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Spokane Beat the Heat: Correlations of Urban Heat with Race and Income in Spokane, Washington

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Correlations of Urban Heat with Race and Income in Spokane, Washington

Center for **Climate, Society,** *and the* **Environment**

GONZAGA UNIVERSITY

From June 26 to July 2, 2021, the northwest experienced an unprecedented heat dome. The Washington State Department of Health concluded that at least **19** Spokane County and **157** Washington State residents died **heat-related deaths** during this event. As heat-trapping gases increase, extreme heat events are expected to become more frequent and more deadly.

To help the Spokane region understand, plan for, and respond to future extreme heat events, the Gonzaga Center for Climate, Society, and the Environment **Spokane Beat the Heat** (gonzaga.edu/BeatTheHeat).

Urban Heat Island Mapping

The Gonzaga Climate Center was awarded a grant from the National Oceanic and Atmospheric Organization's (NOAA) National Integrated Heat Health Information System (NIHHIS) to conduct a community science urban heat island mapping campaign in the summer of 2022. In collaboration with NOAA and CAPA Strategies, three high-resolution maps were created reflecting the distribution of heat across the City. This study made it possible to better understand how urban heat is experienced in different areas of the City of Spokane. To learn more about the study and to interact with the dynamic maps, visit gonzaga.edu/HeatMaps.

> Initial finding: due to differences in tree cover, green spaces, and dark surfaces, some areas in Spokane are as much as 13.9° warmer. A 90° day in one neighborhood could be a 104° day for another.

check-in for their routes

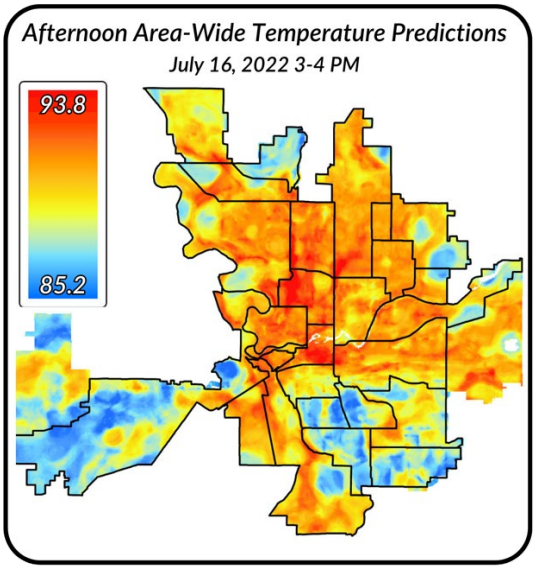
Community Science

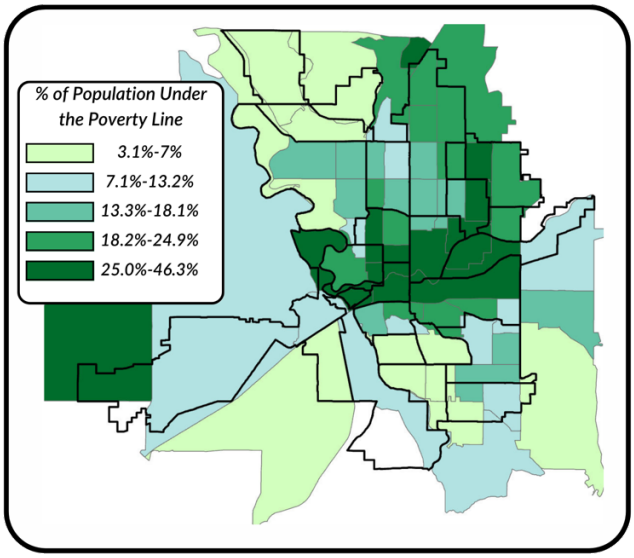
On July 16, 2022, forty volunteers drove defined routes to measure humidity and temperature across the City of Spokane.

