Evaluation of Office Fall Injuries

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1 Summary

For the last sixty years, Halpert & Co. has prioritized the safety of its employees in all areas of the company. Due to a discovered research claim, there has been a recent rise in concern about the risk of injury in office spaces. A 2012 article from The Albert Einstein College of Medicine cited the Center for Disease Control and Prevention, claiming that "office workers are 2 to 2.5 times more likely to suffer an injury from a fall than non-office workers" (Environmental Health & Safety 2012).

Analyzing 2023 survey data from the US Bureau of Labor Statistics, I found an opposing result of office workers being about 2.2 times less likely to suffer an injury from a fall than a non-office worker (U.S. Bureau of Labor Statistics 2021). Overall, non-office industries report 3.5 times the number of injuries as office industries and 3.6 times the number of injuries that result in needing time away from work (U.S. Bureau of Labor Statistics 2023). This result strongly suggests that non-office workers are at higher risk of being injured and suffering an injury of higher severity.

Despite the conclusion that office workers are at lower risk of injuries and falls, stronger safety policies in office spaces would not be a waste of time or resources. About 17.76% of all reported office injuries are falls on the same level, with the most common causes of the fall being misusing ladders, water or contaminants on floors, and tripping hazards in walkways (Centers for Disease Control and Prevention (CDC) 2024). Implementing safety training to use equipment and proper handling of spills and clutter hazards can significantly reduce the risk of fall injuries in the office.

2 Introduction

Safety in the workplace is the most critical priority for any company to have. No matter the industry, location, or project, taking measures to ensure workers are not at risk of injury is a necessity. It is both the responsibility of management and workers to stay informed and up-to-date with safety regulations. These rules and regulations can look very different from industry to industry. Some may think safety is not a prioritized concern in an office setting, but that is far from the truth. Falls are the leading cause of injuries in an office setting [@SurveyOccupationalInjuries], and it is essential to understand the risks, causes, and ways to reduce the probability of this type of injury.

A 2012 article from The Albert Einstein College of Medicine cited the Center of Disease Control and Prevention, claiming that "office workers are 2 to 2.5 times more likely to suffer an injury from a fall than non-office workers" [@einstein2012topinjuries]. An analysis of this claim may reveal insight into the source and interpretation of the original CDC data. This claim may have two slightly different meanings:

1. Office workers are more likely to suffer an injury, given they had a fall, than non-office workers.
2. Office workers are more likely to have a fall resulting in an injury than non-office workers.

In the original claim and this report, any reference to "falls" explicitly means falls on the same level and excludes injuries resulting from falls to a different level (reported in separate categories in CDC and US Bureau survey data). The definition of "slips" in this dataset is a trip without a fall, which is still relevant to the company's concern about fall-related safety. The following analysis will compare the number of falls between office and non-office workers and the number of falls resulting in injury between the two groups. The difference between the two interpretations leads to two separate concerns: are office workers at higher risk of falling or suffering an injury from a fall? It is also important to remember that this data and claim are from 2012 at the latest, and the workplace has changed very much in the last decade.

The CDC categorizes falls as a "common workplace injury" that costs $70 billion in workers' compensation and medical costs each year [@cdcFallsWorkplace2024]. The CDC also cites the industries with the most fall injuries as educational and health services, healthcare and social assistance, residential care, and ambulance services, all considered non-office industries.

While the claim may have held truth at the time, based on my research and analysis of 2023 BLS data, this claim is false in both interpretations. Workers in an office setting are not at

a higher risk of injury from a fall than those in a non-office setting [@SurveyOccupationalInjuries]. The data supports the opposite claim: non-office workers are about 2.2 times more likely to suffer an injury from a fall than office workers.

3 Methods

3.1 Data Sources

Two datasets were used in this analysis from the U.S. Bureau of Labor Statistics. First, the Survey of Occupational Injuries and Illnesses data was used, which covers reported work-related injuries and are detailed by source and industry (U.S. Bureau of Labor Statistics 2021). This data is collected biennially, and the most recently available data is 2021-2022. This data was used to identify the specific number of injuries sustained by office workers in this time period, and further identified the injuries related to falls, trips, and slips. With these detailed variables in the dataset, it was possible to compare the number of fall-related injuries between "office" and "non-office" industries.

