

A PCRB RESEARCH BRIEF

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IMPACT OF EXCESSIVE HEAT ON WORKPLACE INJURIES



PREPARED AND PRESENTED BY
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INTRODUCTION

THIS REPORT AIMS TO ASSESS THE RELATIONSHIP BETWEEN TEMPERATURE FLUCTUATIONS AND HEAT-RELATED CLAIMS IN THE WORKERS' COMPENSATION INDUSTRY, PROVIDING INSIGHTS INTO HOW EXTREME TEMPERATURES INFLUENCE WORKPLACE SAFETY.

This report examines the impact of excessive heat on workplace injuries using workers' compensation claims data from Pennsylvania over 11 policy years, along with average temperature data aggregated across different regions. The analysis focused on outdoor industries such as agriculture and construction, where workers are more exposed to high temperatures. By isolating heat-related claims through detailed injury description codes, we found some evidence suggesting that excessive heat contributes to an increase in workplace injuries. However, due to limitations such as the lack of monthly payroll and employment data, more analysis is needed to fully understand the impact from weather related heat.

In assessing the impact of excessive heat on workers' compensation claims, we focus on air temperature rather than heat index. Temperature

readings are straightforward and universally understood, making them easier to communicate and analyze compared to the more complex heat index, which incorporates humidity. Additionally, temperature is a standard metric reported across various industries and weather services, enabling consistent comparisons over time and across different geographic locations. The current data used for loss cost calculations automatically incorporates the change in claim frequency and severity due to excessive heat over time.

To more fully understand how excessive heat influences loss costs of individual classifications, additional long-term data is needed. This data should capture changes in claim frequency and severity over an extended period to better assess how fluctuations in temperature impact loss costs and identify relevant trends.

SUMMARY OF DATA ELEMENTS

Period	Policy Year 2012-2022
Metric	Air Temperature
Nature of Injury	32 - Heat Prostration, 90 - Multiple Physical Injuries Only
Cause of Injury	3 - Temperature Extremes, 99 - Other
Nature / Cause Pairings Applied	32/3, 32/99 and 90/32 For 90/99, only claims identified as heat-related are included
Temperature	The Pennsylvania State Climatologist (average temperature across PA)
# of Classes with Heat-Related Claims	211

Note: 1. Cause of Injury 'Temperature extremes' includes both extremely hot and cold conditions as potential causes of injury. In this study, injuries occurring when the maximum temperature is below 65°F are excluded. 2. Classification code 994 (Firefighter) is excluded from the analysis due to the difficulty in determining whether the claims are weather-related or due to inherent job heat exposure.



KEY FINDINGS

HIGHER TEMPS ARE A FACTOR, BUT MORE DATA IS NEEDED

Excessive heat appears to influence the frequency of workers' compensation claims, particularly in outdoor employment sectors. However, due to data limitations, we cannot conclusively determine the extent of this impact.

HEAT-RELATED CLAIMS FLUCTUATE

The annual number of heat-related claims fluctuates significantly, with no consistent upward or downward trend (Fig 1)

HIGHER TEMPS MEAN MORE INJURIES

There is a higher incidence of workers' compensation

injuries as temperatures rise (Fig 2).

Heat-related workers' compensation claims increased by 36%, rising from 0.25% to 0.35%, as the average number of days exceeding 80°F rose from 51 (2012-2017) to 62 (2018-2022), highlighting a correlation between high temperatures and workplace injuries.(Fig 6)

The number of heat-related claims dramatically increases when the temperature rises from 75-80°F to above 80°F. (Fig 8)

Months with more high-temperature days tend to

show an increase in heat-related claims (Fig 3).

From June to August, the proportion of heat-related claims increases at a higher rate than total claims (Fig 4-5).

INDUSTRY & SEVERITY

The Contracting industry group has the highest percentage of heat-related claims, followed by the Goods and Services industry. (Fig 7).

