

## DATA POINTS

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# Climatological Trends in Utah

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**June 2019**

INFORMED DECISIONS™

KEM C. GARDNER POLICY INSTITUTE

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DISCUSSIONS

*and leads to*

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# Background

In the 2018 General Session the Utah Legislature passed House Concurrent Resolution 7, which among other items prioritized the state’s “understanding and use of sound science to address causes of a changing climate.” The resolution also seeks to find positive solutions.

The Kem C. Gardner Policy sheds light on important issues impacting Utah and the nation. We present in this *Data Points* booklet climatological trends, extreme weather events, air quality indicators, and health information related to a changing climate.

We share these trends to aid policymakers and the public with informed decisions.

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H.C.R. 7

**CONCURRENT RESOLUTION ON ENVIRONMENTAL AND  
ECONOMIC STEWARDSHIP**  
2018 GENERAL SESSION  
STATE OF UTAH

**Chief Sponsor: Rebecca P. Edwards**

Senate Sponsor: Todd Weiler

*Be it resolved by the Legislature of the state of Utah, the Governor concurring therein:*

WHEREAS, Utah has a tradition of supporting good stewardship of our land, air, and water;

WHEREAS, Utah is a leader in technological innovation, ingenuity in problem-solving, and working together to create solutions;

WHEREAS, preservation of Utah’s economic longevity and role as a leader in fiscal responsibility depends on prudent management of natural resources;

WHEREAS, protection, conservation, and reasonable management of the natural environment are essential principles of responsible stewardship;

WHEREAS, Utah recognizes the inherent worth of our natural resources, in addition to their economic value, in their contribution to our identity and their role in inspiring creativity, strengthening families, and providing for future generations;

WHEREAS, the Department of Health has issued a report outlining the increased risk of extreme weather events, including wildfires, water scarcity, and flooding;

WHEREAS, the impacts of a changing climate may affect Utah citizens and impair productivity in key economic areas;

WHEREAS, any efforts to mitigate the risks of, prepare for, or otherwise address our changing climate and its effects should not constrain the economy nor its global competitiveness; and

WHEREAS, Utah recognizes that stewardship includes fostering and maintaining resilient ecosystems that have the capacity to adapt to our changing environment:

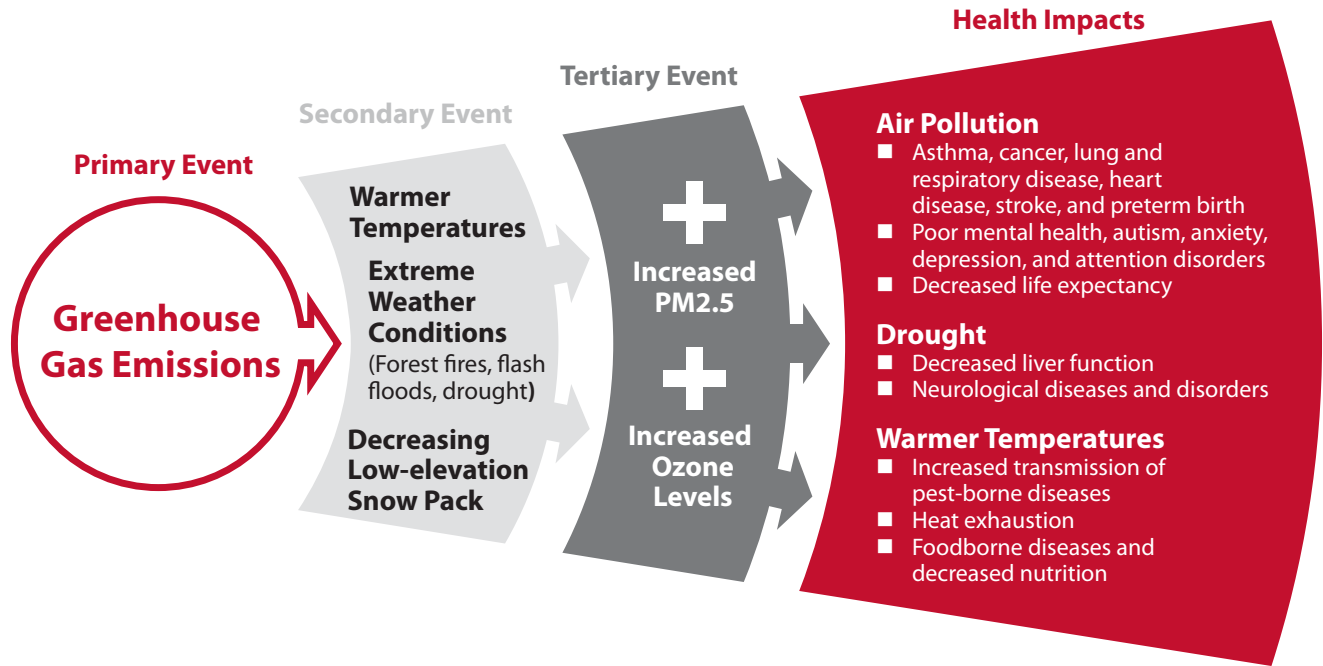
NOW, THEREFORE BE IT RESOLVED that the Legislature of the state of Utah, the Governor concurring therein, commits to working constructively, using our heritage of technological ingenuity, innovation, and leadership to create and support economically viable and broadly supported private and public solutions, including in rural communities.

