# Work-attributed Illness Arising From Excess Heat Exposure in Ontario, 2004-2010

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## ABSTRACT

**OBJECTIVE:** To describe the incidence of occupational heat illness in Ontario.

**METHODS:** Heat illness events were identified in two population-based data sources: work-related emergency department (ED) records and lost time claims for the period 2004-2010 in Ontario, Canada. Incidence rates were calculated using denominator estimates from national labour market surveys and estimates were adjusted for workers' compensation insurance coverage. Proportional morbidity ratios were estimated for industry, occupation and tenure of employment.

**RESULTS:** There were 785 heat illness events identified in the ED encounter records (incidence rate 1.6 per 1,000,000 full-time equivalent (FTE) months) and 612 heat illness events identified in the lost time claim records (incidence rate 1.7 per 1,000,000 FTE months) in the seven-year observation period with peak incidence observed in the summer months. The risk of heat illness was elevated for men, young workers, manual workers and those with shorter employment tenure. A higher proportion of lost time claims attributed to heat illness were observed in the government services, agriculture and construction sectors relative to all lost time claims.

**CONCLUSIONS:** Occupational heat illnesses are experienced in Ontario's population and are observed in ED records and lost time claims. The variation of heat illness incidence observed with worker and industry characteristics, and over time, can inform prevention efforts by occupational health services in Ontario.

**KEY WORDS:** Heat stress disorders; occupational exposure; epidemiology

La traduction du résumé se trouve à la fin de l'article.

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Excess morbidity and mortality observed in recent decades during extreme heat events in Europe and North America has called attention to the environmental and occupational hazards associated with heat.[1] Extreme heat exposures are projected to become more frequent due to climate change. The Intergovernmental Panel on Climate Change estimates that in the next three decades, North America will see mean temperature increases of 1-3°C, alongside intensification of severe heat waves.[2] By the 2050s and 2080s, heat-related population mortality is estimated to increase by 70-90% and 120-140% respectively in south-central Canada.[3]

Public health authorities have focused on addressing the vulnerability of elderly persons and persons with chronic disease during extreme heat episodes. Less attention has been paid to the surveillance and management of occupational health risks arising from extreme heat exposures.[4-6] Both outdoor and indoor working environments can have high ambient temperatures due to weather variation and industrial sources of heat in the absence of sufficient engineering temperature controls. Protective equipment or clothing can inhibit the body's ability to effectively cool in the work environment.[7] In addition, work requiring physical exertion will generate additional metabolic heat, even at moderate temperatures.[6,7]

Heat illnesses vary in severity, from heat cramps, heat edema and heat syncope (fainting), to heat exhaustion and heat stroke, which can lead to death. Heat stress can increase risk of other types of workplace injuries due to impairment of physical and mental performance.[7,8]

Previous research examining occupational heat illness has largely been conducted in the United States and has focused on heat illness in specific occupational groups, including military personnel, agricultural workers and miners,[5,9-13] most frequently using workers' compensation claim datasets.[9,11] The burden of illness related to high ambient temperatures across all sectors of the labour force is not well described and has not been examined for geographic areas in Canada.[7] Given projected increases in heat hazards from climate change, an increased understanding of this issue is critical to inform policies and occupational health programming. The purpose of this study is to describe the incidence of heat illness among occupationally-active adults in the Canadian province of Ontario. The study makes use of two population-based sources of data on incident heat illness: work-related emergency department (ED) visit records and workers' compensation lost time claim records. We assess the concordance of information in the two datasets with a view that work-related ED records are more suited to the surveil-

