

# Determinants of IET in the Greater Phoenix Area



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## Problem Statement & Research Context

Climate change and urbanization exacerbate the risk of heat related illness because of increasing temperatures globally and through the urban heat island effect (Frumkin et al. 2014, Harlan et al. 2006). Heat-related deaths have been observed and recorded on all of the populated continents (Harlan et al. 2014). As a matter of prevention, we need to understand if and how heat affects people differently so as to develop more specialized interventions. The effect of heat on health outcomes varies on levels from individual to community and depends on factors such as physiology, demographics, and the built environment (Kovats and Hajat 2008). Neighborhood is often used to represent many factors such as the ones mentioned above and assess heat health vulnerability (Harlan et al. 2006). However there is sometimes heterogeneity within neighborhoods due to individual differences (Kuras et al. 2015). This study investigated which characteristics about individuals (i.e race, gender, socioeconomic status) may be associated to person-to-person variability in heat exposure.

## Results & Discussion

- With an alpha level of 0.05, four different attributes appeared to have an association with IETs
- Nighttime thermostat settings were found to be positively associated with average daily IETs
- Setting of occupation and exercise were statistically significantly related to average daytime IETs; those partaking in outdoor work or exercise recorded the highest values.
- Thermostat setting (both daytime and nighttime) were positively associated with average nighttime IETs. The relationship was stronger for nighttime thermostat settings.
- No other statistically significant relationships were found for individual-level attributes.
- Home thermostat setting is likely related to a combination of socioeconomic status and individual preferences; future efforts will test for interactive effects of these and other variables.
- Daytime IETs appeared to be effected the most by daytime activities such as physical activity and occupation. It is therefore possible that certain lifestyles are more likely to lead to an individual experiencing higher temperatures.
- Measurement of IETs provides quantitative evidence of differential heat exposure for certain attributes