BE IT FURTHER RESOLVED that we should prioritize our understanding and use of sound science to address causes of a changing climate and support innovation and environmental stewardship in order to realize positive solutions.

BE IT FURTHER RESOLVED that the Legislature and the Governor encourage individuals, corporations, and state agencies to reduce emissions through incentives and support of the growth in technologies and services that will enlarge our economy in a way that is both energy efficient and cost effective.

BE IT FURTHER RESOLVED that a copy of this resolution be sent to the members of Utah’s congressional delegation.

# Climatological Trends in Utah

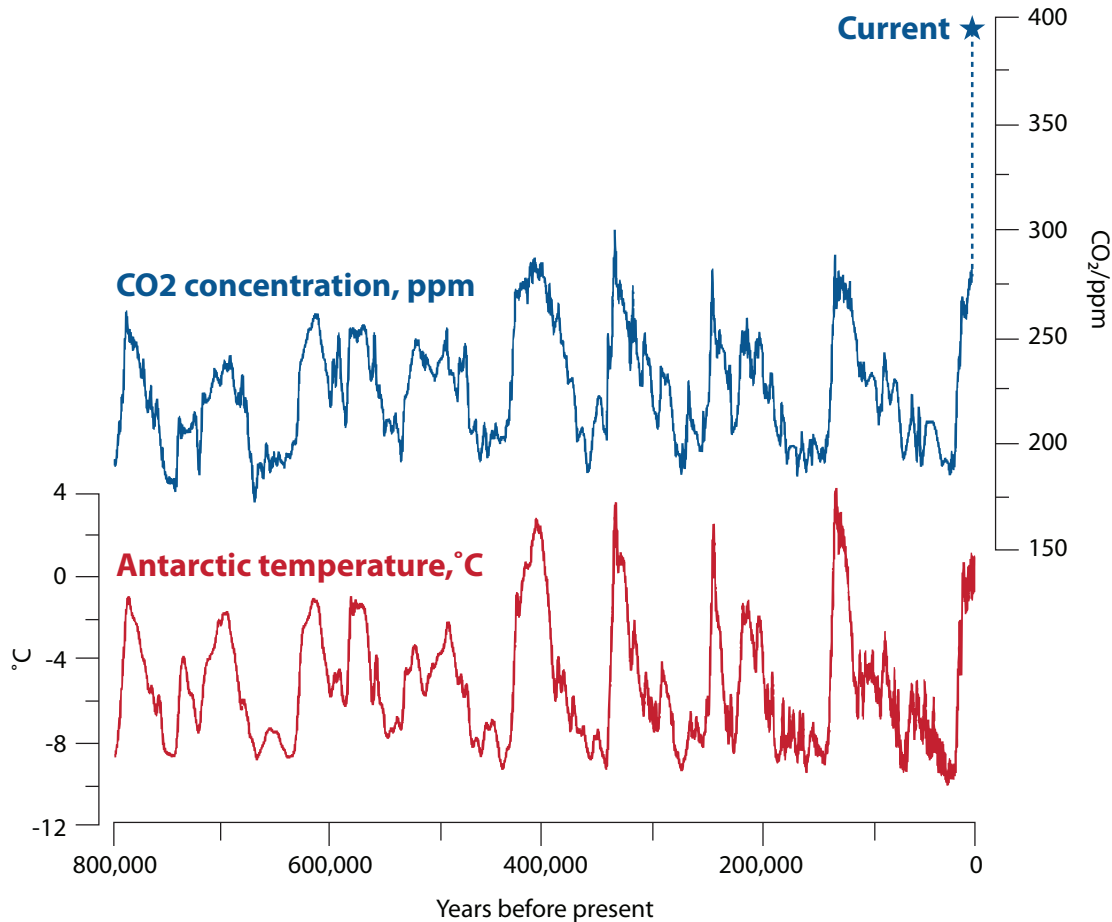


*“It is extremely likely that human activities... are the dominant cause of the observed warming since the mid-20th century. For the warming over the last century, there is no convincing alternative explanation supported by the extent of the observational evidence.”*