Secondly, the Injury Incidence Rates per 100 workers detailed by industry and case type was used (U.S. Bureau of Labor Statistics 2023). This data includes injuries reported in 2023 that involved time away from work, which was used as a measure of severity in the work-related injuries. By looking at the total injuries reported, the number of "severe" injuries between "office" and "non-office" industries was compared.

The U.S. Bureau of Labor Statistics used the North American Industry Classification System (NAICS). These codes easily identify industries on both a broad and specific level, depending on the number of digits in the code (2-6). This code is how "office" and "non-office" industry were defined.

An important note about both these dataset is that they include hierarchical entries, meaning some rows represent aggregate totals for a broader industry, followed by rows that represent subindustry counts. In these cases, the broader row count represents the sum of all subsequent subindustries. For the analysis, only one specified level of data was used to avoid double-counting.

Further information on the datasets used can be found in the data documentation section of the appendix (**data-documention?**).

3.2 Classification Method

To categorize the industry using NAICS codes, the industries on the 3-digit level of the codes were chosen, so the several subindustries with 4,5, or 6 digit codes are grouped in with their

respective broader industry. The categories of "office" industries includes the following:

- Information (511, 517, 518, 519)
- Finance and Insurance (521, 522, 523, 524)
- Real Estate (531, 532)
- Legal Services and Accounting (541)
- Management (551)
- Administrative Support (561).

These codes were identified based off of research and inspection of the code list in the dataset. These decisions are subjective, and all jobs in each industry may not all be true office jobs. There are also likely specific office jobs that are within many other "non-office" industries. It is important to acknowledge that cleanly dividing this data into "office" and "non-office" categories is imperfect, and further analysis with more precise measures could produce slightly different results.

3.3 Data Cleaning and Assumption

When starting the analysis, the assumption was made that a blank observation (indicated by a dash) represented a zero, not an NA. Entries with actual NA values were removed. There were 186 observations that were removed (on raw data, prior to sectioning with NAICS codes).

For clarity and convenience, several columns were renamed to have shorter names without spaces in them. To section the data by NAICS codes, variables were filtered for only 3-digit observations, and then split the data using the list of 13 predecided codes.

For the first dataset, there were 2936 raw observations, and 96 sections at the 3-digit NAICS code level. After the data split, there were 83 "non-office" industries and 13 "office" industries (listed above). For the second dataset, it contained 1074 raw observations, 87 subsections with 74 "non-office" and 13 "office".

3.3.1 Libraries

The following libraries were utilized in R studio for the analysis:

- readxl: (Wickham and Bryan 2023) This library was used to read in and use both the datasets, which were provided by the BLS in excel files.

- dplyr: (Wickham et al. 2023) This library provided the majority of the data handling, specifically the mutate statement which allowed easy manipulation of dataframes. The filter and summarize statements were also extremely useful to sectioning the data into "office" and "non-office" dataframes.
- ggplot2: (Wickham 2016) This library was used for the visualization to create all graphs used in the analysis.
- tidyr: (Wickham, Vaughan, and Girlich 2024) This library has a function "pivot_longer" that was used in one case to reshape a dataframe for easier visualization.
- stringr: (Wickham 2023) One function was used, "slice_max", to select a certain number of observations from a dataframe. Just like with the tidyr function, stringr was for reshaping data for easier visualization.

4 Results

4.1 Primary Findings

4.1.1 Mean Slips and Falls

To reiterate, this dataset only records incidents that result in days away from work or job restriction, which I am generalizing to mean the incidents resulted in injury.

In 2023, the mean number of falls in non-office industries was 1546, and the mean for office industries was 3426. The mean number of slips in non-office industries was 941, and the mean was 340 for office industries (Figure 1). Non-office had, on average, about 2.2 times the number of falls and about 2.8 times more slips. This contradicts the previous claim of office workers being 2 to 2.5 times more likely than non-office workers to suffer an injury from a fall. According to these results, the reverse of the claim is more supported.