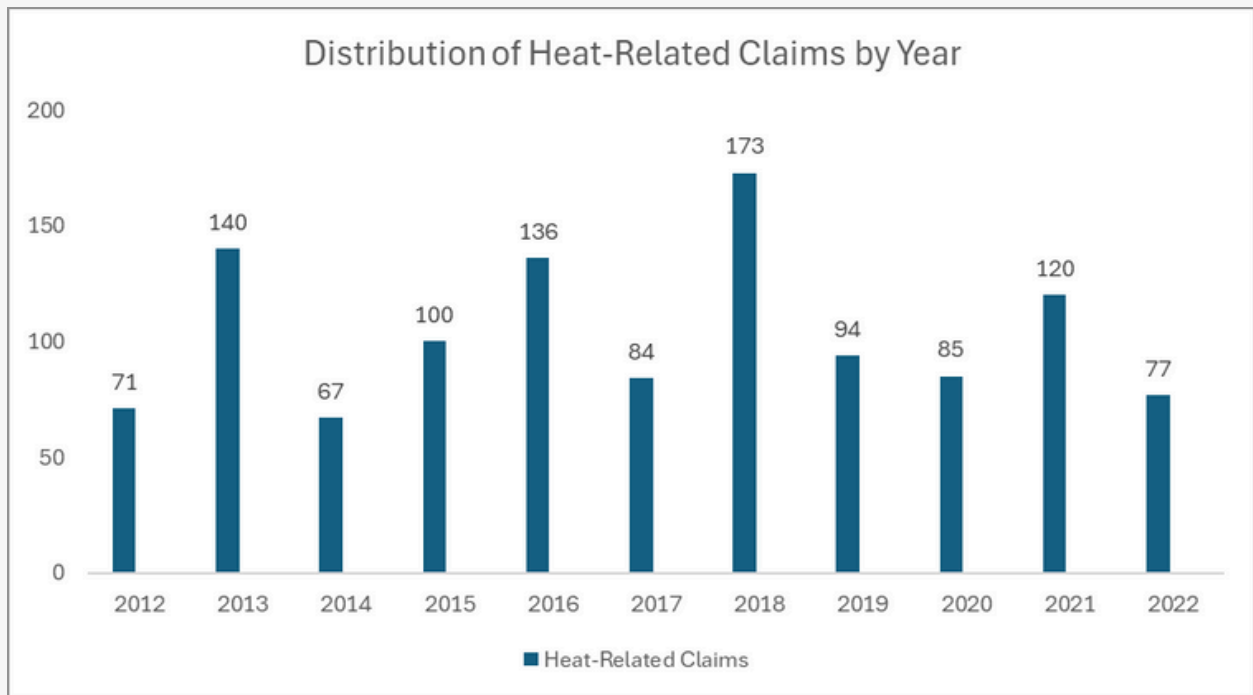
Most heat-related injuries are relatively less severe, with an average severity of \$3,100. Approximately, 96% of these are medical-only claims (Fig 9).

DISTRIBUTION OF HEAT-RELATED CLAIMS BY YEAR

Figure 1 shows that the annual number of heat-related claims varies significantly over the period, ranging from a low of 67 claims in 2014 to a

high of 173 claims in 2018. While there are year-to-year fluctuations, the data shows no consistent upward or downward trend overall.

FIGURE 1

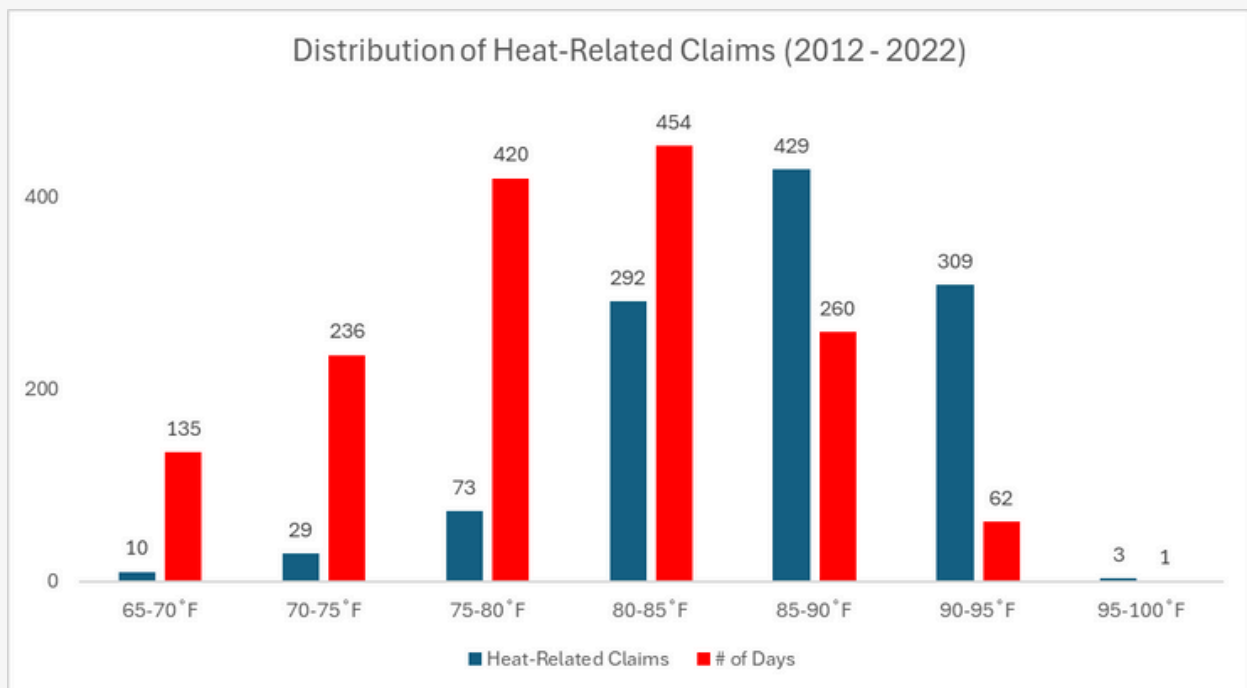


DISTRIBUTION OF HEAT-RELATED CLAIMS (2012-2022)