U.S Global Change Research Program. Fourth National Climate Assessment

# Historical Cycles

## Cycles of temperature and carbon dioxide

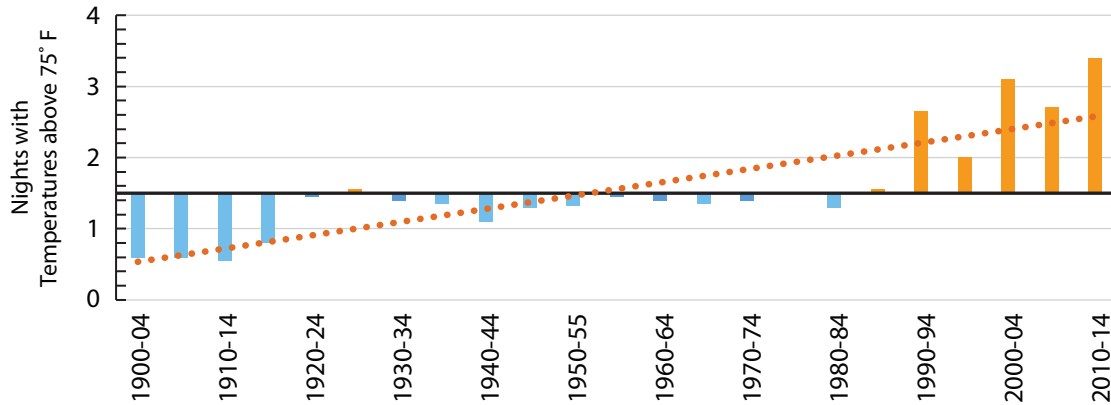


Over the last 800,000 years, the earth's climate has alternated between ice ages and warm periods. During this cycle, temperatures at the South Pole have risen and fallen by about 10 degrees Centigrade during a cycle. The figure above highlights a recent spike in carbon dioxide levels from 275 ppm to 400 ppm.

Source: United States National Academies of Sciences, Climate Change: Evidence and Cause

# Temperatures

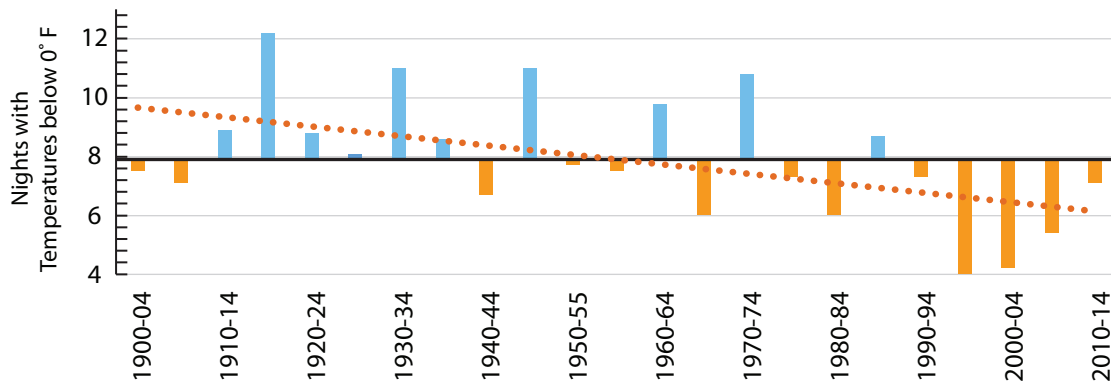
## Observed number of very warm nights in Utah



Typically Utah has not experienced warm nights due to its semi-arid climate and high average elevation.

