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Summary

This report serves as a condensed overview of workplace injury data, with a primary objective of addressing the presented questions. The report seeks to unravel and shed light on novel insights within the dataset. The document aims to provide a clear and concise summary that not only answers specific inquiries but also contributes to a deeper understanding of the underlying dynamics. Through an examination of the data, this report endeavors to illuminate key patterns, trends, and correlations, thereby offering valuable knowledge for informed decision-making and potential avenues for further research and exploration in the realm of workplace safety.

Business Problem

Exploratory analysis of workplace injury data for federal and state programs.

Which program, state or federal, has the highest rate of fatalities?

Which state with a state program has the highest number of injuries/illnesses?

What is the relationship, if any, between “Average of Years to Inspect Each Workplace Once” and “Rate of Fatalities”?

Data

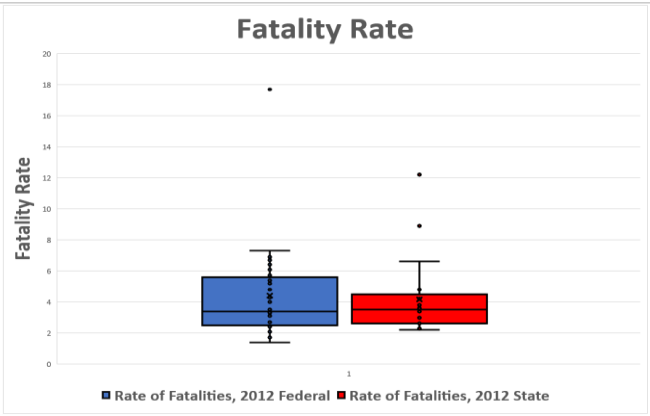
The dataset encompasses information on state and federal workplace safety programs within the United States. The included variables offer a view of the safety landscape, covering aspects such as the number of injuries and illnesses, the corresponding rate of injuries and illnesses, the number of fatalities, the rate of fatalities, imposed penalties, the number of inspectors, the frequency of inspections, and the program type.

Methods

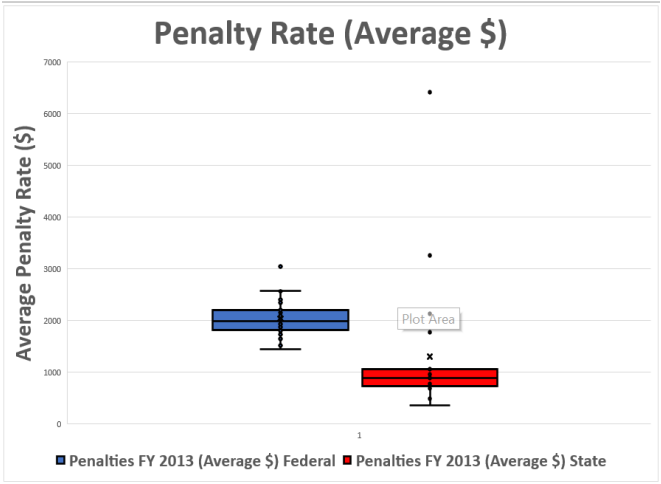
The data analysis for this project was carried out utilizing a combination of Excel and Power BI tools. To ensure the quality of the dataset, the cleaning process was executed using Microsoft Query Editor and filters within Power BI. Additionally, two supplementary tables were created to house the cleaned data, and integrated into the data model. Power BI's advanced features such as splicers, filters, hierarchies, drill-through capabilities, and tooltips were employed to enhance the visual representation of the findings. Furthermore, for in-depth analysis, Excel's Data Analysis ToolPak and XLMiner Analysis ToolPak were employed to extract valuable insights from the dataset. Python programming language, specifically utilizing pandas and scikit-learn libraries, was also incorporated to conduct advanced analyses and generate informative visuals.

Results

The analysis reveals that Texas, a federal program state, experiences the highest overall incidences of injuries, illnesses, and fatalities. In contrast, among state program states, Michigan has the highest number of injuries and illnesses, while Virginia leads in fatalities. Interestingly, the top 5 states with the highest occurrences in these categories are all federal program states.



Examination of fatality rates between state and federal programs indicates no significant difference, supported by histogram and whisker plot data and confirmed by a t-test. Similarly, the analysis for injury/illness rates yields no significant difference between state and federal programs, with substantial overlap in the 50th percentiles of the ranges. However, a marked contrast emerges when looking at penalties for the fiscal year 2013. The histogram and whisker plot illustrate minimal overlap in the penalty rate ranges for state and federal programs, and a t-test supports the rejection of the null hypothesis, revealing a significant difference in mean penalty rates.