Figure 2 provides insights into the distribution of claims and the number of days by temperature range from May to September. Analysis of claim data and temperature records from 2012 to 2022 shows a higher incidence of workers' compensation injuries as temperature rises.

The number of claims increases with rising temperatures, peaking when the daily maximum temperature ranges between 85°F and 90°F. Notably, up to 85°F, there are more hot days than claims, but above 85°F, this pattern reverses, with more claims than hot days.

FIGURE 2



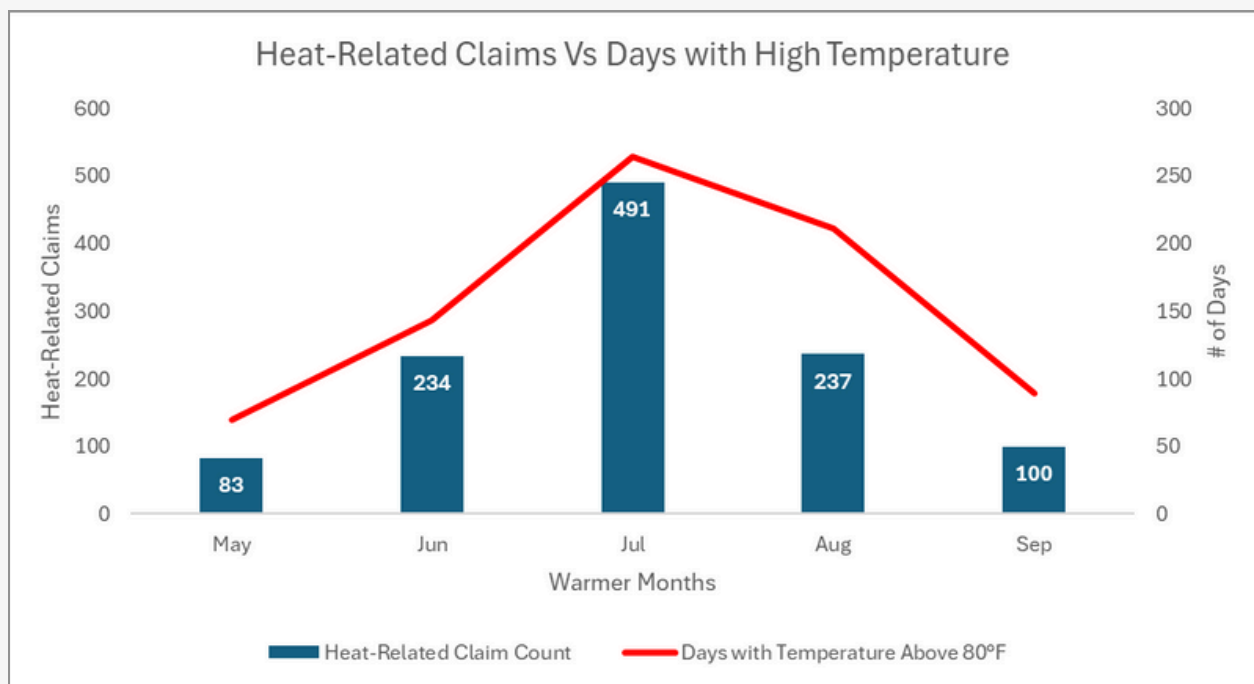
Note: Claims that occurred on days with a maximum temperature below 65°F are excluded, as those claims may be related to extreme cold. The temperature data used is based on the average temperature across Pennsylvania.

HEAT-RELATED CLAIMS VS DAYS WITH HIGH TEMPERATURE

Figure 3 illustrates the relationship between the number of claims and the number of days with temperatures above 80°F from May through

September, based on data 2012 to 2022. The data clearly shows that months with more high-temperature days tend to have an increase in heat-related claims.

FIGURE 3



However, it's important to recognize that the increase in claims may also be influenced by heightened seasonal activity during the summer months. Seasonality can play a significant role in workers' compensation claims, particularly in occupations that experience increased activity during warm weather. These occupations include, but are not limited to:

Landscaping/Grounds Maintenance: Landscapers and groundskeepers are busiest in the spring and summer, leading to more exposure to excessive heat.