Source: National Centers for Environmental Information and Cooperative Institute for Climate and Satellites

## Observed number of very cold nights in Utah

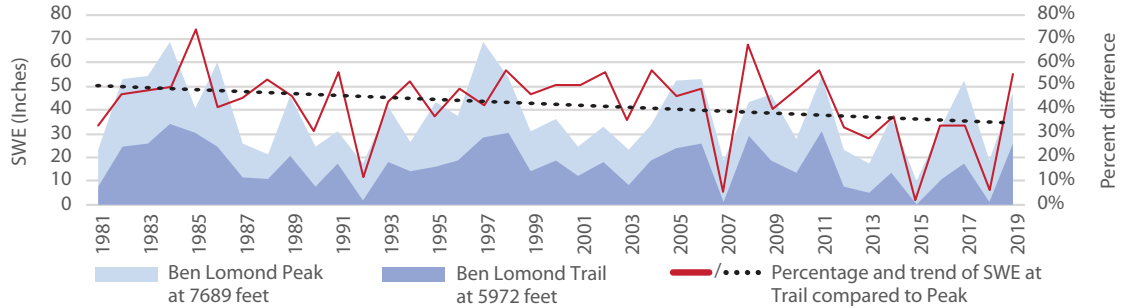


Over the last twenty-five years, the number of nights with temperatures below 0° F has decreased.

Source: National Centers for Environmental Information and Cooperative Institute for Climate and Satellites

# Snow Pack

## April 1 Snow Water Equivalent (SWE) at Ben Lomond Peak and Ben Lomond Trail

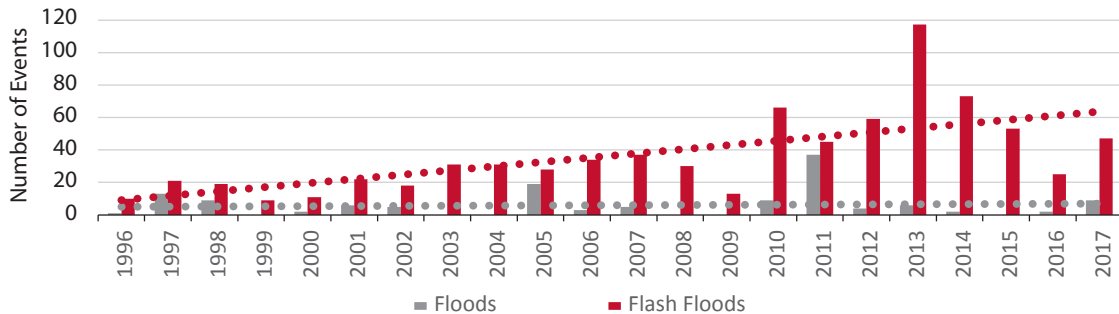


Warming temperatures have spurred more snowpack melting at lower elevations relative to snowpacks at higher elevations on the same mountain. Ben Lomond Trail snowpacks levels have declined over the four decades relative to snowpacks at higher elevations at Ben Lomond Peak.

Source: Natural Resources Conservation Service, National Water & Climate Center, Snow Telemetry (SNOTEL)

