



Heat-related Deaths in New York City, 2013

Extreme heat events kill more people, on average, than any other type of extreme weather event in both New York City (NYC) and the United States overall.¹ Vulnerable individuals, such as older adults and those with underlying chronic physical health conditions or with serious mental or cognitive disorders, have the highest risk of dying from an extreme heat event.

Deaths from extreme heat are defined as those resulting from a high body temperature or in which heat exposure is recognized as a contributing cause (“heat-related deaths”) on death certificates. This definition does not include deaths from natural causes above the number expected for the time of year (“excess mortality”), which are estimated statistically (see box on page three). From 2000 to 2012, 162 heat-related deaths occurred in New York City, including 70 (43%) that were reported during two extreme heat events in 2006 and 2011.

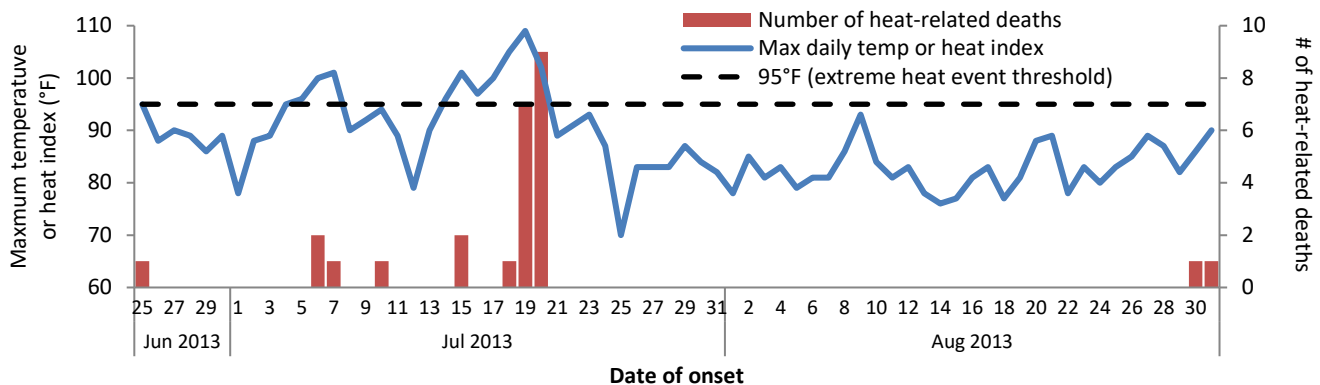
This report describes characteristics and circumstances of heat-related deaths in New York City during the 2013 summer season based on a review of death certificates and medical examiner investigation reports. An extreme heat event that occurred July 14 to 20, 2013, was among the three most severe in New York City since 2000, with heat indices reaching at least 95°F for seven consecutive days and peaking at 109°F.

Extreme Heat Event

The National Weather Service (NWS) issues heat advisories. In New York City advisories are issued when the forecast calls for two or more consecutive days when the heat index, which incorporates both air temperature and relative humidity, will reach at least 95°F (35°C) or at least one day when the heat index reaches 100°F (37.8°C). For this report, extreme heat event dates were defined as dates meeting these conditions based on the highest observed hourly weather among LaGuardia Airport, JFK Airport, or Central Park NWS monitoring stations.

Most heat-related deaths in 2013 were associated with a single extreme heat event

2013 New York City heat-related deaths and maximum temperature or heat index



Date of illness onset was missing for two deaths, represented here based on date of death (July 20, 2014).

Sources: Preliminary NYC DOHMH Vital Records 2013 as of June 2014, National Weather Service

- Nineteen of the 26 (73%) heat-related deaths identified by DOHMH surveillance during the 2013 warm season were associated with the July 14 to 20 extreme heat event.
- The maximum temperature (99°F) and maximum heat index (109°F) were recorded on July 19, 2013. For 12 of the heat-related deaths, the date of illness onset was July 19 or 20; two additional deaths on July 20 did not have a recorded date of illness onset.
- Three heat-related deaths were associated with a July 4 to 7 extreme heat event.
- Three heat-related deaths were associated with illegal methylamphetamine (MDMA) use at two outdoor concerts; two deaths in late August and one during the July 14 to 20 extreme heat event.