- **Agricultural Workers:** Farming, particularly harvesting and planting, intensifies in warmer months, resulting in prolonged outdoor exposure.
- **Construction Workers:** Construction activities peak in warmer weather, increasing outdoor work and the risk of heat-related conditions like heat exhaustion or heat stroke.
- **Outdoor Event Workers:** Workers at festivals, concerts, and sporting events are more active during summer when these events are in full swing.

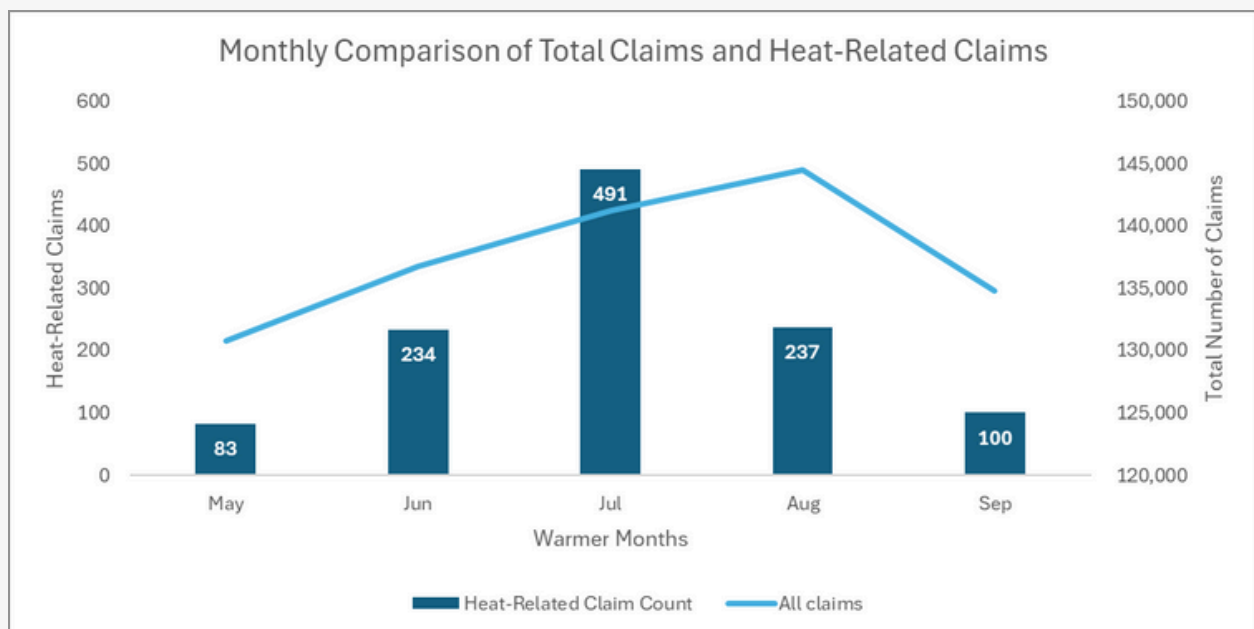
MONTHLY COMPARISON OF TOTAL CLAIMS AND HEAT-RELATED CLAIMS

Since the PCRB does not collect data on the number of employees, work hours, or payroll by month, it's difficult to determine the exact extent to which seasonality affects the increase in claims during summer months. To account for seasonality in the analysis, the PCRB evaluates the proportion of heat-related claims relative to the total number of claims each month. This approach offers partial insights into

whether the rise in heat-related claims is influenced more by temperature or by seasonal factors.

Figure 4 shows the total number of claims and heat-related claims by month. Heat-related claims increase alongside the total number of claims. It is important to investigate how much seasonality of workers contributes to this rise in claims during warmer months.