# Weather Events

## Increased Frequency of Utah Flash Floods

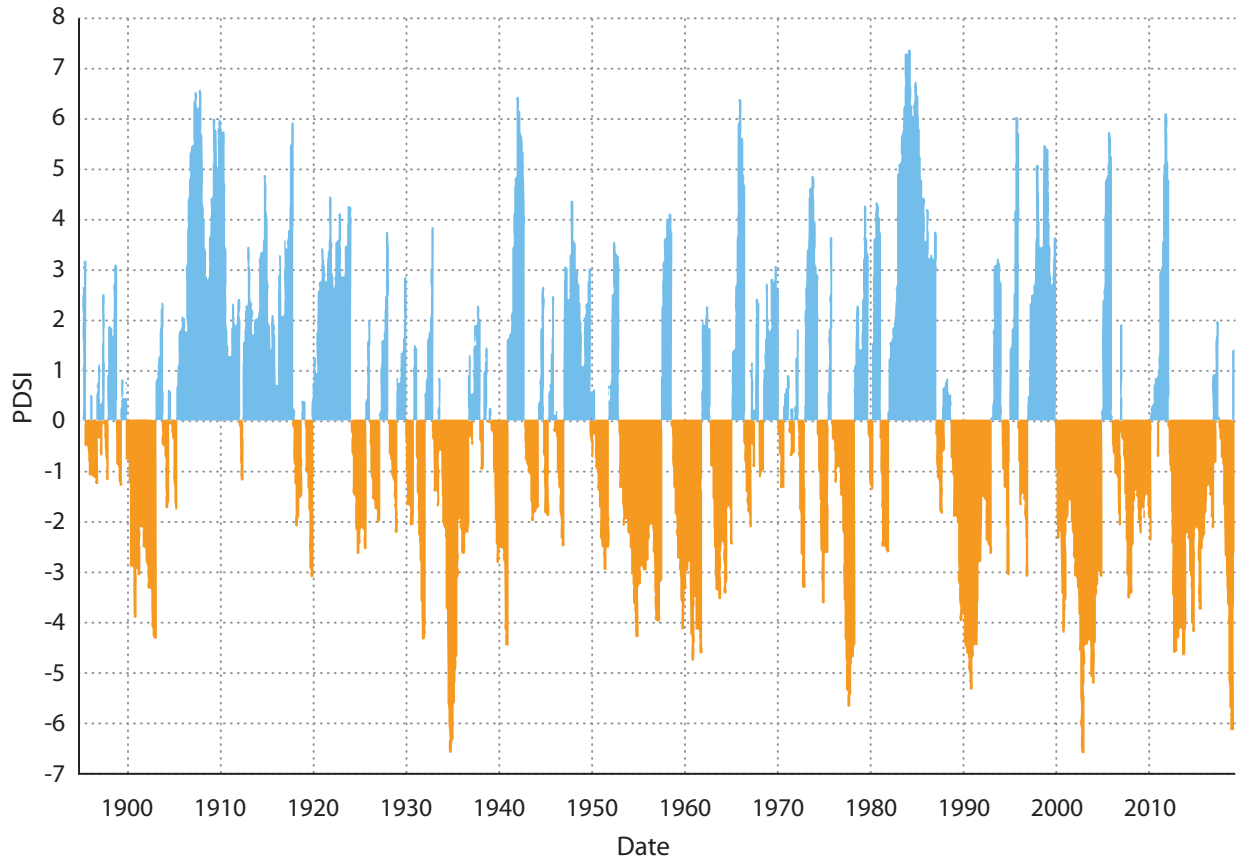


A flash flood is defined as a rapid and extreme flow of high water into a normally dry area beginning within six hours of a causative event, usually a thundershower. A warmer atmosphere holds more moisture—about 7 percent more per 1.8°F (1°C) of warming. Storms that arise in increased atmospheric moisture conditions produce heavier rainfall, creating extreme weather events.

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center

## Weather Events (*continued*)

### Palmer Drought Severity Index in Utah, 1895-2019



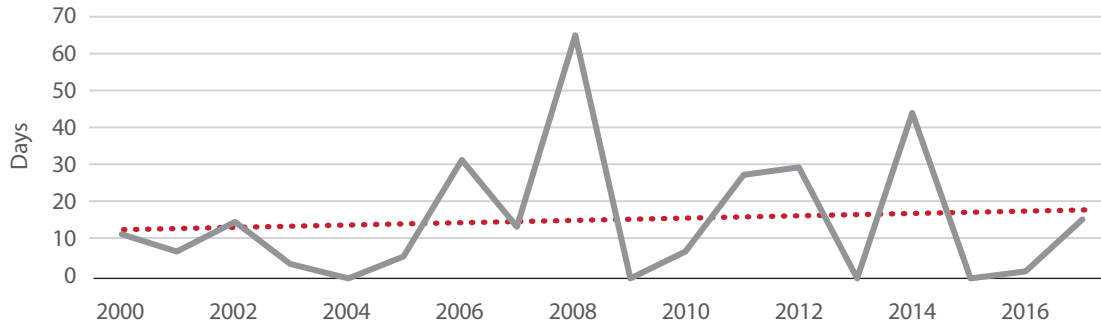
The Palmer Drought Severity Index (PDSI) indicates moisture deficiency (values below zero) or abundance (values above zero). Water supply comprises precipitation to recharge soil moisture, groundwater, lakes, and reservoirs. Water demand includes evapotranspiration and water needed to recharge soil moisture and keep lakes, reservoirs, and stream flow at normal levels. Utah's last three decades have been marked by prolonged periods of water deficits.