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**Table 1.** Inclusion and Exclusion Criteria for Case Definitions of Heat Illness in Emergency Department (ED) Encounter Records and Lost Time Claim Records

| **ED Encounter Records**<br>**ICD-10-CA Codes[27]** | **Lost Time Claim Records**<br>**Z795 Codes[28-30]** |
|---|---|
| INCLUSION | INCLUSION |
| Reason for Visit | Nature of Injury |
| T67: Effects of heat and light | 072: Effects of heat and light |
| T67.0: Heatstroke and sunstroke | 07200 Effects of heat and light, unspecified |
| T67.1 Heat syncope | 07210 Heat stroke |
| T67.2 Heat cramp | 07220 Heat syncope |
| T67.3 Heat exhaustion, anhydrotic | 07230 Heat fatigue |
| T67.4 Heat exhaustion due to salt depletion | 07240 Heat edema |
| T67.5 Heat exhaustion, unspecified | 07280 Multiple effects of heat and light |
| T67.6 Heat fatigue, transient | 07290 Effects of heat and light, n.e.c.* |
| T67.7 Heat oedema | Event |
| T67.8 Other effects of heat and light | 32000 Contact with temperature extremes, unspecified |
| T67.9 Effect of heat and light, unspecified | 32100 Exposure to environmental heat |
| X30: Exposure to excessive natural heat | 32900 Contact with temperature extremes, n.e.c.* |
| | Source of Injury |
| | 93600 Temperature extremes–environmental, unspecified |
| | 93620 Heat–environmental |
| | 93690 Temperature extremes–environmental, n.e.c.* |
| | 93920 Sun |
| | EXCLUSION |
| | 071: Effects of reduced temperature |
| | 073: Effects of air pressure |

* n.e.c.: not elsewhere classified.

lance of work-related heat illness than hospital admission or mortality records due to their prompt sensitivity to meteorological conditions.[14]

## METHODS

### Study objective and study design

The objective of this observational study was to estimate the incidence rate of work illness arising from excess heat exposure in two data sources for the Ontario labour force over a seven-year period. Records of heat-related work-related illness for a complete population of occupationally-active adults aged 15-64 years in the province of Ontario were obtained from two independent sources: a census of allowed lost time compensation claims registered with the Ontario Workplace Safety & Insurance Board (WSIB) and a census of emergency department encounter records where the illness was attributed to a workplace cause. Included in this study are all individuals with an illness date from January of 2004 to December of 2010.

Approval for this study was obtained from the University of Toronto Health Sciences Research Ethics Board.

### Data sources

*National Ambulatory Care Reporting System (NACRS)*

The Canadian Institute for Health Information (CIHI) is the mandated repository for electronic records documenting visits to EDs in acute care facilities in Ontario under the framework of the National Ambulatory Care Reporting System (NACRS).[15] All Ontario citizens are insured for medically necessary care, including care provided in acute care hospital emergency departments. For this study, emergency department records where the "responsibility for payment" code indicated the WSIB were obtained from NACRS for the period January 2004 to December 2010. Responsibility for payment refers to the clinical determination of a work-related cause of morbidity presenting to the emergency department and is independent of the registration or acceptance of a workers' compensation claim.[16] Variables included in the extracted records were: gender, birth date, visit type, visit date and a series of up to 10 fields documenting the main problem and the external cause of injury. All unplanned ED visits were included in the analysis. Data describing the reason for each visit is recorded using the Canadian implementation of the International Classification of Diseases, 10th Revision (ICD-10-CA).

*Workplace Compensation Lost Time Claims*

In Ontario, the WSIB is the sole provider of workplace compensation coverage. Approximately 70% of the labour force is insured by the WSIB based on firms' industrial characteristics; those not covered include self-employed workers, domestic and casual workers and some designated economic sectors (for example, financial and insurance services).[17] Employees of insured firms are eligible for compensation of lost wages and reimbursement of health care expenses resulting from a work-related illness that required time to be taken off of work the day after the injuring incident, under compensation known as lost time claims. Electronic records of lost time claims include information on the source, event and nature of occupational illness, classified according to a standardized coding system.[18]

### Measures

*Case Definitions: Heat Illness*

In ED records, a case of heat illness was defined on the basis of ICD-10-CA codes for conditions diagnosed as heatstroke, sunstroke, heat collapse, heat cramps, heat exhaustion, heat fatigue, heat edema or other effects of heat and light (Table 1). A visit was also classified as a case of heat illness if a cause of the injury was "exposure to natural heat".