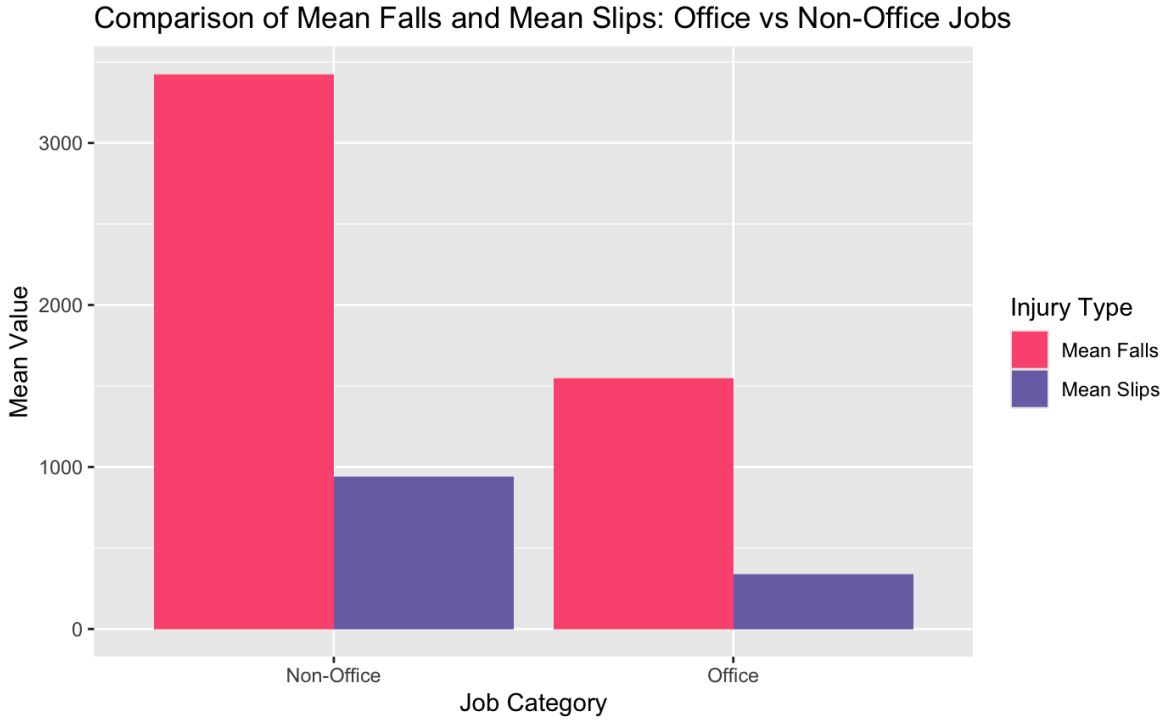


Figure 1: The mean number of slips and falls for both non-office and office industries. The mean

number of falls/slips can also be interpreted as the mean number of injuries resulting from a workplace fall/slip.

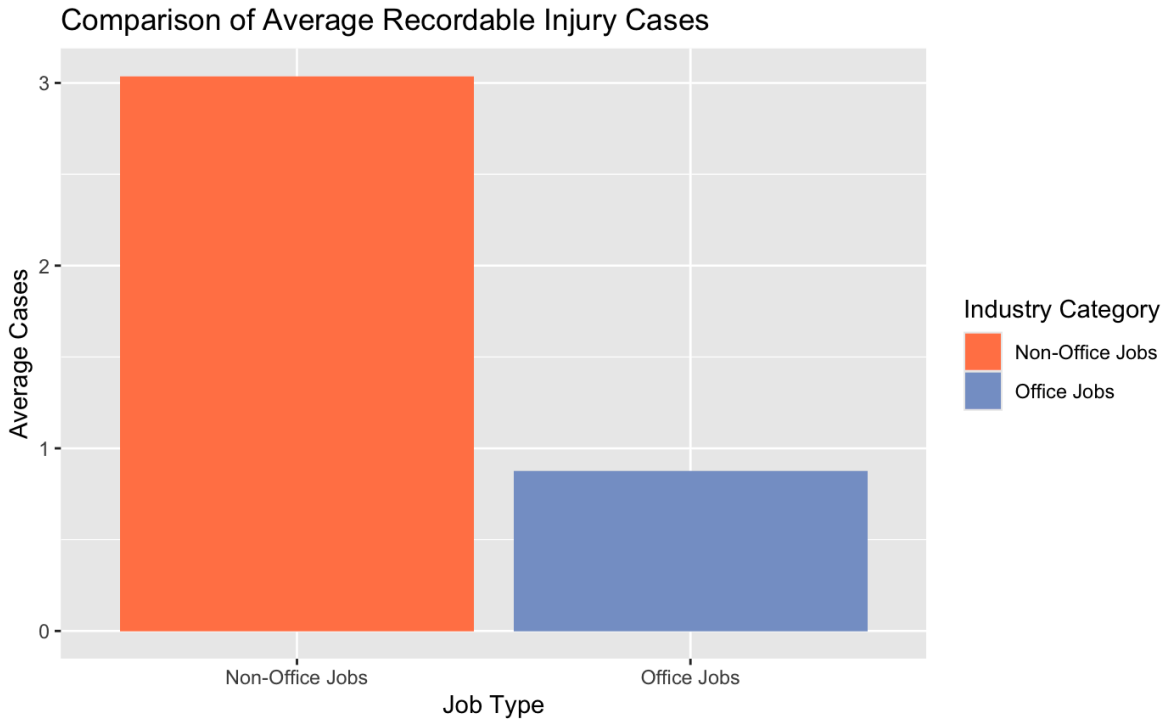
First, the data was tested for non-constant variance since the two groups have unequal sample sizes. Although visual inspection is not a fail-safe way to check for constant variance, the conclusion met is that both the groups created from this dataset have non-constant variance, and the Welch t-test will be used to account for this at a significance level of 0.05.