Nearly all heat-related deaths occurred among adults with at least one pre-existing health risk factor

There were 24 heat-related deaths among adults ages 18 and older, and two deaths among children in summer 2013. Among the adult heat-related deaths:

- More than half (58%) had a cardiovascular condition.
- More than one third (38%) were reported to have evidence of alcohol or drug abuse at the time of illness onset or had a history of chronic substance abuse.
- More than one quarter (29%) had a history of diabetes.
- One fifth (21%) had a serious mental health or cognitive disorder (e.g., developmental disabilities, schizophrenia).
- The proportion of decedents who were obese (Body Mass Index (BMI) \geq 30, 24%) was similar to the prevalence among all NYC adults.
- The heat-related death rate was greater among older adults than among those younger than 65 years (7.7 vs. 2.3 per million population).

Number and percentage of heat-related deaths among adults ages 18 and older in New York City (n=24) by selected risk factors, 2013

Characteristic	n	%
Ages 65 years and older	8	33%
Specific conditions		
Cardiovascular disease	14	58%
Obese (BMI = 30 or higher)	6	25%
Diabetes	7	29%
Drug or alcohol abuse	9	38%
Cognitive or mental health condition	5	21%
Respiratory conditions	1	4%

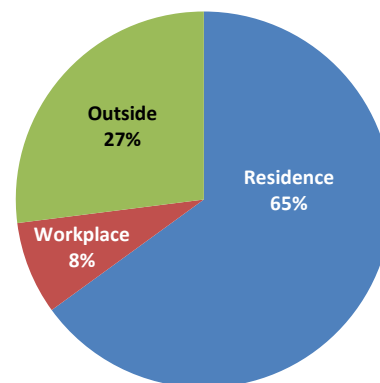
Source: 2013 NYC DOHMH Vital Records data and OCME case investigation records

- Nearly one third of adult heat-related deaths in 2013 (33%) were among those ages 65 or older.
- Of the deaths among adults ages 18 to 64 years, 15 in 16 (94%) had at least one health risk factor.

The majority had onset of illness at home

- Nearly two thirds (65% or 17 deaths) of all heat-related deaths in 2013 had an onset of illness in the decedent's home.
- Among those exposed at home for whom information about home air conditioning was available (nine), eight did not have a working air conditioner or the air conditioner was not running when the death scene was investigated.
- At least six of the decedents exposed at home were using fans at the time of death.
- Of those who died or were exposed at home, ten (59%) did not live alone.

Percent of heat-related deaths by place of exposure, New York City, 2013



Source: 2013 OCME case investigation records

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- Visit EpiQuery – the Health Department's online, interactive health data system at nyc.gov/health/EpiQuery

Data & Statistics at nyc.gov/health/data

The risk of deaths from natural causes can increase during extreme heat events

Deaths from extreme heat also include “excess deaths,” which can result from exacerbation of chronic health conditions by hot weather. Excess deaths are estimated as the number of deaths due to natural causes above the number expected for the time of year. Statistical models are used to compare average death rates associated with extreme heat events to the expected death rates based on usual seasonal trends. For the years 1997 to 2013, the Health Department estimated an annual average of 94 excess deaths from natural causes associated with extreme heat events, including the three days following each heat event to allow for delayed effects of heat. Annual estimates of excess heat-related deaths vary with the weather and are not precise because of random variation in daily death rates. For 2013, a preliminary Health Department estimate of 140 excess deaths from extreme heat events was not statistically different from the 1997-2013 average. Unlike the heat-related deaths described in this report, which can be individually identified and investigated, the individual circumstances of death cannot be investigated for excess natural cause deaths. However, estimating excess deaths more accurately demonstrates the true burden of heat mortality. For example, in 2013 the 22 heat-related deaths associated with extreme heat events accounted for just 14% of the total mortality burden of extreme heat. *Source: Abstract: Matte T, Lane K, Ito K. Excess non-external cause deaths attributable to heat waves in New York City, 1997-2013. International Society for Environmental Epidemiology Annual Conference, 2014. Accepted.*