Among lost time claims, a case of heat illness was defined by information describing the nature, event or source of injury. If the principal physical characteristics of the injury, its nature, included effects of heat and light, the claim was defined as heat-related. This encompassed heat stroke, heat syncope, heat fatigue, heat edema, multiple effects of heat and light, unspecified effects of heat and light, and effects of heat and light not classified elsewhere. Where the source of injury, describing the exposure inflicting the injury,

**Table 2.** Incidence of Work-related Emergency Department (ED) Encounters and Lost Time Claims Related to Excess Heat Exposure, by Month, Year, Age and Gender, Ontario 2004-2010

| | ED Encounters | | Lost Time Claims | |
|---|---|---|---|---|
| | Number of Events | Incidence Rate per 1,000,000 FTE Months (95% CI) | Number of Events | Incidence Rate per 1,000,000 FTE Months (95% CI) |
| Month | | | | |
| January | <5 | 0.1 (0.0-0.2) | 5 | 0.2 (0.0-0.3) |
| February | <5 | 0.0 (0.0-0.1) | 7 | 0.2 (0.1-0.4) |
| March | <5 | 0.1 (0.0-0.2) | 6 | 0.2 (0.0-0.4) |
| April | <5 | 0.1 (0.0-0.2) | 8 | 0.3 (0.1-0.5) |
| May | 75 | 1.8 (1.4-2.2) | 53 | 1.8 (1.3-2.3) |
| June | 175 | 4.2 (3.5-4.8) | 118 | 3.9 (3.2-4.6) |
| July | 235 | 5.5 (4.8-6.2) | 224 | 7.4 (6.4-8.3) |
| August | 246 | 5.8 (5.1-6.5) | 149 | 4.9 (4.1-5.7) |
| September | 32 | 0.8 (0.5-1.0) | 18 | 0.6 (0.3-0.9) |
| October | <5 | 0.1 (0.0-0.2) | 14 | 0.5 (0.2-0.7) |
| November | <5 | 0.1 (0.0-0.2) | 8 | 0.3 (0.1-0.5) |
| December | <5 | 0.0 (0.0-0.1) | <5 | 0.1 (0.0-0.2) |
| Year | | | | |
| 2004 | 48 | 0.7 (0.5-0.9) | 37 | 0.8 (0.5-1.0) |
| 2005 | 166 | 2.4 (2.0-2.8) | 155 | 3.1 (2.6-3.6) |
| 2006 | 191 | 2.7 (2.3-3.1) | 124 | 2.5 (2.0-2.9) |
| 2007 | 132 | 1.8 (1.5-2.2) | 93 | 1.8 (1.4-2.2) |
| 2008 | 52 | 0.7 (0.5-0.9) | 44 | 0.9 (0.6-1.1) |
| 2009 | 54 | 0.8 (0.6-1.0) | 42 | 0.8 (0.6-1.1) |
| 2010 | 142 | 2.0 (1.7-2.3) | 117 | 3.5 (1.9-5.1) |
| Age group (years) | | | | |
| 15-24 | 186 | 3.4 (2.9-3.9) | 110 | 2.7 (2.2-3.2) |
| 25-34 | 232 | 2.1 (1.9-2.4) | 121 | 1.6 (1.3-1.9) |
| 35-44 | 177 | 1.4 (1.2-1.6) | 152 | 1.6 (1.4-1.9) |
| 45-54 | 144 | 1.1 (1.0-1.3) | 169 | 1.8 (1.6-2.1) |
| 55-64 | 43 | 0.7 (0.5-0.9) | 54 | 1.2 (0.9-1.5) |
| 65+ | <5 | 0.3 (-0.1-0.7) | 6 | 0.8 (0.2-1.5) |
| Gender | | | | |
| Male | 612 | 2.2 (2.0-2.4) | 419 | 1.9 (1.7-2.1) |
| Female | 173 | 0.8 (0.7-0.9) | 193 | 1.4 (1.2-1.6) |

Incidence per 1,000,000 full-time equivalent (FTE) months, 95% confidence intervals.

was specified as environmental heat, sun or environmental temperature extremes that were unspecified or not classified elsewhere, the claim was defined as heat-related. Heat-relatedness was also attributed where the event or exposure that resulted in the illness was listed as exposure to environmental heat or contact with temperature extremes that was unspecified or not classified elsewhere.