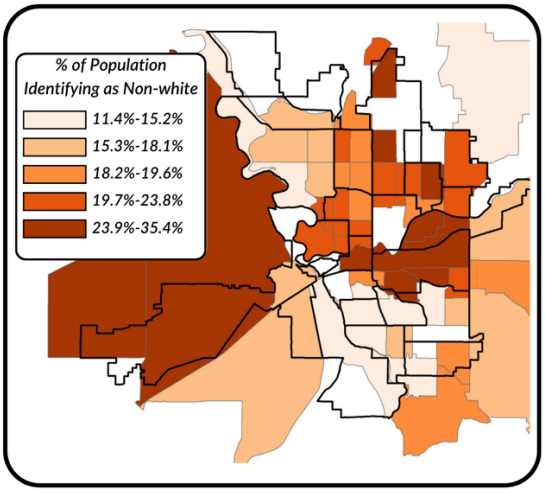
The resulting data were used to create high-resolution maps of the City's urban heat islands.

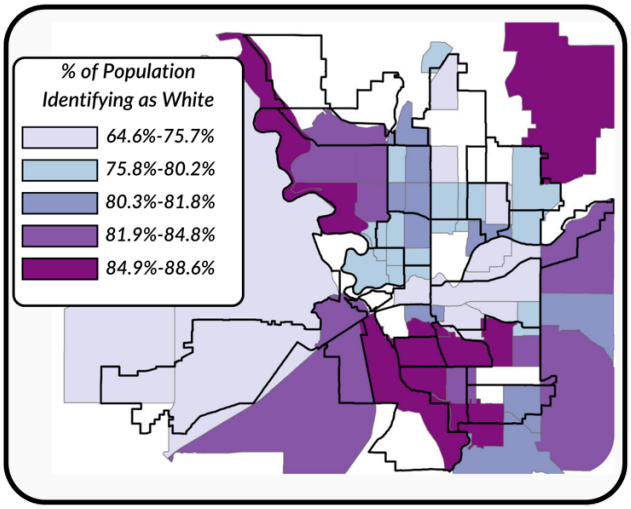
Is everyone equally impacted by extreme heat?

Environmental justice is the fair treatment and meaningful involvement of all people—regardless of income, race, or color—with respect to both decision-making and the distribution of environmental benefits and burdens. Are there environmental justice factors involved in the Spokane community's experience of extreme heat events, such as the heat dome of 2021? Do extreme heat events equally impact residents are some individuals likely to experience greater impacts?







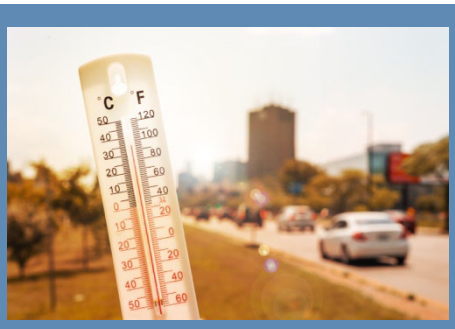


Engage with the interactive data maps at gonzaga.edu/HeatMaps.

Correlations with urban heat islands

A correlation analysis was conducted in collaboration with the Washington State Department of Health to determine whether there are significant correlations between Spokane's urban heat islands and other US Census data, such as income, age, race, English proficiency, or prevalence of paved surfaces. The analysis revealed the following significant correlations:

- Significant and *very strong positive* correlation between **urban heat** and **paved surfaces** (r=0.8, p<0.0001)
- Significant and *strong positive correlation* between **urban heat** and the **percentage of population living under the poverty line** (r=0.7, p<0.0001)
- Significant and *moderately strong negative correlation* between **urban heat** and the **percentage of the population that identifies as white** (r=-0.6, p<0.0001)
- Significant and *moderately strong positive correlation* between **urban heat** and the **percentage of the population that is non-white** (r=0.55, p<0.0001)
- Significant and *moderately strong positive correlation* between **urban heat** and the **percentage of the population that is Indigenous** (r=0.6, p<0.0001)
- Significant and *moderately strong positive* correlation between **urban heat** and the **percentage of the population that is Black** (r=0.5, p<0.0001)
- Significant and *moderately strong positive correlation* between **urban heat** and the **percentage of the population that identifies their race as other** (r=0.6, p<0.0001)



Key Findings

No significant correlations were found between urban heat and age or English proficiency.

Spokane community members identifying as Black or Indigenous are statistically more likely to live in an urban heat island than those identifying as white.

Spokane community members living under the poverty line are statistically more likely to live in an urban heat island than those who are more affluent.