FIGURE 4

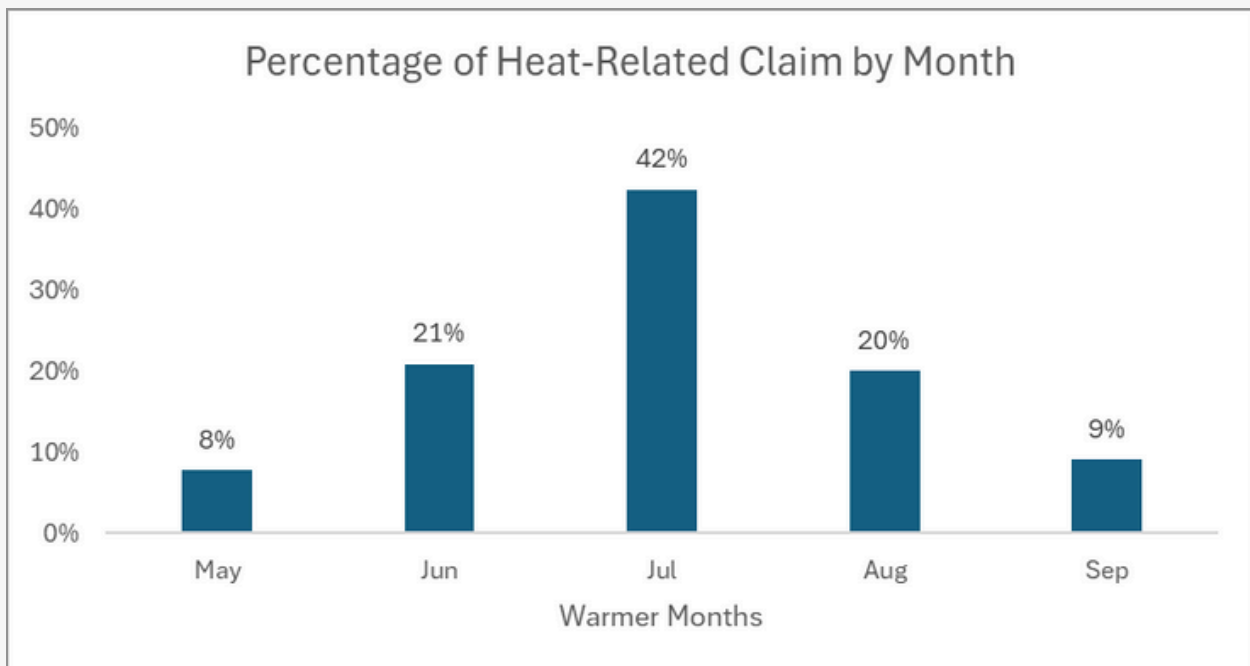


% OF HEAT-RELATED CLAIMS BY MONTH

Figure 5 shows that the proportion of heat-related claims in relation to all claims is higher in June, July, and August compared to May and September (July also has the highest number of days with temperatures above 80°F, as seen in Figure 3). In Figure 5, the total number of claims is used as a proxy for the total number of workers in each month, under the assumption that the number of injuries

increases as the number of employees increases. We also assume that workers hired during the warmer months have similar levels of experience as those employed during other times of the year. If seasonality alone were driving the number of heat-related claims, we would expect the percentage of these claims to remain relatively stable throughout the months. Figure 5 indicates that temperature influences the rise in heat-related injuries.