*Occupation, Industry and Tenure of Employment*

Information on occupation and industry of employment was available only for lost time claims. Occupation is coded according to the National Occupational Classification, 1991, (NOC)[19] and industry is classified using the 1980 Standard Industrial Classification (SIC).[20] Worker's employment tenure is the number of days between the worker's initial employment and illness.

*Labour Force Estimates*

Denominator estimates of the number of full-time equivalent (FTE) workers, stratified by age, gender, month and year for the Ontario labour force were obtained from the Labour Force Survey conducted by Statistics Canada.[21] Forty hours of work per week based on the actual hours reported was considered to be the equivalent of a full-time work commitment. To accurately calculate rates of heat illness based on lost time claims, estimates of the working population from the Labour Force Survey were adjusted based on industry characteristics to determine the number of FTE employees eligible for WSIB coverage.[17]

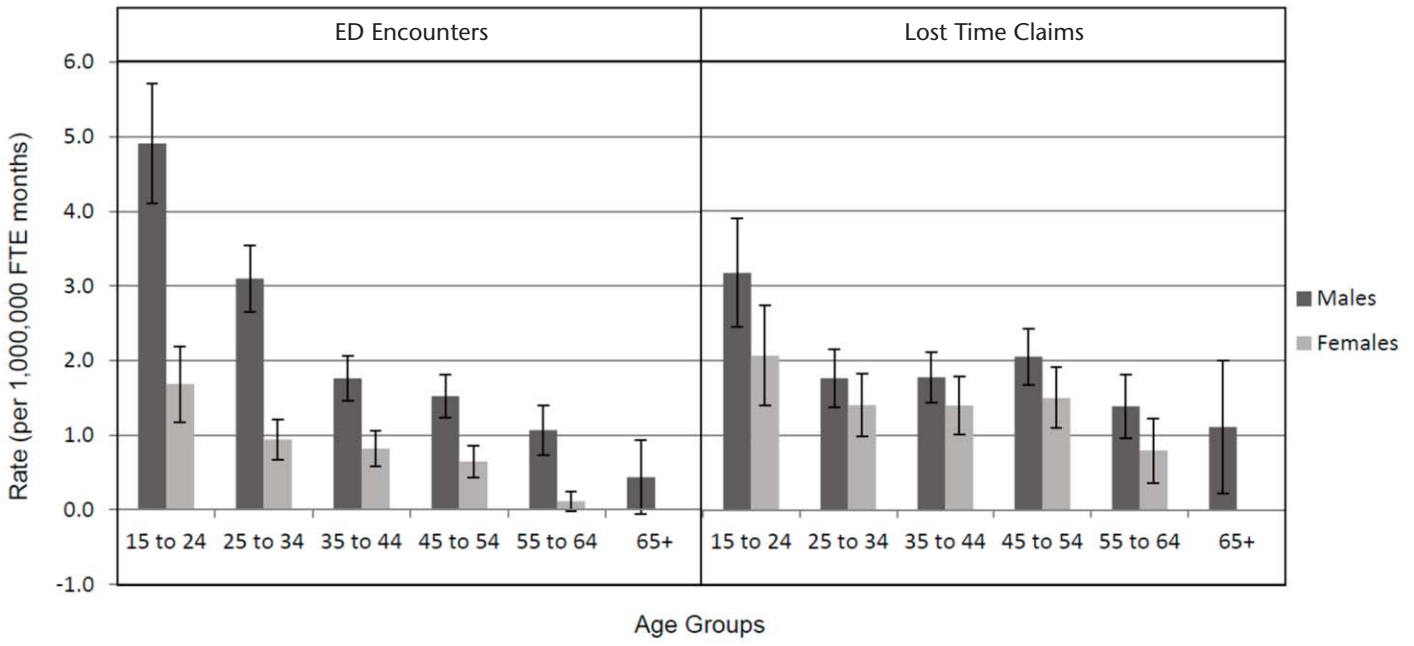
## Analysis

Age, gender, year, month and age-/gender-specific rates of heat illness were generated from both datasets. The distribution of heat-related illnesses on days throughout the seven-year period was examined, considering the number of days over which all heat illnesses occur and the adjacency of days with heat illnesses.

