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THE COMPLEXITIES OF RAIL SUICIDE DATA

SUMMARY

This document highlights the complex nature of rail suicide data collected from international peer-reviewed articles, and from the United States. The purpose of this effort is to identify the types of rail suicide data that exist, and to understand how they can be used to develop and select effective mitigation and prevention strategies. This research will benefit the Federal Railroad Administration (FRA), railroads, researchers, and other stakeholders. This work was performed under interagency agreements between FRA's Office of Research, Development & Technology's Human Factors Division and the Volpe National Transportation Systems Center's (Volpe) Human Factors Division.

Volpe reviewed 49 peer-reviewed journal articles from 16 countries published between 1985 and 2021. Volpe gathered information about the data sources used in each dataset (see [Figure 1](#)) including their accessibility, the factors surrounding each incident, limitations for each dataset noted in the articles, future research needs, and how to apply findings for informing or evaluating mitigations.

The findings show that to achieve the most comprehensive understanding of rail suicide, multiple data sources are often needed. In particular, information about individuals involved in these incidents may be unavailable or incomplete due to privacy concerns. In some cases, it can be difficult to combine datasets because of differences in data collection methods, definitions, and overall lack of standardization.

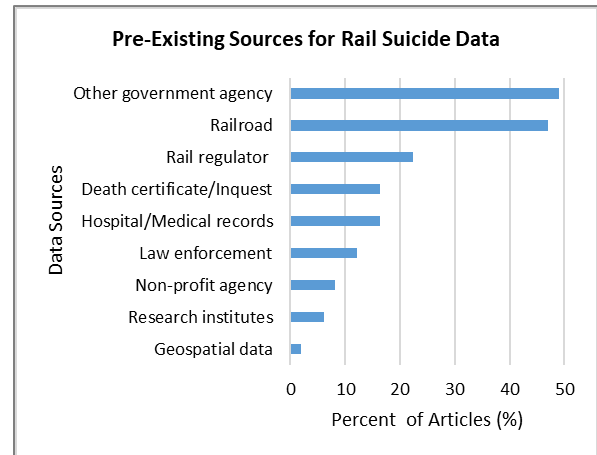


Figure 1. Rail Suicide Data Sources

BACKGROUND

Suicide is the second leading cause of death for 10- to 34-year-olds and in the top eight causes of death for 35- to 64-years-olds in 2019 (National Institute of Mental Health, 2022). These incidents impact many, but when they occur by train, they are especially traumatic for railroad employees, emergency responders, and bystanders. Many railroads want to adopt mitigation strategies but are sometimes unaware of suitable options and how to locate helpful information for decision-making. Also, the cost (including time and effort) to select and carry out mitigation strategies on railroad rights-of-way can be challenging.

The complexity of rail suicide requires a broad perspective to understand each railroad's unique characteristics and situations, and to also consider railroad networks. Volpe reviewed published, peer-reviewed journal articles on rail suicide to understand the factors associated with incidents (e.g., locations, environment, and individuals), and develop an inventory of mitigation strategies.



Additionally, railroads from across the globe report suicides. Most research on rail suicide is from outside of the U.S. Therefore, it is important to critically assess the information to effectively apply it within the current U.S. rail system.

This research acknowledges the complexities of rail suicide and identifies considerations when implementing local mitigation efforts.

OBJECTIVES

This document discusses the complexities of rail suicide incident data and the role that data from published research can play in mitigating suicide on railroad rights-of-way. The published data is particularly beneficial when mitigations are needed to improve railroad safety. Considering published research and applying those findings to a rail suicide situation can be an efficient way to move forward in mitigation.

METHODS

Researchers analyzed peer-reviewed journal articles on railway suicide. In total, 49 articles from 16 countries published between 1985 and 2021 were reviewed. For each article, a variety of information was collected, and a subset is presented in [Table 1](#) and discussed in this report.

Table 1. Summary Information Collected

Information Collected
Data accessibility: Authors collected their own data, used pre-existing data, or both, and information about the process for requesting pre-existing data.
Data collection: Data were collected through incident reports, interviews, surveys, or observations.
Timeframe of data: Total number of years and actual years of data included.
Factors involved in the incidents: Types of information collected including demographic, environmental, location, temporal, behavior, and health history of decedents.
Limitations: Research limitations determined by authors such as lack of comparison group, small sample size, subjective, underreporting.
Future research needs: Future research needs determined by authors based on their findings.
Mitigation information: Mitigation efforts for rail suicide were discussed in the article, including evaluations, or how the research could be used to inform future mitigations.

RESULTS

Accessibility of data can be a barrier for any research endeavor. The review of articles found that information about the process for accessing the data was rarely included. Through separate online searches, additional details of the data's accessibility were discovered. Most articles used private or restricted data (80%) with less than half (39%) of including publicly available data. Some public sources can require request or registration to gain permission, delaying access to the data. Without details included for retrieving data, the nuances of the data and the findings may be difficult to follow, which can decrease the reader's confidence in the findings.