The t-test for fall-related cases revealed a significant p-value of 0.016 and a confidence interval of (-3416, -344). This is enough evidence to conclude there is a significant difference in the number of recordable falls between office and non-office injuries.

The same t-test was run for slip-related cases and resulted in a significant p-value of 0.0013 with a confidence interval of (-956, -245). This is enough evidence to conclude there is a significant difference in the number of recordable slips between office and non-office injuries.

4.1.2 Total Recordable Injury Cases

Non-office industries experienced an average rate of 3.04 workplace injuries per 100 workers in 2023, and office industries experienced an average of 0.88 workplace injuries within in the same data. On average, non-office jobs reported was about 3.5 times the rate of total recordable cases compared to office jobs (Figure 3).



Figure

3: Average number of recordable injuries in both non-office and office industries in 2023

After running a Welch two-sample t-test to account of non-constant variance, a significant p-value of 9.418x10-7 was revealed. The confidence level was (-2.85, -1.48). We can conclude a significant difference between the average number of injuries per 100 workers for non-office and office industries.

4.1.3 Injury Severity (Cases with Days Away from Work)

Non-office jobs also had a greater proportion of injuries resulting in time away from work. For non-office industries, the average rate of injuries per 100 workers resulting in days away from work was 1.19. For office industries, the average was 0.33. Similarly to the total number of cases, the average for non-office industries was about 3.6 times larger than that of the office industries (Figure 4). This can be used to make inference on the average severity of the injuries that non-office workers and office workers are acquiring.