Rates of heat illness were calculated by dividing the number of heat-related ED visits or lost time claims over the number of FTE workers in Ontario eligible for each service. Rates were expressed per 1,000,000 FTE employee months. Confidence intervals consider variation of the numerator only and were calculated using the normal approximation method based on a Poisson distribution.[22] The characteristics of workers with a heat illness documented in WSIB lost time claims were described for industry and occupation. A number of occupational exposures were attributed to individual claim records based on job exposure matrices. The required skill level for the heat-injured worker's occupation in addition to the physical job demands (manual, mixed and non-manual) and environmental conditions relevant to heat illness in their occupation were also described. Occupational physical job demands were classified using methods developed by the Institut de recherche Robert-Sauvé en santé et en sécurité du travail.[23] Worker's environmental condition classifications were coded using the Human Resources and Skills Development Canada classifications, which categorize hazards likely to be present in the occupational environment and locations where the main duties of an occupation are conducted (regulated inside climate, unregulated inside climate, outdoors and/or vehicle). An unregulated inside climate describes the presence of temperature or humidity levels considerably different from normal room conditions. If an occupation lacks a regulated inside climate (normal room conditions), no regulated inside climate was indicated.[24]

The proportionate morbidity ratio (PMR) of heat-related lost time claims relative to non-heat-related lost time claims was calculated

**Figure 1.** Rate of heat-related, occupationally-attributed emergency department (ED) encounters and lost time claims per 1,000,000 full-time equivalent (FTE) worker months in Ontario from 2004-2010 by worker age and gender




for all characteristics. Confidence intervals were calculated for incidence rates. All analyses were conducting using SAS 9.3 and Microsoft Office Excel 2007.

## RESULTS

From 2004-2010, there were 785 heat-related visits to Ontario emergency departments that were clinically attributed to work exposures and there were 612 lost time claims identified as heat-related. The rate of occupationally-attributed, heat-related ED visits was 1.6 per 1,000,000 FTE employee months (95% CI 1.5-1.7) and the rate of heat-related lost time claims was 1.7 per 1,000,000 FTE employee months (95% CI 1.6-1.9).

Unspecified heat exhaustion was the most frequent reason for an ED visit (68%), while heat stroke and sunstroke represented 14% of visits. Among lost time claims declared to be the effects of heat and light, 50% of injuries were not classified, 18% were attributed to heat stroke, 10% to heat fatigue and 6% to heat syncope. Monthly rates of occupationally-attributed heat illness are less than one in a million FTE employees from September to April, and incidence of heat illness is highest in the June to August period in both data sources (Table 2). Annual variation is also observed in both data sources, with elevated incidence in 2005, 2006 and 2010.

Over the seven-year study period, the 785 ED visits for heat illness occurred on 312 days (12% of all days in the seven-year observation period). A total of 55% of all heat illnesses were clustered in epidemics over contiguous days. Approximately 13% of all visits over the seven-year period occurred on only two days in August of 2006.

WSIB lost time claims demonstrated similar clustering over time. The 612 lost time claims occurred on 298 days (11% of all days in the seven-year observation period). A total of 40% of all heat illnesses were clustered in epidemics over contiguous days. Pronounced concentration was also observed in this data source: 9% of illnesses occurred on two days, one day in August 2006 and the other in July 2010.

The rates of ED visits and lost time claims were highest among workers aged 15-24, although age differences were less pronounced among lost time claimants (Figure 1). The incidence of heat illness was higher among men in both data sources.

