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HEADLINE: Most Deadly of the Natural Disasters: The Heat Wave

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BODY:
Natural disasters usually come rife with drama. Hurricanes, tornadoes, forest fires, earthquakes-- all make for good headlines and even better visuals.

But it would be hard to make a blockbuster movie about a heat wave. Heat waves come on subtly, raising summer temperatures just a little higher than normal and then receding. But they kill more peopl in the United States than all other natural disasters combined.

The numbers are striking. According to the Center for Climatic Research at the University of Delaware, an average of 1,500 American city dwellers die each year because of the heat. Annual deaths from tornadoes, earthquakes and floods together total fewer than 200.

The most deadly heat wave in recent years occurred in Chicago over a week in July 1995, when temperatures hovered around 100 degrees. Then, over 50,000 people were left without electricity, nearly two dozen hospitals closed their doors to new patients, ambulances lined up around the block waiting to drop off victims, and the county buried 68 people in a 160-foot-long trench. Though there was some argument over numbers, scientists now say that 739 people died that week.

For context, the great Chicago fire of 1871 killed half that many. The San Francisco earthquake of 1989 killed 62, and Hurricane Andrew in 1992 killed 26.

But even many of those who suffered through the 1995 heat wave failed to recognize its deadliness.

"When I interviewed Chicago residents, they usually remembered a death toll of about 100, and generall questioned whether the medical examiner had fabricated the figures or if the media had turned a nonevent into headline news," said Dr. Eric Klinenberg, a sociologist at New York University and the author of "Heat Wave: A Social Autopsy of Disaster in Chicago."

People find it hard to consider heat as a disaster for several reasons, Dr. Klinenberg says. First, heat waves cause little visible destruction. "If a tornado touches down, the moment it hits, you can assess the damage," he said. With heat, at worst, roads buckle, trains derail and livestock die.

Then there is the type of people heat waves kill. "When there's a hurricane coming and there's valuable coastal property at risk, the whole world goes to watch," Dr. Klinenberg said. But in Chicago, as in other heat waves, the victims were "the poor, the old, residents of abandoned and violent neighborhoods who lived alone, lacked access to transportation and lacked air-conditioning," he said. "We're talking about people who are already out of sight."

It is not easy to assess the number of deaths in a heat wave. In 1995, Chicago officials questioned whether the medical examiner's count of 525 was exaggerated; epidemiologists now say it was low.

"As a mathematician I did know whatever the medical examiner said would be undercounting it," said Dr. Steven Whitman, who was director of epidemiology for Chicago's Department of Public Health then For each heat-related death, he said, the medical examiner must confirm one of three factors: a body temperature of 105 degrees or more, a high environmental temperature at the death scene, or decomposition in a body seen alive just before the heat wave.

But since autopsies are not performed on all bodies, not all heat-related deaths are recorded. In addition, fatal strokes and heart attacks attended by physicians are generally not counted as heat-related deaths, even if they probably would not have occurred without the heat.

For a more accurate picture, Dr. Whitman compared the number of deaths that month, around 3,000, with the expected number in an average month, 2,200, attributing the difference, or "excess deaths," to the heat.

Other deadly heat waves in the United States occurred in New York City in 1972, when 891 died; in Los Angeles in 1955, when 946 died; and across the Midwest in 1980, when hundreds were killed.

Perhaps surprisingly, cities that suffer most in heat waves are not those in the hottest zones.

"A heat wave is a very relative factor," said Dr. Laurence S. Kalkstein, a climatologist at the University of Delaware Center for Climatic Research. "What makes a heat wave in Duluth is not what makes a heat wave in Dallas. We respond to the normal weather conditions of wherever we live."

A heat wave, as he defines it, is a variation from normal. Areas with irregular but intense variability, like New York or Chicago, where the temperature can vary by 20 degrees or more in a few days, fare worse than places like Phoenix or Miami, where the weather is warmer but more constant.

"In New York we once calculated a threshold of 93 degrees for a few days, whereas in Phoenix it might be 112," Dr. Kalkstein said.

Other factors also come into play. Cities bake more intensely under sunny skies than under clouds. Humidity reduces the body's ability to perspire and cool down. Strong winds are more dangerous than still weather because they dry people out.