FIGURE 5

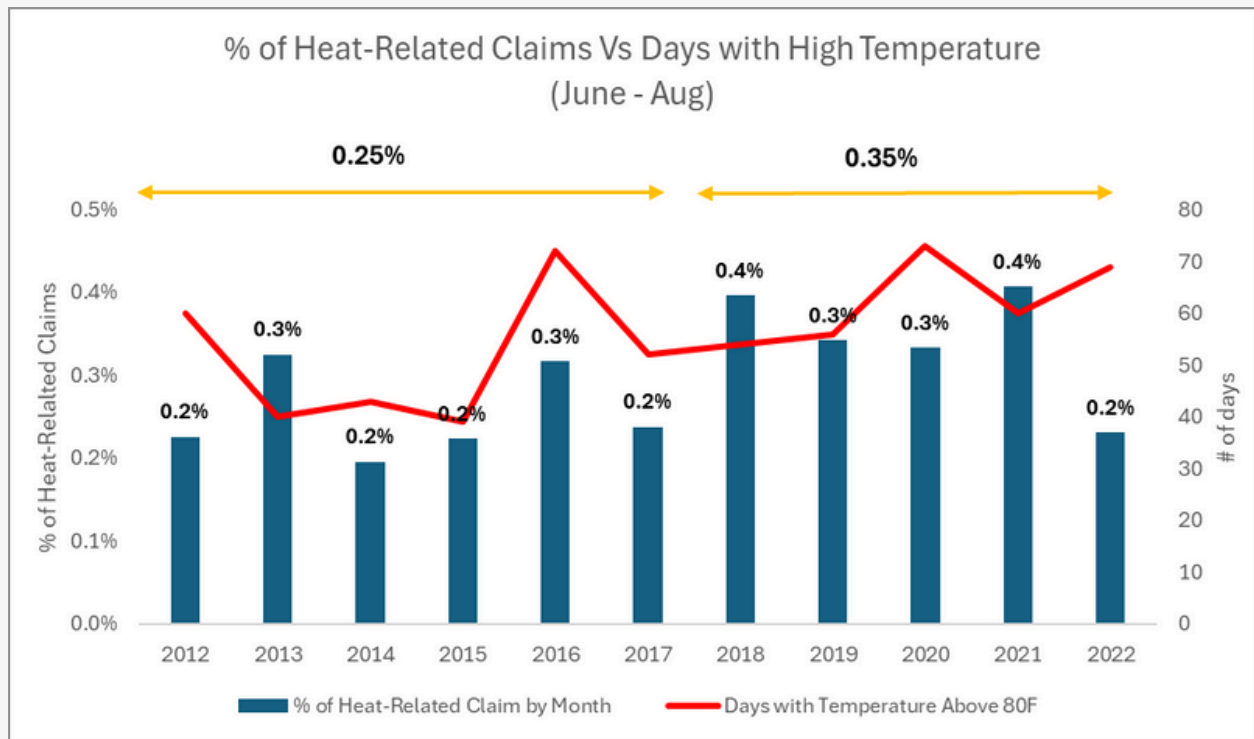


% OF HEAT-RELATED CLAIMS VS DAYS WITH HIGH TEMPERATURE

Figure 6 shows the historical relationship between the percentage of heat-related claims and the number of high-temperature days in June, July, and August. From 2012 to 2017, the average percentage of heat-related claims was 0.25%, with an

average of 51 days exceeding 80°F. From 2018 to 2022, the average percentage of heat-related claims increased to 0.35%, with an average of 62 days above 80°F. This is roughly a 36% increase between the two time periods.

FIGURE 6

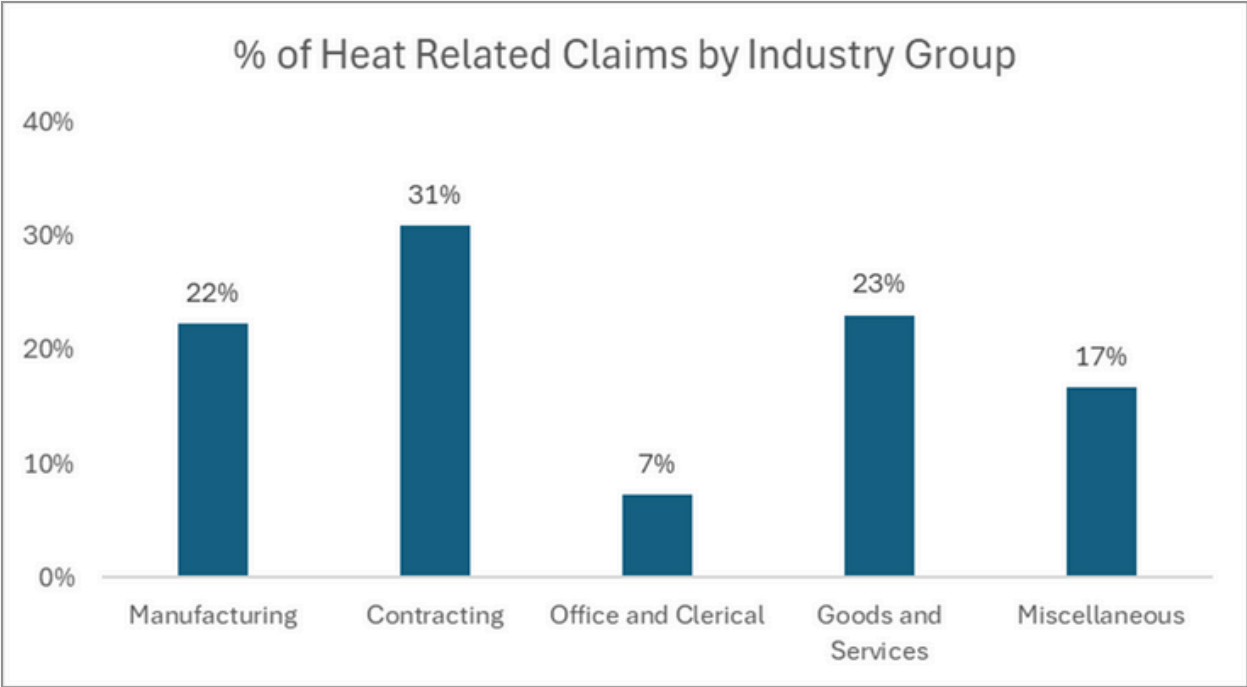


% OF HEAT-RELATED CLAIMS BY INDUSTRY GROUP

Figure 7 illustrates the proportion of heat-related claims in relation to all claims by industry group. The data reveals that the Contracting industry group experiences the

highest percentage of heat-related claims, followed by the Goods and Services industry. The Contracting industry group includes all construction-related classes.

