

The Influence of Excess Heat and Human Health – Drug Concerns

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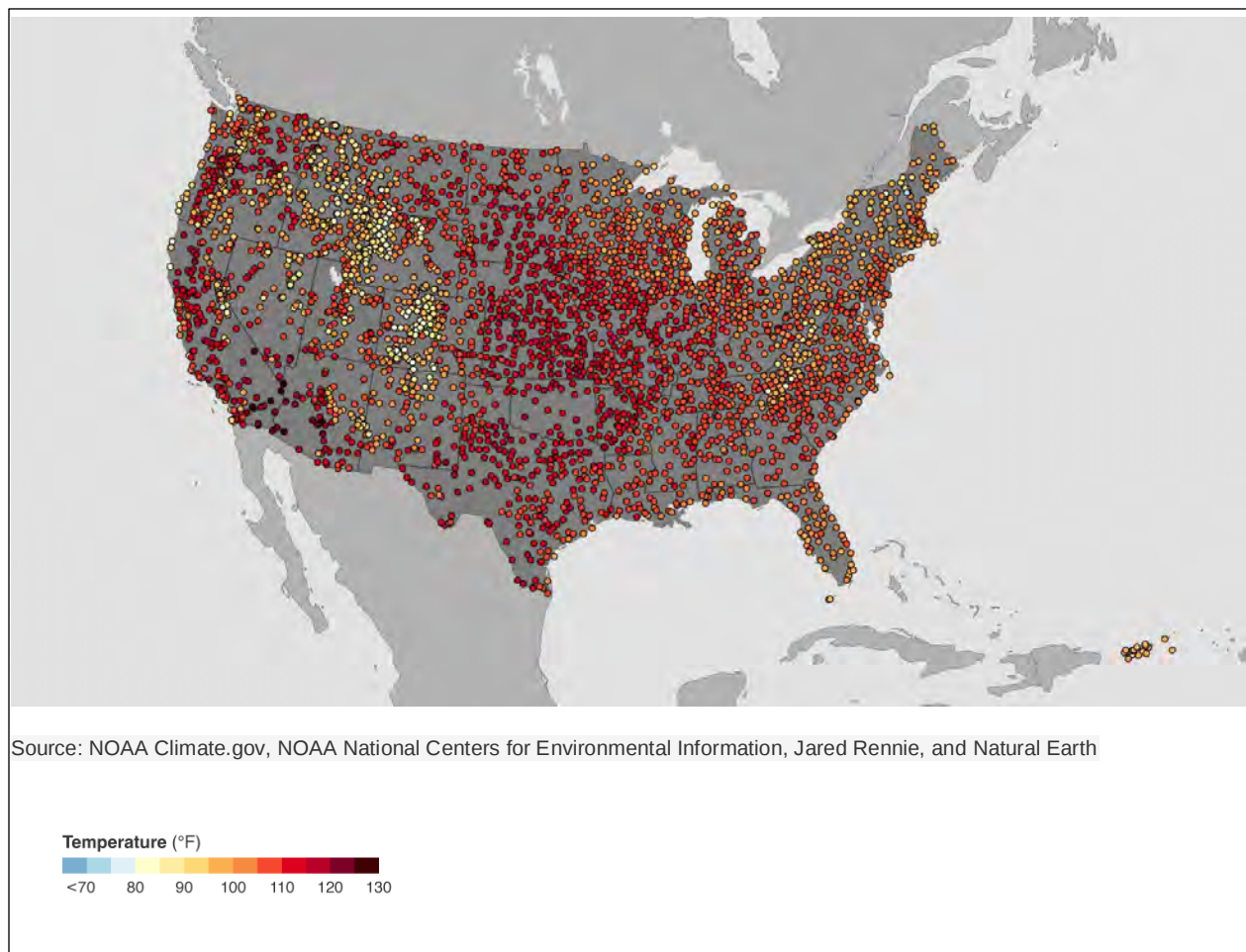
Most studies on the impact of specific heat events or that of the long-term trend to higher temperatures on human health consider, rightfully, the increase in crisis events or the exacerbation of the many conditions that are sensitive to heat. They concentrate on emergency room use or the increase in mortality especially among vulnerable populations. These are perhaps the most urgently visible and important aspects of heat-related health conditions. But there is another heat related impact to human health that is more subtle and much more widespread.