Table 3 reports the frequency of heat-related lost time claims by industrial sector, occupational activity and skill level of worker's position, as well as the PMR for these characteristics, comparing those that are heat-related to all lost time claims. Among heat-related lost time claims, the most frequent industrial sectors of employment were Manufacturing (25%), Government Service (15%), Construction (10%) and self-insured public sector employers (10%). Relative to the proportion of all claims within each sector, there was a higher proportion of heat-related claims in the following sectors: Government (includes those working for school boards, power and telecommunication lines, electric power generation, and municipal services including waste management), Agriculture, Construction, Business Services (includes employment agencies, technical and professional services), Communication & Other Utility, self-insured public sector employers, Manufacturing, Real Estate & Insurance Agent, and Other Services (includes hospitality industries, janitorial and repair industries as well as recreational services and facilities).

Among lost time claims, approximately two thirds of workers with heat illnesses were in positions that were classified as manual labour (Table 3). Relative to all lost time claims, there was a higher proportion of heat-related claims among manual workers.

Table 3 also provides information on typical environmental working conditions for the occupations of heat-injured workers with a lost time claim. Approximately one half of workers with a lost time claim for heat illness were employed in occupations with a prominent exposure to outdoor work (PMR: 1.2), and approximately 25% were employed in occupations that typically work in unregulated indoor environments (PMR: 1.5). Approximately 18% of workers with a lost time claim for heat illness worked in occupations with typical exposure to fire, steam or hot surface hazards at work (PMR: 1.5).

**Table 3.** Proportional Morbidity Ratios for Heat-related Lost Time Claims in Ontario, 2004-2010, by Occupational Skill Type, Labour Classification, Required Training Level, Environmental Conditions, and Employment Tenure

| | Total Lost Time Claims (All Cause) | Percent of Lost Time Claims (All Cause) | Total Heat-related Lost Time Claims | Percent of Heat-related Lost Time Claims | PMR |
|---|---|---|---|---|---|
| Industrial sector | | | | | |
| Government service | 35,834 | 6.3% | 89 | 14.6% | 2.31 |
| Agriculture & related services | 5908 | 1.0% | 12 | 2.0% | 1.89 |
| Construction | 41,101 | 7.2% | 62 | 10.1% | 1.40 |
| Business service | 22,391 | 3.9% | 33 | 5.4% | 1.37 |
| Communication & other utility | 19,723 | 3.5% | 27 | 4.4% | 1.27 |
| Self-insured public sector | 44,884 | 7.9% | 61 | 10.0% | 1.26 |
| Manufacturing | 122,524 | 21.6% | 154 | 25.2% | 1.17 |
| Real estate & insurance agent | 3300 | 0.6% | <5 | 0.7% | 1.13 |
| Other services | 18,757 | 3.3% | 21 | 3.4% | 1.04 |
| Wholesale trade | 29,146 | 5.1% | 28 | 4.6% | 0.89 |
| Logging & forestry | 1117 | 0.2% | <5 | 0.2% | 0.83 |
| Accommodation, food & beverage | 34,488 | 6.1% | 30 | 4.9% | 0.81 |
| Educational service | 13,625 | 2.4% | 11 | 1.8% | 0.75 |
| Mining, quarrying & oil well | 2607 | 0.5% | <5 | 0.3% | 0.71 |
| Transportation & storage | 40,557 | 7.1% | 30 | 4.9% | 0.69 |
| Health & social service | 62,724 | 11.0% | 22 | 3.6% | 0.33 |
| Retail trade | 69,188 | 12.2% | 24 | 3.9% | 0.32 |
| Fishing & trapping | 102 | 0.0% | <5 | 0.0% | 0.00 |
| Finance & insurance | 235 | 0.0% | <5 | 0.0% | 0.00 |
| Occupational labour classification | | | | | |
| Manual | 296,248 | 52.0% | 364 | 59.5% | 1.14 |
| Mixed | 186,153 | 32.7% | 172 | 28.1% | 0.86 |
| Non-manual | 68,906 | 12.1% | 58 | 9.5% | 0.78 |
| Missing | 17,815 | 3.1% | 18 | 2.9% | 0.94 |
| Required training level for occupation | | | | | |
| No training required | 131,759 | 23.1% | 181 | 29.6% | 1.28 |
| College/apprenticeship training | 135,469 | 23.8% | 149 | 24.3% | 1.02 |
| High-level management | 17,877 | 3.1% | 18 | 2.9% | 0.94 |
| Secondary school | 241,053 | 42.4% | 238 | 38.9% | 0.92 |
| Middle management | 10,851 | 1.9% | 7 | 1.1% | 0.60 |
| Bachelor's degree | 31,925 | 5.6% | 19 | 3.1% | 0.55 |
| Missing | 188 | 0.0% | <5 | 0.0% | 0.00 |
| Environmental conditions in occupation | | | | | |
| Hazard: Fire, steam, hot surfaces | 64,869 | 11.4% | 107 | 17.5% | 1.53 |
| Location: No regulated inside climate | 84,228 | 14.8% | 138 | 22.5% | 1.52 |
| Location: Outside | 205,040 | 36.0% | 269 | 44.0% | 1.22 |
| Location: Unregulated inside climate | 130,271 | 22.9% | 159 | 26.0% | 1.14 |
| Missing | 32,448 | 5.7% | 31 | 5.1% | 0.89 |
| Employment tenure | | | | | |
| <1 month | 23,833 | 4.2% | 50 | 8.2% | 1.95 |
| 1-2 months | 33,437 | 5.9% | 55 | 9.0% | 1.53 |
| 3-5 months | 35,475 | 6.2% | 38 | 6.2% | 1.00 |
| 6-11 months | 46,463 | 8.2% | 36 | 5.9% | 0.72 |
| ≥12 months | 46,427 | 70.7% | 399 | 65.2% | 0.92 |
| Missing | 402,060 | 4.8% | 34 | 5.6% | 1.15 |