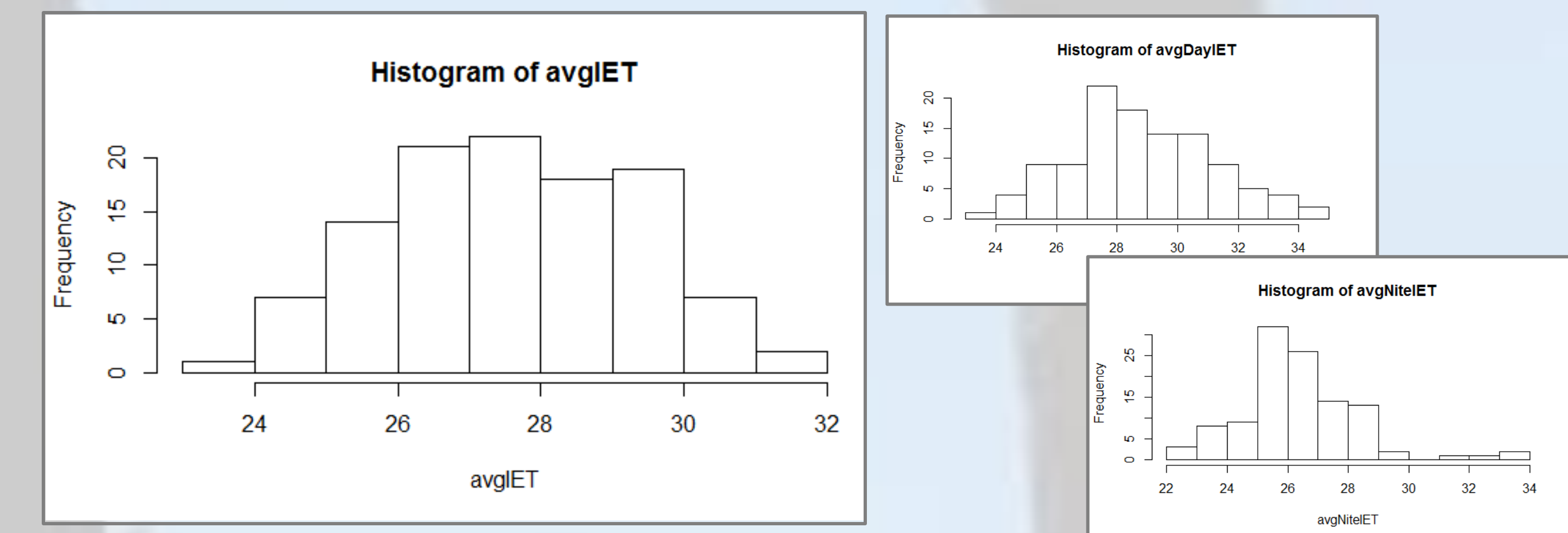
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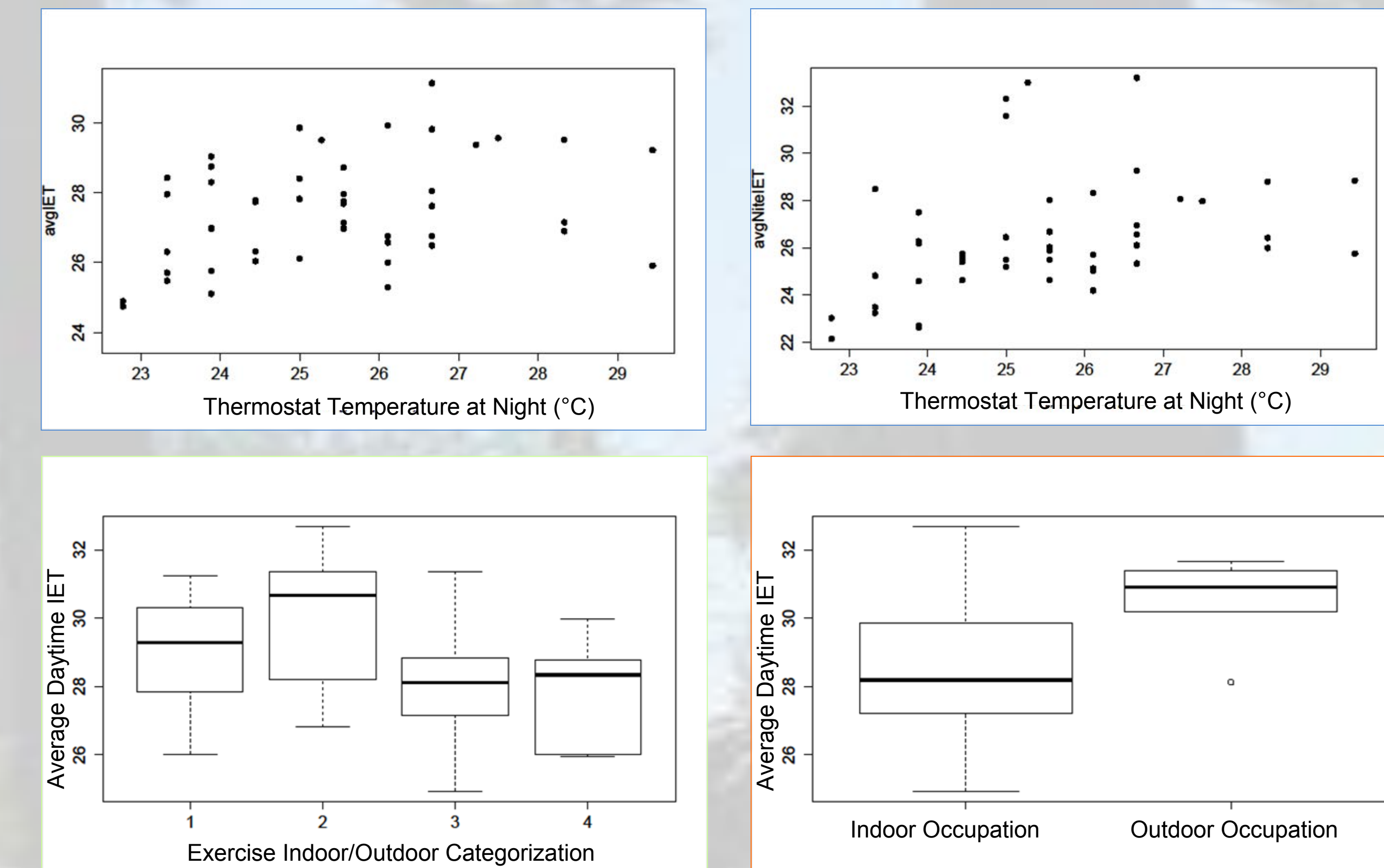
Attribute	Question Used in Background Survey	Descriptive Statistic	Pvalue Overall	Pvalue Day	Pvalue Night
Neighborhood	Not asked in Background survey; but recorded from recruitment process 1=Coffelt, 2=Encanto Palm Croft, 3=Garfield, 4=Power Ranch, 5=Thunderhill	11 from Coffelt, 19 from Encanto PalmCroft, 20 from Garfield, 19 from Power Ranch, 11 from Thunderhill	0.827	0.404	0.519
Age	In what year were you born?	Min:18, Med:45.50, Max: 85.00; 51 NA's	0.886	0.811	0.911
Age categorical	In what year were you born? 1=<35 years old, 2=35-49, 3=50-64, 4=65+	11 were less than 35 yrs old, 22 were 35-49 yrs old 17 were 50-64 yrs old, 4 were 65 yrs old and over	0.958	0.941	0.976
Gender	What gender do you identify with? 1=male, 2=female	36 males 44 females	0.813	0.693	0.955
Race	Which of the following best represents your racial or ethnic heritage? 1=white, 2=black, 3=hispanic, 4=black, 5=asian, 6=other	47 said White, 1 said black, 14 said hispanic 2 said Asian and 1 said other	0.161	0.554	0.0949
Occupation	What is your occupation? ( Was later separated into 2 categories: Indoor & Outdoor) 1=Indoor 2=Outdoor	55 work indoors 6 work outdoors	0.151	0.00586	0.916
Education	What is your highest educational attainment? 1=less_than_HS, 2=HS_graduate, 3=GED_alt, 4=some_college, 5=bachelors+	10 said 1, 3 said 2, 1 said 3 13 said 4, 37 said 5	0.386	0.557	0.44
Income	How would you categorize your household income range? 1=<10k, 2=10-30k, 3=31-50k, 4=51-75k, 5=76-100k, 6=101-150k, 7=151-200k, 8=200+	8 said 1, 7 said 2, 4 said 3, 7 said 4 5 said 5, 13 said 6, 4 said 7, 6 said 8	0.387	0.434	0.335
Rent/Own	How would you describe your housing situation? Please select as many options as apply 1=own, 2=rent, 3=other	33 said 1, 25 said 2, 1 said 3	0.322	0.232	0.456
Public/Private	How would you describe your housing situation? Please select as many options as apply 1=public, 2=private, 3=other	4 said 1, 1 said 3	0.607	0.524	0.656