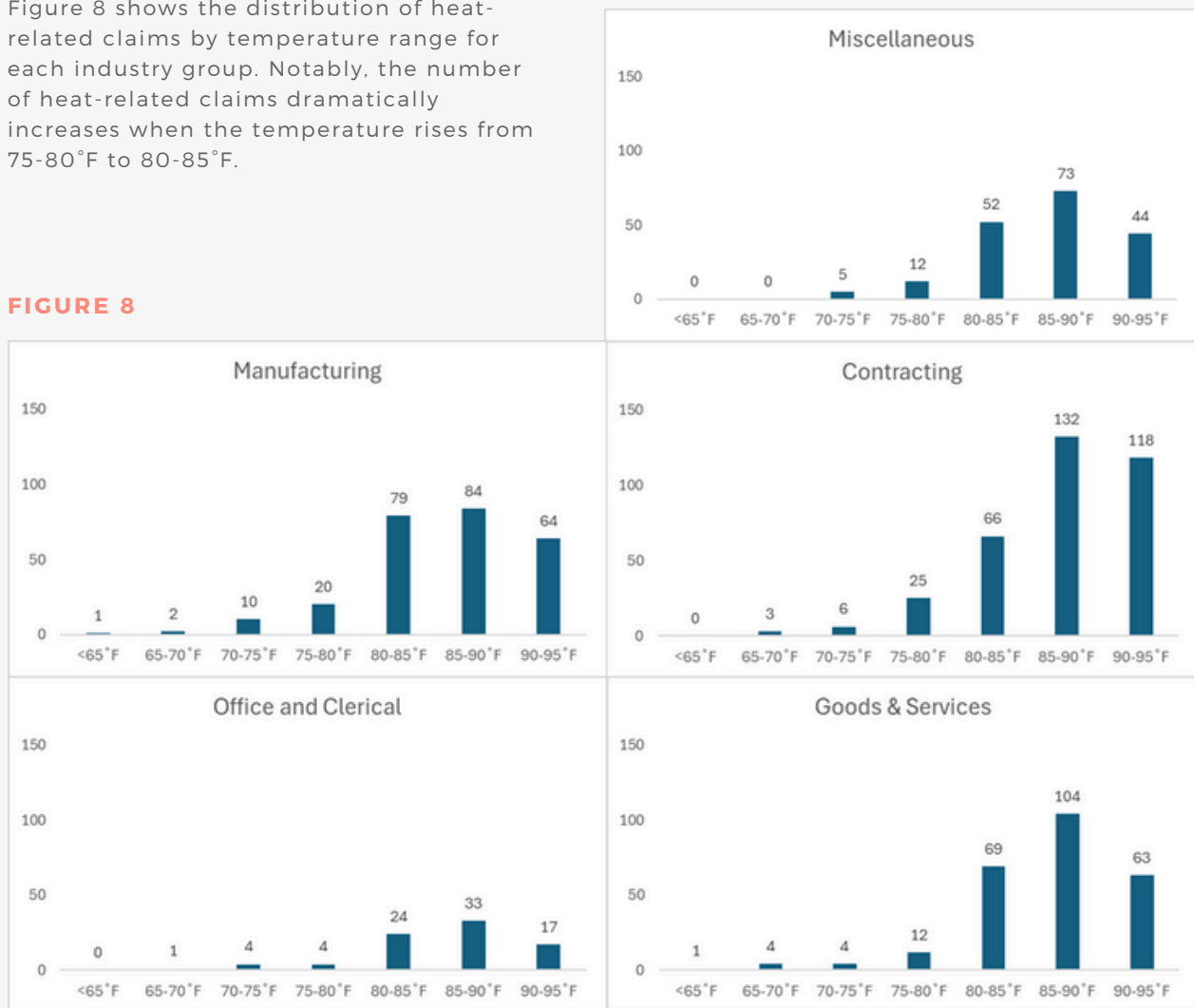
FIGURE 7



DISTRIBUTION OF HEAT-RELATED CLAIMS BY TEMPERATURE RANGE FOR EACH INDUSTRY GROUP

Figure 8 shows the distribution of heat-related claims by temperature range for each industry group. Notably, the number of heat-related claims dramatically increases when the temperature rises from 75-80°F to 80-85°F.