Data sources

NYC DOHMH Vital Records: NYC Annual Summary of Vital Statistics, 2000-2012. Heat-related deaths were identified through a review of death certificates to identify those with assigned *International Classification of Diseases, 10th Revisions* (ICD-10) codes X30 “exposure to excessive natural heat” or T67 “heatstroke and sunstroke” as primary or secondary causes of death from May – September. Records with a man-made cause of heat exposure (W92) were excluded. For 2000-2012, final vital records were reviewed; for 2013, preliminary data as of June 2014 were reviewed and counts represent preliminary estimates.

Office of Chief Medical Examiner (OCME) Case Investigation Records: Electronic records for all heat stroke deaths were reviewed to obtain information about the characteristics and circumstances of heat-related deaths, including medical conditions, body mass index (BMI – based on post-mortem height and weight measurements), and information about air conditioning for those exposed at home. Chronic health conditions noted in either the death certificate or OCME records were captured, as well.

Community Health Survey (CHS): Data on BMI prevalence among all NYC adults were obtained from NYC Dept. of Health and Mental Hygiene. EpiQuery: NYC Interactive Health Data System – CHS 2012. Viewed 6/25/14. nyc.gov/health/epiquery

DOHMH Population Estimates: Rates were calculated using NYC Dept. of Health and Mental Hygiene population estimates, modified from U.S. Census Bureau intercensal population estimates from 2000-2012 and last updated July 22, 2013.

Reference

¹Office of Climate, Water, and Weather Services. Weather fatalities, 2013. Silver Spring, MD: US Dept of Commerce, National Weather Service; 2014. Available at nws.noaa.gov/om/hazstats.shtml



Epi Data Tables

New York City Department of Health and Mental Hygiene

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Data Tables

Table 1. Percent of New York City heat-related deaths by characteristic, 2013

Table 2. Percent of New York City heat-related deaths with underlying chronic health conditions, 2013

Table 3. Percent and rate of New York City heat-related deaths by demographic characteristics, 2000-2012 and 2013

Data Sources

NYC DOHMH Vital Records: NYC Annual Summary of Vital Statistics, 2000-2012. Heat-related deaths were identified through a review of death certificates to identify those with assigned International Classification of Diseases, 10th Revisions (ICD-10) codes X30 “exposure to excessive natural heat” or T67 “heatstroke and sunstroke” as primary or secondary causes of death from May – September 2013 as of June 2014. Records with a man-made cause of heat exposure (W92) were excluded.

Office of Chief Medical Examiner (OCME) Case Investigation Records: Electronic records for all heat stroke deaths were reviewed to obtain information about the characteristics and circumstances of heat-related deaths, including medical conditions, body mass index (BMI – based on post-mortem height and weight measurements), and information about air conditioning for those exposed at home. Chronic health conditions noted in either the death certificate or OCME records were captured, as well.

DOHMH Population Estimates: Rates were calculated using NYC Dept. of Health and Mental Hygiene population estimates, modified from U.S. Census Bureau intercensal population estimates from 2000-2012 and last updated July 22, 2013.