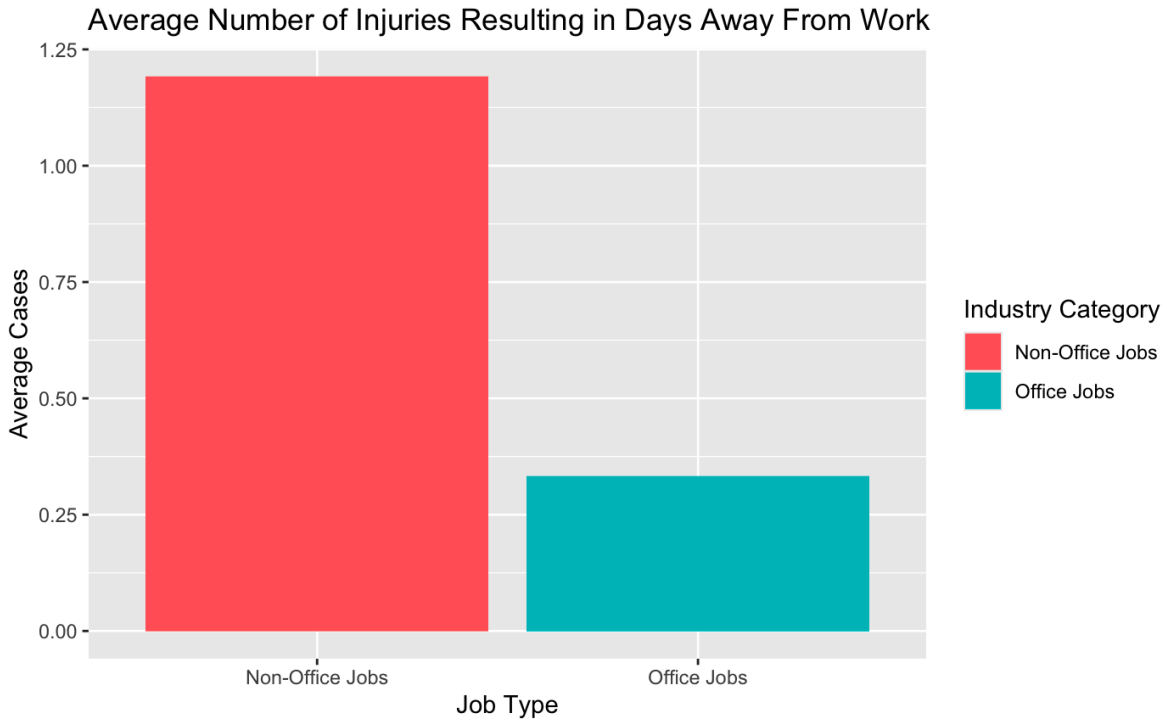


Figure 4: Average rate of 2023 recordable injuries per 100 workers that resulted in days away from work in both non-office and office industries

The same t-test was used due to the non-constant variance, and the resulting significant p-value was 1.88x10-5 with a confidence interval was (-1.21, -0.51). We can conclude there is a

significant difference between the average rate per 100 workers of injuries that resulted in time away from work.

5 Secondary Findings

5.0.1 Most Common Office Injuries

By visualizing the total reported injury cases (Figure 5), we can see the which type of injuries are most common. Falls on the same level are the second most common injury type reported in office spaces with 18,550 total cases in 2023.

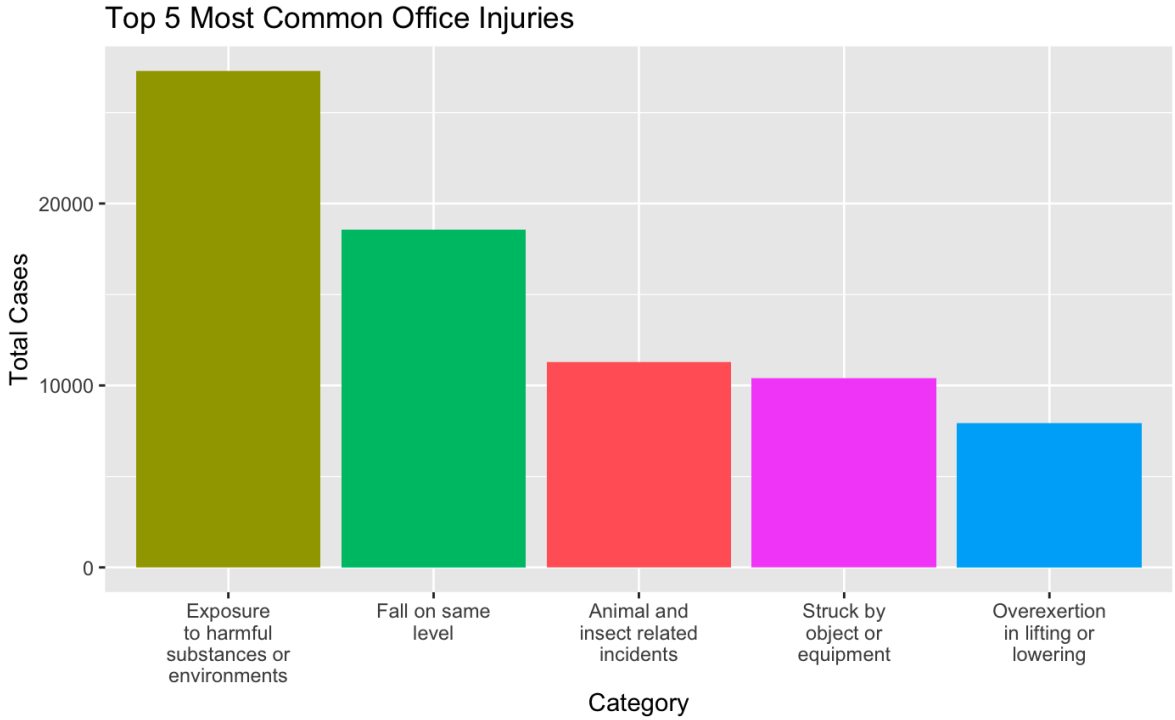


Figure 5: Total injury cases reported for office injuries by injury type. Only the 5 most common injury categories shown.