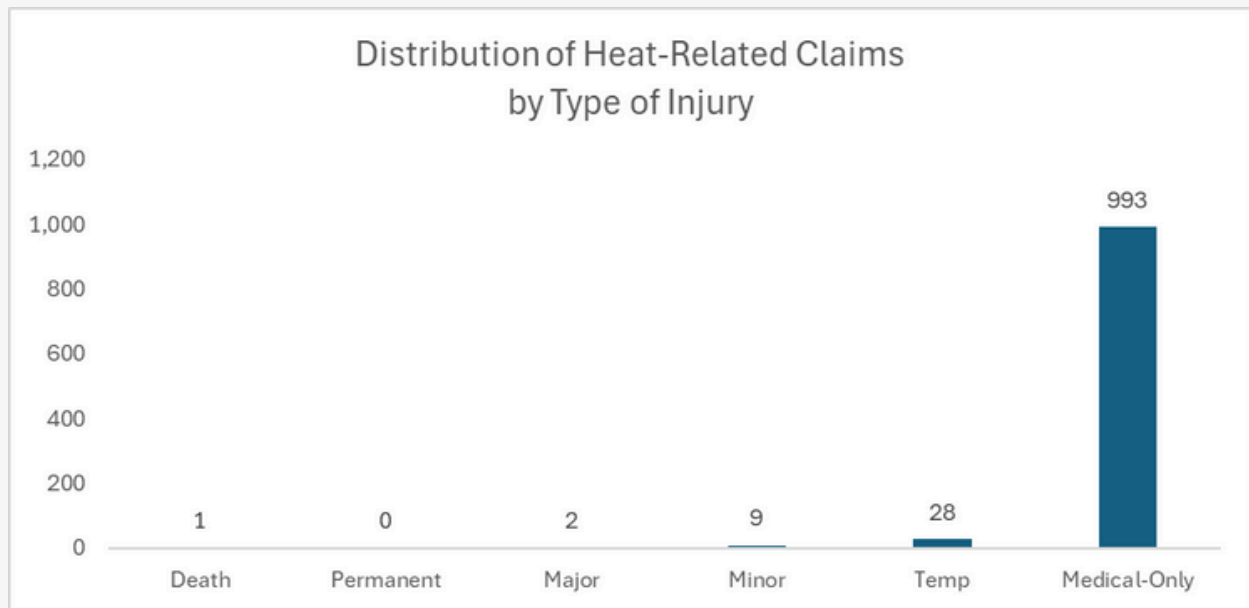
FIGURE 8



DISTRIBUTION OF HEAT-RELATED CLAIMS BY TYPE OF INJURY

Figure 9 shows the distribution of heat-related claims by injury type. The data indicates that most heat-related injuries are relatively less severe, with an average severity of \$3,100. Approximately 96% of the claims are medical-only claims.

FIGURE 9



Note: Claims occurred on days when the temperature exceeded 80°F between May and September.

LOOKING AHEAD



THERE EXISTS A CORRELATION BETWEEN EXCESSIVE HEAT AND FREQUENCY OF WORKERS COMPENSATION CLAIMS

This report highlights a notable correlation between excessive heat and the frequency of workers' compensation claims, particularly in outdoor employment sectors. As temperatures rise, there is a meaningful increase in heat-related claims, especially during the warmer months of June to August. The data indicate that the number of heat-related claims has risen by 36% as the average number of days exceeding 80°F increased. Notably, the Contracting industry exhibits the highest percentage of such claims. Meanwhile, most heat-related injuries tend to be less

severe, with 96% classified as medical-only claims.

The impact of heat-related claims on overall system costs is minimal, with a negligible effect on individual class loss costs. The loss cost process naturally accounts for gradual environmental shifts in exposure and cost, ensuring that any changes are reflected over time. Additionally, since most of these claims are medical-only, we are not seeing any significant impact on overall costs.

DATA LIMITATIONS

To accurately assess the impact of excessive heat during the warmer months, it is crucial to account for the effects of seasonality in the workplace. However, the PCRB does not collect payroll or employment data on a monthly basis, which poses a challenge in this regard. For example, industries such as boat building and repair (classification 718) or Club-Country, Golf or Yachting (Classification 944) experience increased activity during warmer months, which could lead to a rise in claims that are not necessarily linked to heat exposure. This seasonal uptick in work volume presents challenges in isolating heat as a driving factor, as some of the observed injury patterns may be explained by increased work rather than excessive temperatures. While the total number of claims during the warmer

months is used to account for seasonality (See Figure 5), the lack of monthly employment data makes it challenging to determine whether the increase in claims is due to heat-related injuries or simply a larger workforce during hotter months.

Additionally, variations in reporting and underwriting practices, and access to heat protection measures (e.g., water breaks, cooling areas/fans, biometric monitors/wearables, and rest periods) overtime can influence the number of heat-related claims. Exploring how preventive measures mitigate the effects of heat on workplace injuries could provide useful insights for understanding the impact of high temperatures on workplace safety.



ABOUT

THIS RESEARCH BRIEF WAS PRODUCED BY THE PCRB ACTUARIAL RESEARCH DEPARTMENT.



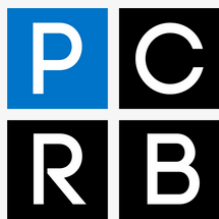
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