Housing Type	Do you live in a... 1=single fam home, 2=multi fam home, 3=lownhouse, 4=condo, 5=apartment, 6=mobile home, 7=other	48 said 1, 7 said 2, 7 said 5, 1 said 7	0.947	0.815	0.916
Others in house	How many people do you share a household with (not including yourself)?	6 said 0, 23 said 1, 7 said 2, 8 said 3 6 said 4, 6 said 5, 2 said 6, 2 said 7	0.248	0.616	0.145
Language	What language do you speak at home? 1=english, 2=spanish, 3=english&spanish	52 said 1, 7 said 2, 2 said 3	0.66	0.797	0.576
Pets	How many pets do you have? 0=0, 1=1, 2=2, 3=3+	15 said 0, 21 said 1, 10 said 2, 15 said 3	0.701	0.65	0.829
Cooling Device	How would you describe any cooling devices you have at home? 1=Central AC, 2=AC units, 3=Swamp coolers, 4=Fans, 5=None, 6=Other	49 said 1, 3 said 2, 8 said 3, 1 said 5, 50 said 1, 3 said 2, 8 said 3, 1 said 5,	0.274	0.152	0.584
Cooling Device #2	How would you describe any cooling devices you have at home? 1=Central AC, 2=AC units, 3=Swamp coolers, 4=Fans, 5=None, 6=Other	5 said 3, 21 said 4, 85 Nas	0.452	0.634	0.393
Thermostat Day	If you have air conditioning, at what temperature do you set your thermostat?	Min:73, Med:78, Max: 85 62 NA's	0.0725	0.696	0.0346
Thermostat Night	If you have air conditioning, at what temperature do you set your thermostat?	Min: 73, Med:78, Max: 85 62 NA's	0.0252	0.597	0.00714
Transportation	Does your primary mode of transportation have air conditioning? 1=Yes, 2=No	53 said 1, 8 said 2	0.139	0.115	0.535
Health	In general, compared to other people your age, would you say your health is... 1=excellent, 2=good, 3=fair, 4=poor, 5=dk	26 said 1, 2 said 1.5, 28 said 2, 1 said 2.5 2 said 3, 1 said 4, 2 said 5	0.979	0.307	0.21
Exercise	If/When you exercise where do you do it? 1=indoors, 2=outdoors, 3=both, 4=no_exercise	13 said 1, 17 said 2 26 said 3, 6 said 4	0.163	0.0118	0.803
Height	How tall are you? (Converted to Meters)	Min: 1.520, Med: 1.680, Max: 1.910 60 NA's	0.838	0.41	0.467
