# Phoenix as a Human Habitat in Summer:
## Exposure and Resources to Cope with Extreme Heat

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## Background/Problem Statement

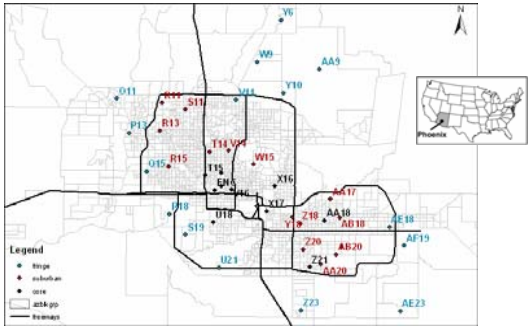
Exposure to excessively warm weather is a global threat to human health and well-being, according to assessments of major impact studies on climate change. Extreme summer heat events increasingly cause illness and death in cities that are climatically diverse. As rapid urban development continues, the impacts of temperature extremes on human health and comfort are also expected to increase as threshold temperatures of human tolerance are crossed more frequently and for longer periods of time. Analyses based on eight neighborhoods in the 2001 Phoenix Area Social Survey showed that predominantly lower socioeconomic and minority neighborhoods were warmer, exposed to greater heat stress in summer, and residents had fewer social and material resources to cope with extreme heat.

## Abstract

Using data from the 2006 Phoenix Area Social Survey (PASS), this poster continues this line of inquiry, analyzing respondents' perceptions of and experiences with summer weather in Phoenix. Variation across key social and geographic characteristics are examined, and findings reveal differences in exposure among Anglo and Hispanic respondents. Hispanics experienced greater exposure to heat as a result of spending more time in the Valley, working outdoors more, and living predominately in the urban core. Additionally, Hispanic respondents indicated they have access to fewer resources for coping with high temperatures and they report a lower maximum tolerable outdoor temperature. Findings also show that Hispanics reported more heat-related symptoms and illnesses than Anglos for the Summer of 2005. Respondent demographics include: Ethnicity: 73% White, 19% Hispanic, 8% Other; Household Income: 36% of households earn <$40K, 29% between $40K and $80K, 36% >$80K; Gender: 56.3% of respondents were female, 43.8 male.

## PASS 2006 Neighborhoods

This study surveyed 808 Phoenix residents in 40 neighborhoods located at CAP LTER's Survey 200 sites.




The neighborhoods are classified as urban core, suburban, and fringe. Core neighborhoods are within 5 miles of downtown Phoenix or within 1.5 miles of the 7 other large-city downtowns. Fringe neighborhoods are in urban growth areas developed in 2000-2005 (MAG Regional Report, 2005, Map U-1). Suburban neighborhoods are all others.

## Summer Weather 2005

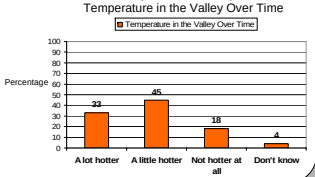
The 2005 summer season, which began June 21st and ended September 22nd, witnessed temperatures above normal in Phoenix. This year was characterized by record high temperatures in the day as well as the evening. This summer continued a regional trend that has seen the daily average temperature increase by more than 3°C over the past 50 years.

2005 Facts:

-24 days when the temperature topped 110 degrees (10 days over 110 is normal);
-16 temperature records tied or broken with 11 of the records as nighttime high temperatures;
-96 days when the temperature reached 100 degrees or higher (89 days is normal);
-The highest temperature recorded was 116° on July 17th.

Normal is the 30-year average, 1971-2000
Source: National Weather Service

PASS Respondents' Perception of Temperature in the Valley Over Time

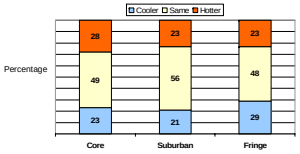


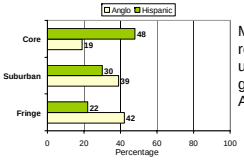

## Exposure to High Temperatures, Summer 2005

### Temperature Variability in the Valley

Human exposure to high temperatures varies widely in the Phoenix metropolitan area depending on the location of neighborhoods as well as other characteristics (Harlan et al. 2006). For example, average maximum temperature variation on a rural to urban gradient in the southeastern CAP LTER study area at night was measured at 7.3°C in 2001 (Hedquist and Brazel 2004). Neighborhoods on the urban fringe that are near agricultural or desert lands are likely to be cooler than neighborhoods in the inner city for a variety of reasons.

There is some evidence that people perceive differences in neighborhood temperatures. Although half the PASS respondents perceived that the temperature in their neighborhoods was the same as others, 29 percent of residents in fringe neighborhoods thought their neighborhood was cooler than others. In urban core neighborhoods, 28 percent of residents thought their neighborhood was hotter than others.

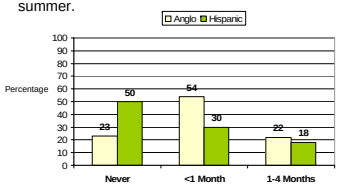



More Hispanic PASS respondents live in the urban core while a greater percentage of Anglos live on the fringe.

