from <https://www.mdpi.com/2071-1050/11/5/1264>

## VITA

Seth Atkins

### 1. Education:

- a) University of Kentucky – Bachelor of Science in Civil Engineering (May 2021)
- b) University of Kentucky – Master of Science in Civil Engineering (In Progress, Expected August 2022)

### 2. Professional Positions:

- a) Scholarship Trainee – Kentucky Transportation Cabinet (May 2018 – July 2021)
- b) Graduate Research Assistant – University of Kentucky (August 2021 – July 2022)

### 3. Scholastic and Professional Honors:

- a) Undergraduate Merit-Based Scholarships
- b) Kentucky Transportation Cabinet Civil Engineering Scholarship
- c) Awarded Bachelor of Science in Civil Engineering with Summa Cum Laude
- d) Graduate of Lewis Honors College

### 4. Professional Publications:

Dadi, Gabriel; Ammar, Ashtarout; Atkins, Seth; and Horseman, Martha, "Specialized Safety Training and Tracking for KYTC Construction and Maintenance Personnel" (2022). *Kentucky Transportation Center Research Report*. 1750. [https://uknowledge.uky.edu/ktc\\_researchreports/1750](https://uknowledge.uky.edu/ktc_researchreports/1750)