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center



# Air Quality

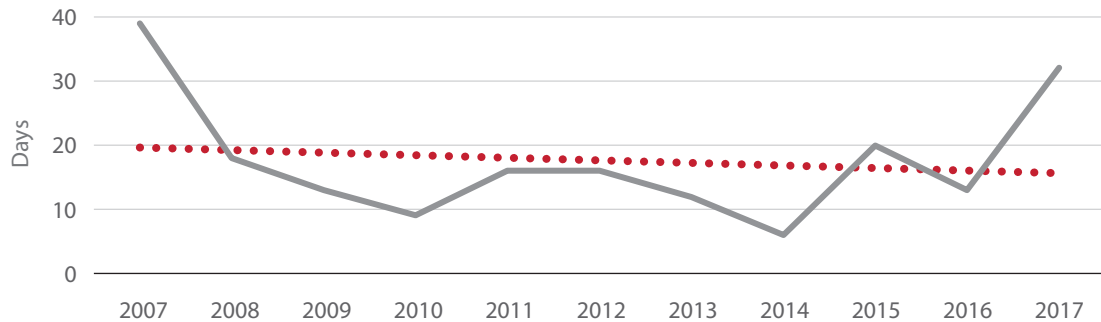
## Smoke Days in Salt Lake and Tooele Counties



Particulate pollutants are created by wildfires and industrial activities. The increasing impact of state and regional wildfires on local Utah air quality is measured by the frequency of annual smoke days. Air pollution, such as PM2.5, has a negative impact on personal health by triggering or worsening rates of asthma; cancer; emphysema, bronchitis, and other chronic obstructive pulmonary diseases (COPD); and heart disease.

Source: Utah Public Health Data Resource; Indicator Based Information System (IBIS)

## Ozone Concentrations above National Ambient Air Quality Standards (NAAQS) in Salt Lake County



Ground-level ozone is key contributor to smog and is a harmful air pollutant that exacerbates many health conditions.

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center

## Health Impacts

Poor air quality in Utah negatively impacts health. Highlights from key research findings are provided below.

Exposure to short-term particulate matter is associated with **more emergency department visits and hospitalizations** for pneumonia, severe pneumonia, and increased inpatient pneumonia-related mortality for individuals age 65 and older.



Reductions in particulate matter along the five air sheds of the Wasatch Front are estimated to reduce direct pneumonia-related medical facility costs by up to **\$1,500,000** annually.<sup>1</sup>

Short-term exposure to fine particulates and nitrogen dioxide air pollution **increases the risk of suicide death.**<sup>3</sup>

Short-term exposure to elevated PM2.5 air pollution is associated with **acute lower respiratory infection** in young children as well as older children and adults.<sup>2</sup>

Older adults are **2.5 times more likely to have severe pneumonia** and 3 times more likely to die in the hospital with pneumonia during PM2.5 spikes of 30  $\mu\text{g}/\text{m}^3$ .<sup>1</sup>

Maternal exposure to PM2.5 during the first trimester can result in higher risk of **preterm birth** and increased health care costs of up to **\$61,000** per preterm infant.<sup>4</sup>

Reductions in fine-particulate air pollution are positively associated with **increases in average life expectancy.**<sup>5</sup>

1. Pirozzi C., Jones, B, et al. (2018). Short-Term Air Pollution and Incident Pneumonia: A Case-Crossover Study. *Annals of the American Thoracic Society*. 15(4): 449-459.
2. Horne, B., Joy, E., Hofmann, M. et al. (2018). Short-Term Elevation of Fine Particulate Matter Air Pollution and Acute Lower Respiratory Infection. *American Journal of Respiratory and Critical Care Medicine*. 198(6):759-766.
3. Bakian, A., Huber, R., Coon H., et al. (2015). Acute Air Pollution Exposure and Risk of Suicide Completion. *American Journal of Epidemiology*. 181(5).
4. Hackman, D., Sjoberg, E. (2016). Ambient Air Pollution and Pregnancy Outcomes. *Air Quality, Atmosphere & Health*, 10.1007/s11869-016-0415-2.
5. Pope, A., Ezzati, M., et al. (2009). Fine Particulate Air Pollution and Life Expectancy in the United States. *New England Journal of Medicine*. 360(4): 376-386.

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