Weight	What do you normally weigh? (If you are a pregnant woman, report pre-pregnancy weight)	7 said 113, 19 said 138, 13 said 163, 12 said 188 5 said 213, 2 said 238, 2 said 263	0.218	0.826	0.129
Close-Knit Neighborhood	I live in a close-knit neighborhood. 1=strongly_agree, 2=somewhat_agree, 3=somewhat_disagree, 4=strongly_disagree, 5=dk	17 said 1, 31 said 2, 6 said 3, 3 said 4, 6 said 5	0.936	0.796	0.841
Trust Neighbors	I can trust my neighbors. 1=strongly_agree, 2=somewhat_agree, 3=somewhat_disagree, 4=strongly_disagree, 5=dk	28 said 1, 27 said 2, 3 said 3, 3 said 4, 3 said 5,	0.984	0.951	0.942
Collaboration	If there were a serious problem in my neighborhood, the residents would get together to solve it. 1=strongly_agree, 2=somewhat_agree, 3=somewhat_disagree, 4=strongly_disagree, 5=dk	23 said 1, 22 said 2, 5 said 3, 2 said 4, 10 said 5	0.856	0.725	0.876
Know neighbors	How well do you feel you know your neighbors? 1=very well, 2=fairly well, 3=not very well, 4=not at all, 5=dk	11 said 1, 28 said 2, 21 said 3, 4 said 5	0.952	0.764	0.835
Visit Neighbors	How often, if at all, do you typically visit with your neighbors? 1=daily/almost, 2=1-3x/week, 3=1-3x/month, 4=<1x/month, 5=never, 6=dk	14 said 1, 20 said 2, 10 said 3 11 said 4, 5 said 5, 3 said 6	0.814	0.657	0.49

## Methods

80 Participants were recruited from five Phoenix area neighborhoods in September 2014. Participants were given an air temperature sensor to wear for a week that recorded their IETs. In addition, participants filled out background surveys, daily logs, and activity logs. Occupations were categorized into either indoor or outdoor and reported home thermostat temperatures were separated into day and night. ANOVA was used to test for differences in IETs across personal attributes gleaned from surveys.



Figures 1-3. Distribution of Individually Experienced Temperatures during all hours, daytime hours, and nighttime hours.



Figures 4-7. Relationships between IETs and four statistically significant individual-level attributes (identified in main table).

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