Many medications have diminished effectiveness at extreme temperatures. Look at a medication in your cabinet and it may will contain a warning that you should guard it against exposure extreme heat, by which they helpfully suggest room temperature of 68-77 degrees F. Shipping temperature ranges, being of short duration, are broader - 59-86 degrees F. This means that many homes, all cars and most importantly, mailboxes and doorsteps in 100-degree weather are not suitable for most drugs. Some delivery vehicles have been recorded as having excessive heat – an NPR story from July 20, 2023, reported that the driver recorded the temp in the back of a brown delivery truck that surpassed 150 degrees. This suggests that in wide swaths of the United States for much of the year, people should be watching the temperature of their medications, especially in the summer.

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Figure 1
RECORDED HIGH TEMPERATURES SUMMER 2023



Source: [History of the hottest summer day at thousands of U.S. locations | NOAA Climate.gov](#)

Medications that are particularly sensitive to heat include antibiotics, hormone preparations – like birth control or insulin, asthma medications, biologics, nitroglycerin, and liquid medications such as eye drops for glaucoma. Some examples include atorvastatin and Synthroid (levothyroxine). As a matter of note, few medications are stable above 93 degrees, according to a report in the BMJ. Unfortunately, it may not be possible to determine by sight or smell if a medication is compromised.¹

Drugs can be exposed to temperature variations in a number of ways.

Pharmacies need to be careful to store sensitive drugs in locations that are not subject to higher heat, but even they can have temperatures that exceed recommendations during extremely hot weather or when electrical distribution is in flux.

During climate events where there are power outages, or where the regulation of the dwelling temperature is not possible, drugs in the home can be exposed for long periods of time to excess heat. This applies to both homes and

¹ Excessive cold is also not good, so refrigeration is not the answer. Cool, dry storage away from sunlight is the key.

to small in-home nursing facilities. Drugs kept in the car or in a purse during hot weather are also compromised. It is important to not pack medications in suitcases during travel where they may sit in a vehicle or on a runway. Keeping medications in the home is not a surefire solution. Households that are less likely to have functioning air conditioning will be more prone to this – including lower income houses or older homes built before the need for air conditioning was so widespread.

Many people use mail order for their drugs based on convenience, price, and benefit rules. The chain of delivery for mail order drugs has safeguards built in but as a rural resident, the author can tell you that it is not unusual to have delays of a day or more in a guaranteed delivery time. This has resulted in the author receiving credit for unusable food shipments – swathed in melted ice packs, but while a credit for food is admirable, timely access to medication is critical. It may not be possible for the recipient to know if the medication had been exposed to high heat during transit, so they may be left with drugs that aren't as effective. While pharmacists and companies are usually fast at getting an emergency supply, it may be difficult to get to the pharmacy when it is open, particularly in rural areas, or even urban areas if the person receiving the drugs is not mobile and public transit is not an easy option.

PBMs and Specialty pharmacies are very intent on keeping the supply chain operating as designed and when the process is operating smoothly it is a good way to deliver drugs. Legislation that addresses this issue has had stiff opposition, and not without reason. Managing the costs of supplying expensive medication is in the best interests of everyone who has a stake in managing health care costs in the United States. However, lower efficacy due to heat exposure negates the benefit of the delivery system, in the best case by duplicating the drug cost, but in the worst case by negatively impacting health.

It is impossible to overemphasize the need for patient education. Public Health departments have poster campaigns and pill bottles have warning labels, but they are not necessarily broadly distributed.

This situation has three implications for actuaries considering climate related impacts to their work, none of which has been very well studied. The first is the cost of replacement drugs, especially some of the more expensive ones, may have an impact on drug trend in a locality, for example an employer concentrated in the geographic area. The second is that by taking drugs with reduced efficacy, patients may experience worsening health status or in the case of birth control pills, unexpected pregnancies, resulting in more medical expense. It is not possible to quantify what these two situations might contribute to the cost of care right now, but it is worth thinking about. The third is that as legislation seeks to address these issues, plans may lose some of the ability to manage costs through close supervision of supply chains. Testimony in states proposing this type of legislation suggest this will have a noticeable impact on pharmacy benefit costs, depending on the situation and the nature of the legislation.

Increasing heat will impact our health in so many ways, and this is just one of them. Some will be more serious, but the increasing proportion of total costs that are pharmaceutical based means keeps growing. It is not unusual to have 30% of costs due to drugs. There are health - and cost implications - of less than effective treatments that may exacerbate conditions when bodies are already stressed by excessive heat.

A note here, this issue applies to deliveries of pet medications too!

<https://www.verywellhealth.com/how-temperature-can-affect-medication-stability-3233264>

<https://ejhp.bmj.com/content/27/2/65>



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