Cities' structures also affect death rates. "In Philly, which has more row houses than any other city, you've got black tar roofs, brick facades and windows on only two sides," Dr. Kalkstein said. "In Baton Rouge, even the poorest of the poor have what they call shotgun shacks, which have aluminum roofs and windows on four sides," allowing more ventilation.

It does not take a lot of extra heat to kill the vulnerable. "The body works in a very small temperature

range," said Dr. Lawrence Robinson, deputy health commissioner of Philadelphia. "The body circulates blood to the skin and perspiration removes heat from the skin. In extreme heat, the heart has to pump faster and harder," leading to heart attacks or strokes. Even a healthy person who overexerts in the heat can die of heat stroke.

Amid fears that global warming will usher in longer and more deadly heat waves, Dr. Kalkstein said weather variability was still more important. If variability in the United States increases or even stays constant, he added, heat deaths could increase from 1,500 to 3,900 by 2050.

Just as high temperatures alone do not make a deadly heat wave, poverty alone does not make a heat wave deadly.

In Chicago in 1995, a disproportionate number of victims were men living by themselves in single room Nor did all poor communities suffer equally. One poor area with high rates of violence and abandoned buildings had a death rate 10 times as high as that of a similarly poor adjacent area with the same percentage of elderly, solitary residents but a more active street life.

"The areas of the city that had high concentrations of deaths are areas that had lost the viable public spaces, the busy sidewalks, the commercial streets," Dr. Klinenberg said. "Those are the things that draw people out of their home and into social contact."

Dr. Klinenberg sees the high death rate as a symptom of a problem that already exists in American cities even when there is no heat wave.

"Heat waves are like urban particle accelerators," he said. "They speed up and make visible conditions that are always there but are difficult to perceive. Living and dying alone is one of those conditions. When hundreds of people die alone and at home behind locked doors and sealed windows out of touch with their families and community support, it's a sign of sweeping social breakdown."

In the past decade, some cities have mitigated the deadliness of heat waves with response systems that include news media warnings, lists of elderly residents who live alone, heat command centers, water trucks and door-to-door checkups of people at risk.

Unlike some natural disasters, heat waves usually allow for some preparation time. "Information about an oncoming heat wave is available as much as three days in advance, and they take two days to start killing," said Dr. Robinson of Philadelphia.

Heat-related death rates there have been down since a warning system was introduced seven years ago by the Center for Climatic Research.

Chicago, which took criticism for its response to the 1995 heat wave, has also improved its systems, to the point where a 1999 heat wave comparable in intensity to the one of 1995 killed only 110 people.

Still, said Dr. Klinenberg, the heat disasters have not gone away.

"If that was an airplane crash, people would still be talking about it today," he said of the 1999 heat wave. "Now, if you ask people, they don't even remember it."

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GRAPHIC: Photos: Workers from the Cook County morgue buried some victims of the Chicago heat wave of 1995 in a common grave. In a week, 739 people died from the heat. (Reuters); A New Yorker tried to generate a breeze as the thermometer in Columbus Circle held steady at 100 degrees on July 14, 1954. The definition of "heat wave" varies by region. (The New York Times)

Chart: "Urban Heat Deaths"
Chicago experienced a devastating heat wave in 1995, but others took an even greater toll.

CITY AND DURATION OF HEAT WAVE: Chicago/7 days, 1995
HEAT-RELATED DEATHS: 739
INCREASE IN DEATHS OVER NORM: 147%

CITY AND DURATION OF HEAT WAVE: New York/7 days, 1972
HEAT-RELATED DEATHS: 891
INCREASE IN DEATHS OVER NORM: 62

CITY AND DURATION OF HEAT WAVE: Los Angeles/9 days, 1955
HEAT-RELATED DEATHS: 946
INCREASE IN DEATHS OVER NORM: 122

CITY AND DURATION OF HEAT WAVE: Kansas City/1 month, 1980
HEAT-RELATED DEATHS: 236
INCREASE IN DEATHS OVER NORM: 65

CITY AND DURATION OF HEAT WAVE: St. Louis/1 month, 1980
HEAT-RELATED DEATHS: 308
INCREASE IN DEATHS OVER NORM: 57

(Source: American Journal of Public Health)

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