

Nearly 9 million injured worldwide by fire, heat, and hot substances in 2017

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Heat-related incidents resulted in nearly 9 million injuries and more than 120,000 deaths worldwide in 2017, according to a new scientific study.

Fires, heat, and hot substances, such as cooking oil or a hot stove, disproportionately kill young children and the elderly.

"Prevention should be the first priority in reducing the intolerable number of injuries and deaths," said Dr. Spencer James, senior author on the study and Lead Research Scientist at the Institute for Health Metrics and Evaluation at the University of Washington School of Medicine.

"Especially as treatment for burns and related injuries remains relatively expensive and requires robust health care services not often available in low- and middle-income countries."

James and coauthors found the risk of dying from a fire, heat, or hot substance is greatest in Seychelles, where one in 15 injuries result in [death](#). Laos follows closely in second at 1 in 17. Conversely, Singapore has the lowest risk among all nations at one in 1,000.

The age-adjusted incidence rate in China has increased by 46% since 1990, with new cases increasing from 935,000 to 1.3 million in 2017. In contrast, the US was among the countries with the largest decreases in the age-adjusted incidence rate, falling by 40% over the study period. The authors suggest this progress could be associated with various factors, including use of smoke detectors, building standards, and safety awareness. However, the US ranked fourth highest globally in overall heat-related deaths, with more than 5,500 in 2017.

Published today in the international medical journal *BMJ Injury Prevention*, the study is part of the annual Global Burden of Disease (GBD). It is the first of its kind to quantify the totality of injuries resulting from fire, heat, and hot substances, not just burns. Other injuries analyzed by IHME researchers include amputations, open wounds, muscle and tendon injuries, and fractures.

The analysis provides comparable estimates of mortality and morbidity

across 195 countries and territories. Examples of incidents classified as "fire, heat, and hot substances" include:

- fires;
- explosive or inflammable material accidents;
- ignited clothing;
- smoke exposure;
- contact with caustic or corrosive material; steam or other hot vapors; hot drinks, food, fats, or cooking oils; stoves, ovens, and other household appliances; heaters, radiators, or other hot pipes; hot engines and metals, etc.

It should be noted that for the purposes of this analysis "fire, heat, and hot substance" does not include injuries directly due to heat waves, climate change, interpersonal violence (e.g., acid attack), or self-immolation.

In an encouraging global trend, IHME researchers saw an overall decrease in heat-related injury burden between 1990 and 2017. For example, the global death and disability rates dropped by 47% and 24%, respectively, likely due to safety improvements, fire danger awareness, and increased access to quality health care.

Yet heat-related injuries continue to present the greatest burden in low- and [middle-income countries](#). Lower-income areas are both more susceptible to fire, heat, and hot substances as a cause of injury, and also experience higher death rates. Despite some of the largest decreases in the age-adjusted rate of new cases since 1990, Laos, Indonesia, and Malaysia remain among the top countries with the highest risk of death given a heat-related injury in 2017.

Eight countries, seven of which are low- or middle-income, accounted for half of all heat-related deaths in 2017. They include India (27,027

deaths), China (10,836), Russia (7,063), United States (5,505), Nigeria (4,085), Pakistan (2,603), Democratic Republic of the Congo (2,093), and Ethiopia (2,013).

"It is imperative that health policymakers study these patterns to help inform safety efforts, prevention programs, and resource planning," said James. "But more research is still needed on smoking, types of cooking fuel, smoke alarm efficacy, synthetic clothing, and other factors leading to these injuries."

Additional findings include:

- Worldwide, there were 8,991,468 new injuries from fire, heat, and hot substances in 2017, of which 120,632 resulted in death.
- Children under 5 adults 60 and older have the highest mortality rate from fire, heat, and hot substances, but the highest rate of [injury](#) is between ages 5 and 30.
- The leading cause of disability for victims of [fire](#), heat, and hot substances was—by far—burns affecting less than 20% of the body.
 - A relatively small proportion of all disability can be attributed to burns affecting more than 20% of the body.

PERCENTAGE CHANGE IN INCIDENCE RATES (AGE-STANDARDIZED), 1990 to 2017

Greatest increase

1. Bermuda: 49.8%
2. Kiribati: 49.5%
3. Palestine: 46.5%
4. China: 46.0%

5. Turkey: 38.0%
6. Oman: 35.5%
7. Bahrain: 33.4%
8. Puerto Rico: 33.3%
9. Vietnam: 33.1%
10. Jamaica: 31.8%

Greatest decrease

1. Mauritius: -55.3%
2. Maldives: -50.9%
3. Greenland: -48.6%
4. Laos: -46.3%
5. Indonesia: -44.8%
6. United States: -40.4%
7. Timor-Leste: -38.9%
8. Cambodia: -36.6%
9. Brazil: -34.2%
10. Estonia: -33.7%

DEATH RATES (ALL AGES), 195 COUNTRIES AND TERRITORIES, 2017

Highest death rates

1. Belarus: 6.6 deaths per 100,000 people
2. Latvia: 6.2
3. Lesotho: 5.6
4. Russian Federation: 4.8
5. Georgia: 4.8
6. Ukraine: 4.3
7. Estonia: 4.3

8. South Sudan: 4.3
9. Swaziland: 4.3
10. Greenland: 4.2

Lowest death rates

1. Singapore: 0.23 deaths per 100,000 people
2. Bermuda: 0.37
3. Oman: 0.40
4. Nicaragua: 0.43
5. Colombia: 0.43
6. Switzerland: 0.48
7. Honduras: 0.48
8. São Tomé and Príncipe: 0.49
9. New Zealand: 0.51
10. Turkey: 0.52

DEATH RATES (ALL AGES), US STATES, 2017

Highest death rates

1. Alabama: 3.7 deaths per 100,000 people
2. Mississippi: 3.5
3. South Carolina: 3.2
4. Kentucky: 3.1
5. Arkansas: 2.9
6. Tennessee: 2.9
7. West Virginia: 2.8
8. Louisiana: 2.7
9. Maine: 2.7
10. Oklahoma: 2.6

Lowest death rates

1. California: 0.7 deaths per 100,000 people
2. Hawaii: 1.0
3. Arizona: 1.0
4. Nevada: 1.1
5. Florida: 1.1
6. Colorado: 1.1
7. Utah: 1.1
8. Washington: 1.2
9. Wisconsin: 1.2
10. Idaho: 1.3

RISK OF DEATH GIVEN A HEAT-RELATED INJURY, 2017

Highest risk of death given a fire, heat, and hot substance injury

1. Seychelles: 6.5% of heat-related injuries resulted in death
2. Laos: 5.8%
3. Mauritius: 5.0%
4. Sri Lanka: 5.0%
5. Cambodia: 4.8%
6. Timor-Leste: 4.4%
7. Philippines: 4.1%
8. Indonesia: 4.0%
9. Malaysia: 3.6%
10. Thailand: 3.5%

Lowest risk of death given a fire, heat, and hot

substance injury

1. Singapore: 0.1% of heat-related injuries resulted in death
2. New Zealand: 0.2%
3. Oman: 0.2%
4. Palestine: 0.3%
5. Slovenia: 0.3%
6. Turkey: 0.3%
7. Bermuda: 0.3%
8. Albania: 0.3%
9. Macedonia: 0.4%
10. Australia: 0.4%

More information: Spencer L James et al, Epidemiology of injuries from fire, heat and hot substances: global, regional and national morbidity and mortality estimates from the Global Burden of Disease 2017 study, *Injury Prevention* (2019). [DOI: 10.1136/injuryprev-2019-043299](https://doi.org/10.1136/injuryprev-2019-043299)

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