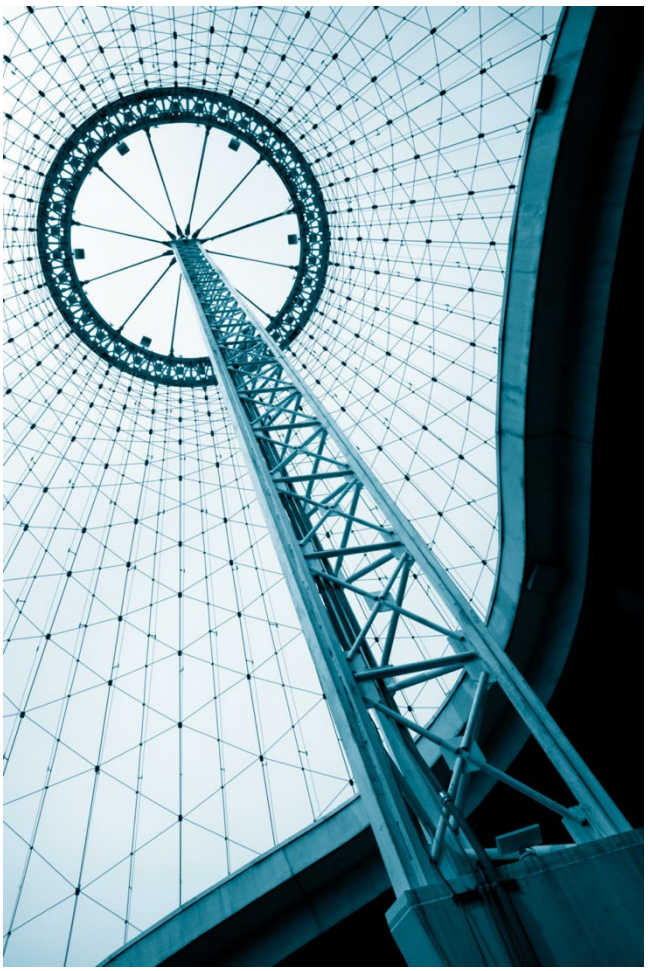
Understanding the problem

Like many communities across the northwest, Spokane did its best to respond to the unprecedented 2021 heat dome. Some in the community thought of the heat wave as a summer version of a recurring winter problem: just as warming shelters are needed to provide safe spaces for unhoused members of the community during the cold Spokane winters, cooling shelters are needed for unhoused people to escape an extended heat wave. While no doubt many hundreds of unhoused people in Spokane were harmed by the heat dome—making cooling centers a responsible and important response—it is not clear that the impacts of extreme heat events are limited to this vulnerable group.

Taken together, the urban heat island maps, demographics maps, and correlation analysis reveal that extreme heat events affect not only the unhoused but also many thousands of people across large segments of the Spokane community.

Not all regions or demographics in Spokane are equally affected by extreme heat.

Differences in green space and the built environment mean that some people are more likely to be in danger during future extreme heat events.



For more information

Visit gonzaga.edu/BeatTheHeat to find interactive maps relating Spokane urban heat island and other demographic factors such as income, as well as a map showing each of the 19 heat-related deaths from the 2021 heat dome.

Prepared by the Gonzaga Center for Climate, Society, and the Environment.

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Acknowledgments and References

- Heat-death data is from WA Department of Health "Heat Wave 2021" https://doh.wa.gov/emergencies/be-prepared-be-safe/severe-weather-and-natural-disasters/hot-weather-safety/heat-wave-2021
- Urban heat island data collection was facilitated by the Gonzaga Climate Center with the help of community science volunteers, analyzed by CAPA Strategies, and supported by the National Oceanic and Atmospheric Administration. The full report is available http://www.gonzaga.edu/HeatMaps.
- The statistical correlation analysis was conducted by Washington State Department of Health's Epidemiologist 1, Alyssa Miller, and Climate Epidemiologist 2,Michelle Fredrickson.
- Credit for front cover image of Riverfront Park and upper Spokane falls: kellyvandellen, August 1, 2019.
- Credit for back cover image of boulders along river in Spokane, Washington: axnjax, June 27, 2009.

A note about statistical correlation

The variable r is the measure of the linear association between two variables, and has a value between -1 and 1 where: -1 indicates a perfectly negative or inverse correlation; 0 indicates no linear correlation; and 1 indicates a perfectly positive linear correlation. The further away r is from zero, the stronger the relationship between the two variables.

Similarly, p value is used to indicate whether the relationship between two values is correlated. It has a value between 0 and 1. The smaller the number, the stronger the correlation and vice versa.

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