### Time Spent Away from the Valley

The survey asked residents how much time they spent away from the Valley during the Summer of 2005. Among the Anglo respondents, 23 percent never left the Valley in contrast to 50 percent of Hispanic respondents who remained in the Valley for the entire summer.

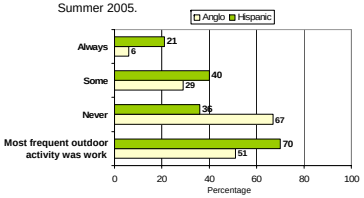



### Employment: Required to Work Outdoors

PASS surveyed residents on the amount of time their job required them to work outside during the summer. 67 percent of Anglos reported never working outside in comparison to 36 percent for Hispanics. For respondents reporting always working outside, 21 percent were Hispanic and 6 percent Anglo.

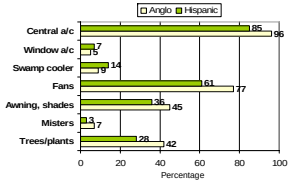
PASS also inquired about outdoor activities during the summer. For Hispanic men, 70 percent of respondents indicated that work (either a job or yard work around the house) was their most frequent outdoor activity in contrast to 51 percent for Anglo men.

Response from men: Time spent working outdoors in Summer 2005.



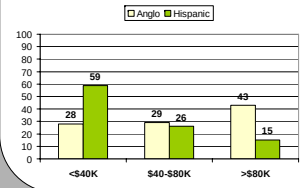

## Resources to Cope with Heat

A variety of mechanisms are available for coping with extreme summer outdoor temperatures. For example, Phoenix residents rely on cooling indoor temperatures with resources like air conditioning, vegetation, fans, etc. Another popular resource residents use to fight the summer heat is a swimming pool. Phoenix ranks 3rd nationally for the number of pools. Residents who own their homes and live in single family homes have greater control over their indoor environments.

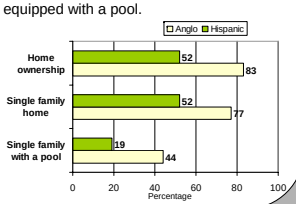



Resources:
A greater percentage of Anglos use central air conditioning, fans, awnings/shades, misters, and trees to combat high temperatures while slightly more Hispanics than Anglos rely on window air conditioning units and swamp coolers.

Income:
The household income among PASS respondents reveals significant variation along ethnic lines. Almost 60 percent of Hispanic respondents reported a household income of <$40K while 72 percent of Anglo households report an income >$40K.



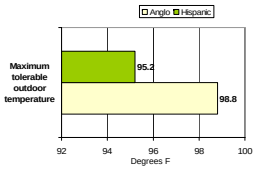

Home Ownership:
Anglos report a much higher percentage of home ownership than Hispanics, 83 percent to 52 percent, respectively. Among home owners, 77 percent of Anglos own a single family home; 44 percent of Anglo homes are equipped with a pool.




## Health Outcomes

Summer heat waves have been occurring more frequently and with greater intensity throughout the world with heat-related deaths particularly prevalent in cities. The Center for Disease Control recently reported that Arizona led the nation in heat-related deaths from 1993 – 2002. Arizona in general, and Phoenix in particular, rank among the nation's most rapidly urbanizing areas and, therefore, more frequent extreme summer heat events can be expected to accompany this growth.

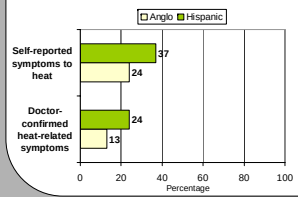
### Self-reported Maximum Tolerable Temperature




PASS shows that Hispanic respondents were more exposed to outdoor temperature and had fewer coping resources than Anglos. However, Hispanics respondents reported a maximum tolerable outdoor temperature that was 3.6° F lower than the maximum tolerable outdoor temperature reported by Anglos.

### Heat-related Symptoms and Illnesses

The survey asked residents questions regarding the occurrence of heat-related symptoms (e.g., leg cramps, dry mouth, dizziness) and doctor-confirmed heat-related illnesses (heat exhaustion, sunstroke, or heat stroke) in their households for the past 12 months.




Among Hispanic households, 37 percent reported experiencing heat-related symptoms and 24 percent of households had a medical diagnosis of heat-related illness. Fewer Anglo households indicated self-reported symptoms and medical diagnoses for heat-related symptoms and illness.

**The PASS Research Team**

Carol Atkinson-Palombo, Anthony Brazel, Megha Budruk, Bill Edwards, Pat Gober, Corinna Gries, Nancy Grimm, Annie Gustafson, Ed Hackett, Sharon Harlan (Project Director), Pam Hunter, Larissa Larsen, Kelli Larson, Kitty Loese, Tom Rex, Darren Ruddell (Research Assistant), Kerry Smith, Jason Walker, Paige Warren, Dave White, Scott Yabiku

**References**

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