Most articles included pre-existing datasets (94%), while few included their own data collection effort (22%) primarily through interviews and surveys. An even smaller number of articles used a combination of existing data and their own data (16%). Overall, data sources most often included incident reports (76%) from railroad companies and police. Medical-related records including autopsies, psychiatric histories, and coroner or medical examiner reports were included less often (33%). When information about the individuals involved is unavailable or excluded from datasets, critical information may be overlooked and left out of the process for developing mitigations. Because of health privacy laws and privatized railroad systems, these data are often protected and require special permission to access in the U.S.

A country's national statistical data is typically available publicly. Whereas the national data often included suicide rates, population by location, and other sociodemographic data, they were rarely included in the articles (16%) that the researchers reviewed.

It is also important to consider the differences and similarities among countries for the applicability of each set of research findings. For example, understanding suicide rates, railroads' infrastructure, and the accessibility of the right-of-way within a location can give context to the research findings, which can assist railroads in fine-tuning mitigation efforts, and understanding the longer-term impacts of these efforts.



Most often, pre-existing datasets came from a railroad's incident reports and video analysis (47%). Data from government agencies other than rail regulators, including death registries and national statistical agencies were also often included (49%), with fewer datasets coming from rail regulators (22%). Differing policies or regulations regarding what types of information regulators collect in each country can cause differences in data availability and accessibility. Additional sources of data came from hospital/medical records (16%), death certificates or inquest results (16%), law enforcement (12%), non-profit agencies (8%), research institutes (6%), and geospatial databases (2%).

Data used in the articles often describe the *who*, *when* and *where* of rail suicide incidents. Sociodemographic data that describes the decedent, and the community or nation where the incident occurs was included most often (73%). Temporal data including year, season, month, day and time (65%), and location or landmark information (49%) were also included in at least half the articles. The individual's behavior at the time of the incident including lying down or walking along the tracks, standing, jumping, and intoxication was included less often (37%). Mental health histories of the individual including general mental health concerns, previous hospitalizations, and past suicide attempts, were even less frequent (31%) with environmental data describing visibility, daylight or darkness were included even less often (18%).

When multiple datasets were used, the articles rarely discussed the process of combining or comparing data. Only two articles commented that a direct comparison was impossible because of the lack of standardization across the datasets. This lack of standardization presents challenges for the validity, reliability and consequently the generalizability of findings to a railroad's situation for potential mitigation efforts. An explanation for why combining data sources was limited while giving clarity for interpreting and applying the findings to their own situation.

No research study is perfect; therefore, articles often include research limitations that illustrate gaps and weaknesses in the data. These

limitations affect how findings can validly be used to inform mitigations, assist future research, and identify ways to improve the existing data quality. Research limitations were mentioned in most of the articles (88%). Additionally, missing data (45%), small sample sizes (24%), lack of representativeness (18%), misreporting (14%), and underreporting (12%) of rail suicide incidents were mentioned. When articles included limitations, it varied from one limitation (31%) to two or more (57%).

Identifying future research needs is also an important component of research to grow the body of knowledge on a particular topic. Many articles did not include future research needs (61%), but the articles that did (39%) noted the need for replication or more in-depth analysis of the data. Articles also described how findings can directly assist in the design and selection of mitigations for rail suicide (65%) or evaluating their effectiveness (12%). Therefore, it is essential to review many sources to identify future research needs and make effective recommendations to address suicide by rail.

CONCLUSIONS

Due to the unpredictability of human action and behavior at the core of these incidents, rail suicide data presents unique challenges when comparing to other safety data. Privacy laws and protections for personal identifying information, limit the availability of data about individuals involved. A comprehensive understanding of the available data is critical for choosing how to best mitigate these incidents. This ensures the highest probability of positive outcomes.

Even when rail suicide data are accessible, they are often found in separate datasets and sources, making it necessary to combine data sources to gain the most comprehensive understanding of rail suicide, its mitigation, and prevention; the data also lacks standardization. Data collection and definition can be hard to validate, and in some cases, the same information can be collected but categorized and recorded using different language within incident report narratives. Awareness of these nuances are



important when considering multiple sources of rail suicide data to inform future mitigation efforts.

This document highlights the importance of understanding rail suicide data availability, clarity of definitions, and the potential for standardization of data for comparisons across articles.

FUTURE ACTION

A more detailed report will provide additional information about this effort. Its findings will include a more comprehensive examination and discussion of rail suicide data. The report will also include interview data collected from FRA inspectors to better understand how they use and collect rail suicide data in the field. Rail suicide data are complex and uncertain. FRA will continue to study how best to collect and use rail suicide data to develop recommendations for suicide mitigation.

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