Approximately 70% of workers with heat-related lost time claims were employed in the workplace for a year or more (Table 3). Workers whose tenure was less than a month (PMR: 1.95) and from one to two months (PMR: 1.53) experienced more heat claims relative to all claims. With longer tenure, workers had proportionally fewer heat claims relative to all claims.

## DISCUSSION

In this study of occupational heat illness, two population-based data sources provided concordant estimates of the incidence of heat illness. The incidence of heat illness was concentrated among young men and among manual occupations. Workers with less employment tenure had proportionally more heat illness, as did those in industries with substantial outdoor work. The absence of this pattern in smaller sectors involving outdoor work, such as logging and forestry, is likely due to lack of statistical precision. Further, proportionately more heat illness was observed among workers in occupations with exposure to fire, steam and hot surface hazards and in occupations with exposure to unregulated indoor environments. Temporally, risk of heat illness was greatest in the summer months, exhibited annual variation and was clustered over contiguous days.

Approximately one sixth of the cases of heat illness ascertained in this study were associated with a diagnosis of heat stroke, the most severe heat illness that has an elevated risk of hospitalization and death.[8] This proportion is comparable to hospitalization rates for heat-affected workers in California.[25] A population-based examination of heat illness in Washington State using workers' compensation data from 1995-2005 observed 3.1 claims for heat illness annually per 100,000 FTE including no lost time claims and lost time claims. Had only lost time claims been included, the rate would have been a tenth of that observed in Ontario.[9] Comparing trends of heat illness by industrial sector reveals similar patterns in Washington State as were noted in Ontario, the exception being the state's Manufacturing sector, which had proportionally fewer heat claims relative to all claims.[9] These differences are likely attributable to regional differences in climate, occupational demographics, prevention programming and claim administration, and reinforce the need for region-specific understanding of occupational heat illness.