A more concrete probability can be found of how likely an office worker is to obtain an injury from a fall by taking the total number of injuries from falls over the total injuries obtained by office workers, which results in 0.1776.

6 Discussion

Using the 2023 survey of occupational injuries, I found that non-office workers are about 2.2 times more likely to suffer an injury from a fall and also 2.8 times more likely to slip without falling than an office worker [@SurveyOccupationalInjuries]. The evidence found using the US Bureau of Labor Statistics data supports this overwhelming conclusion opposite of the original claim. While the original CDC data was unavailable to public access, the available data used for this analysis is reliable and established.

The evidence from BLS directly opposes the original claim. It suggests that office workers are not at a higher risk of suffering injuries from falls than non-office workers. Generalizing to all types of injuries, I found that non-office industries have 3.5 times the number of recordable injuries compared to office industries [@TABLE1Incidence]. Similarly, the same data revealed that non-office industries had 3.6 times the number of recordable injuries requiring days away from work. The rate of recordable injuries and total recordable injuries with time away from work suggests that non-office workers are more likely to be injured at work and that the severity distribution of these injuries is higher than those of office workers. This evidence builds a strong case against any claim that office workers are likelier to suffer an injury from a fall than non-office workers.

Here is another way to think about this main conclusion: If a construction site and an accounting office have the same number of falls, the severity of those falls is likely to vary drastically. In many ways, we would hope to see fewer falls on the construction site than in the office because of the associated risk in the setting. According to the CDC, we see the highest number of workplace falls and fall injuries in construction, educational and health services, ambulance services, building maintenance, and transportation services [@cdcFallsWorkplace2024].

6.1 Limitations

We should consider that many industries filled predominantly by office jobs are partially exempt from OSHA record keeping because of the low incident rate [@RecordkeepingNonMandatoryAppendix]. Low report rates may lead to a bias in the data regarding how many fall injuries are reported in office industries or only reporting severe injuries. On the other hand, many office workers may be less conscious of OSHA regulations, increasing the likelihood of falls. Both these factors may lead to different kinds of bias in the data, which could be addressed in

the future by more focused studies into office workplace injuries and stress on following OSHA safety regulations in all workplaces.

We should acknowledge that the definition of "office" jobs and industries is sometimes subjective, and categorizing all the recognized NAICS industries into two groups is not a perfect system. Some jobs, such as real estate and administration support, have subcategory industries that vary significantly between office and non-office. For example, real estate may require workers to have an office, but it also includes extensive work outside an office. The administration support industry includes office support, security detail, and janitorial services, which likely have higher rates of injury. While there could be a debate on whether some industries are included, the evidence is conclusive enough for the variability not to make a significant difference. Future work could compare results from different combinations of NAICS codes to see how much the conclusion changes or allow the time to divide all 1074 industries into the two categories meticulously.

6.2 Recommended Actions

Despite the evidence that office workplaces are at much lower risk for falls and overall injuries, the second most common injury in offices still falls on the same level [@SurveyOccupationalInjuries]. Given that an office industry reports an injury, there is about a 17.76% chance that the injury is a fall on the same level. The CDC cites the following reasons as the most common causes of falls in the workplace [@cdcFallsWorkplace2024]:

- Unprotected edges
- Unsafely positioned ladders
- Misused fall protection
- Water, grease, and other contaminants on the floor
- Clutter and tripping hazards in walkways
- Irregularities in the floor and wall openings

Appropriate steps taken in an office could significantly reduce the risk of any workers falling, such as safety training, proper use of ladders, and cleaning up/labeling any floor area with liquid on it. It is a company's responsibility to ensure all parts of the building are using accessible architecture (ramps, elevators, wide doorways) so no employees are put in a position to take unnecessary risks.

This report concludes with strong evidence to say that office workers are not at a higher risk of suffering an injury from a fall than non-office workers. That said, office workers risk injury if proper safety regulations are not followed. Every company highly values the well-being of

its employees and should always take the appropriate steps to ensure a comfortable and safe work environment.

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