Table 1. Percent of New York City heat-related deaths by characteristic, 2013

Source: NYC Office of Vital Statistics Data, 2013

Characteristic	N	Percent
Socio-demographics		
Age		
0-14	2	8
15-34	4	15
35-64	12	46
65+	8	31
Sex		
Female	9	35
Male	17	65
Race/Ethnicity		
Non-Hispanic white	9	35
Non-Hispanic Black	9	35
Hispanic	5	19
Non-Hispanic Asian	2	8
Other/Missing	1	4
Borough of Residence		
Bronx	2	8
Brooklyn	9	35
Manhattan	4	15
Queens	4	15
Staten Island	3	12
Unknown	4	15
Place of Illness Onset		
Inside Not At Own Residence	2	8
Outside	7	27
Residence	17	65
Days Between Onset and Death		
0	16	62
1	7	27
23	1	4
Unknown	2	8
Place of Death		
In Emergency Department/ Outpatient Facility	9	35
In Hospital	6	23
Residence	9	35
Unknown	1	4
Selected Housing Characteristics for those with illness onset in residence (n=17)		
Fan		
Present and On	6	35
Present, Not On	1	6
Not Present/Unknown	10	59
Air Conditioner		
Not Present	7	41
Present and On	1	6
Present, Not On	1	6
Unknown	8	47

Table 2. Percent of New York City heat-related deaths with underlying chronic health conditions, 2013*Source: NYC Office of Vital Statistics Data, 2013; OCME medical review*

Characteristic	N	Percent
Age	26	100
< 65 years	18	69
65 years and older	8	31
Any chronic condition*		
Cardiovascular	14	58
Obese (BMI = 30 or higher)	6	25
Diabetes	7	29
Substance use, including alcohol (history or at time of illness onset)	9	38
Cognitive or mental health conditions	5	21
Respiratory conditions	1	4

*Among adults ages 18+ (n=24)

Table 3. Percent and rate of New York City heat-related deaths by demographic characteristics, 2000-2012 and 2013

Source: NYC Office of Vital Statistics Data, 2000-2013; NYC DOHMH Population Estimates 2000-2012

Characteristic	2000-2012 (N=162) [†]			2013 (N=26)		
	N	Percent	Average annual rate per million*	N	Percent	Average annual rate per million*
Female age group (years)						
0-14	1	0.6	0.1	1	3.8	1.4
15-34	5	3.1	0.3	1	3.8	0.8
35-64	22	13.6	1.0	4	15.4	2.4
65+	40	24.7	5.2	3	11.5	4.8
Male age group (years)						
0-14	3	1.9	0.3	1	3.8	1.3
15-34	9	5.6	0.6	3	11.5	2.4
35-64	56	34.6	2.9	8	30.8	5.3
65+	26	16.0	5.2	5	19.2	11.9
Neighborhood Poverty Level**						
Low (<10%)	27	16.7	1.2	2	7.7	1.2
Medium (10 to <20%)	53	32.7	1.4	11	42.3	3.7
High (20 to <30%)	38	23.5	1.5	4	15.4	2.0
Very High (30%+)	37	22.8	1.8	4	15.4	2.6
Unknown	7	4.3	N/A	5	19.2	N/A
Race/Ethnicity						
Non-Hispanic white	59	36.4	1.6	9	34.6	2.9
Non-Hispanic Black	80	49.4	3.2	9	34.6	4.7
Hispanic	16	9.9	0.5	5	19.2	2.1
Non-Hispanic Asian	4	2.5	0.3	2	7.7	1.8
Other/Missing	3	1.9	N/A	1	3.8	N/A

*2000-2012 average annual rates calculated using 2000-2012 population estimates produced by the NYC DOHMH; 2013 rates based on 2012 population estimates. Rates are not age-adjusted.

**Neighborhood poverty is based on ZIP code and is defined as the percent of residents in each ZIP code area with incomes below 100% of the Federal Poverty Level per American Community Survey 2007-2011. Rates based on 2010 census data.

[†]Includes deaths occurring between May and September defined as those with International Classification of Diseases, 10th Revisions (ICD-10) codes X30 "exposure to excessive natural heat" or T67 "heatstroke and sunstroke" listed as primary or secondary causes of death among NYC residents are those with unknown residence who died in NYC. Records with a man-made cause of heat exposure (W92) were excluded. The 2013 deaths include three non-NYC residents who died in NYC.