We note a number of strengths of this study. The use of two data population-based sources that have consistent methods for the classification of work-related morbidity over the seven-year observation period was an advantage for confirming observed patterns and

trends. We applied broad criteria for case ascertainment, including cases with definitive diagnostic findings of heat illness and cases with suggestive diagnostic classification.[14,25,26]

The study has a number of limitations. Although not incorporated in this study, we anticipate that temperature, humidity and air pollution measures available from meteorological sources would provide a more refined analysis of risk estimates and may explain the annual variation and clustering of heat illnesses observed over contiguous days. To provide a simplistic example, on the day with the greatest burden of heat illness, the maximum ambient temperature was 36°C in Toronto and the Humidex peaked at 47°C, whereas the maximum daily temperature and Humidex in the preceding week had a mean of 30°C and 39°C, respectively.

Additionally, the study is describing the incidence of heat illness presenting to EDs or resulting in a workers' compensation lost time claim. As such, we expect that the incidence rates reported in this study underestimate the true burden of heat illness in this jurisdiction. Drawing on studies of heat illness in the US states of Washington and California, we might estimate that between 45-90% of cases with less severe heat illness that do not require time off work do not get reported in lost time compensation data.[9,25] While some of this burden was likely captured in the ED encounters, cases treated in primary care or workplace settings were excluded from this surveillance study of the Ontario labour force.

Finally, we note that the study methods did not link individual worker records between the ED data source and the workers' compensation data source. The proportion of incident events that are present in both data sources and that are uniquely present in each data source are not estimated in this study.

In conclusion, this study of work-related heat illness events provides information to inform occupational health services. The evidence from this report suggests heat illness prevention programs should target workers in manual occupations in typically outdoor industries and workers in occupations with exposure to unregulated indoor environments. Within these workplaces, younger individuals with less workplace tenure would benefit most as they are unlikely to be acclimatized to occupational conditions. Acknowledging that ambient heat will become more severe in the coming decades, continuing efforts to prevent work-related heat illness will be important.

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## RÉSUMÉ

**OBJECTIF :** Décrire l'incidence des maladies professionnelles liées à la chaleur en Ontario.

**MÉTHODE :** Les épisodes de maladies liées à la chaleur ont été recensés dans deux sources de données populationnelles : les dossiers des services médicaux d'urgence (SMU) concernant les travailleurs et les réclamations avec interruption de travail pour la période de 2004 à 2010 en Ontario (Canada). Les taux d'incidence ont été calculés à l'aide d'estimations dans le dénominateur tirées d'enquêtes nationales sur le marché du travail, et ces estimations ont été ajustées selon la couverture d'assurance indemnisant contre les accidents du travail. Des ratios proportionnels de morbidité ont été estimés par industrie, par profession et par durée d'emploi.

**RÉSULTATS :** Sur notre période d'observation de sept ans, 785 épisodes de maladies liées à la chaleur ont été recensés dans les dossiers des SMU

(taux d'incidence : 1,6 p. 1 000 000 mois équivalents temps plein [ETP]), et 612 épisodes du même type dans les réclamations avec interruption de travail (taux d'incidence : 1,7 p. 1 000 000 mois ETP), avec des pics observés durant les mois d'été. Le risque de maladie liée à la chaleur était élevé chez les hommes, les jeunes travailleurs, les travailleurs manuels et les personnes ayant eu une durée d'emploi plus courte. Une proportion supérieure de réclamations avec interruption de travail imputées aux maladies liées à la chaleur a été observée dans les secteurs des services gouvernementaux, de l'agriculture et du bâtiment comparativement à l'ensemble des réclamations avec interruption de travail.

**CONCLUSIONS :** Il y a des cas de maladies professionnelles liées à la chaleur dans la population ontarienne; ils sont observés dans les dossiers des SMU et dans les réclamations avec interruption de travail. On constate des écarts dans l'incidence des maladies liées à la chaleur selon les caractéristiques des travailleurs et des industries; au fil du temps, ces écarts peuvent éclairer les efforts de prévention des services de santé au travail en Ontario.

**MOTS CLÉS :** troubles dus à la chaleur; exposition professionnelle; épidémiologie