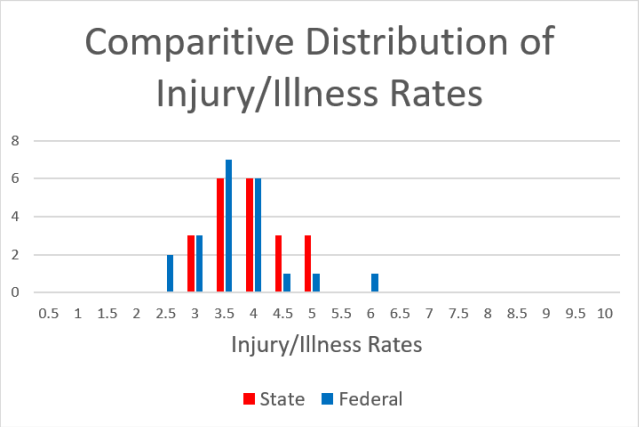


Additionally, a correlation analysis uncovers several noteworthy relationships. Strong positive correlations are observed between the number of injuries/illnesses and fatalities, inspectors and injuries/illnesses, as well as the rate of fatalities and state fatalities rank. Conversely, a strong negative correlation is evident between penalties rank and penalties average. Moderate positive correlations are found between the years to inspect each workplace once and the number of fatalities, while weak positive correlations exist between years to inspect each workplace once and penalties average. Weak negative correlations are identified between the number of injuries/illnesses and rate of fatalities, inspectors and rate of fatalities, years to inspect each workplace once and rate of injuries/illnesses, and years to inspect each workplace once and penalties rank. Importantly, negligible correlations are observed for several variables, notably

the lack of correlation between penalties and the number of injuries/illnesses and fatalities, injuries/illnesses rate and number of fatalities, and fatality rate.

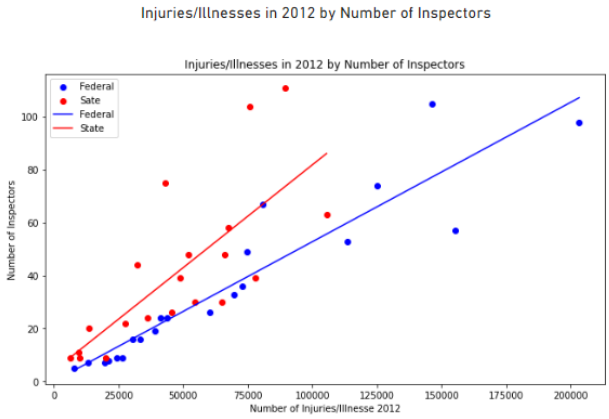
Conclusions

The analysis of state and federal programs reveals several key conclusions. Firstly, there is no significant difference in the range of fatality rates between the state and federal programs, suggesting that neither program holds a distinct advantage in preventing fatalities. Similarly, there is no significant difference in the range of injury/illness rates between the two programs, emphasizing the absence of a clear advantage in preventing injuries and illnesses.



However, a notable contrast emerges in the analysis of penalties for the fiscal year 2013, where a significant difference in the range of penalty rates is observed between state and federal programs. Despite the state program having states with the highest two average penalties, it maintains a significantly lower average penalty rate. This finding suggests that while certain states within the state program may have higher average penalties, the overall average penalty rate is lower compared to the federal program.

The study also reveals significant relationships between various factors. The number of injuries/illnesses has a noteworthy impact on the number of fatalities in a state, indicating a predictable correlation. This insight implies that focusing on preventing injuries, rather than solely on fatalities, may be the most effective approach to developing a comprehensive safety program.



Furthermore, the number of inspectors is shown to have a significant effect on the number of injuries, as well as the number and rate of fatalities. Increasing the number of inspectors is identified as a potentially effective strategy for enhancing workplace safety.

Interestingly, the lack of correlation between penalty amounts and the number of injuries/illnesses and fatalities or their rates suggests that higher fines may not serve as an effective deterrent against unsafe working conditions. Finally, the number of years it takes to inspect each workplace emerges as the most predictive factor for the cost in terms of fines related to workplace injuries, illnesses, and fatalities. This suggests that increasing the frequency of inspections may result in cost savings and improved overall workplace safety.

To enhance future studies, the incorporation of population data, number of workplaces, or size of the workforce would contribute to a nuanced understanding of inspection frequency, allowing for direct comparisons between states and program types. Additionally, a follow-up study focusing on the calculation and assessment methods of penalties would offer greater insights into their connection with the rates of injury/illness and inspections. This deeper understanding could pave the way for addressing the costs associated with workplace injuries more effectively. Furthermore, the inclusion of data detailing the severity of incidents and a breakdown of state injury data by industry could prove invaluable. Such information would provide a granular perspective on areas where immediate improvements are most needed, guiding targeted interventions for enhanced workplace safety.