

Does Temperature Affect Suicide Rate?

The U.S. (1999 - 2011)

Brad Johnson & Seoho Hahm



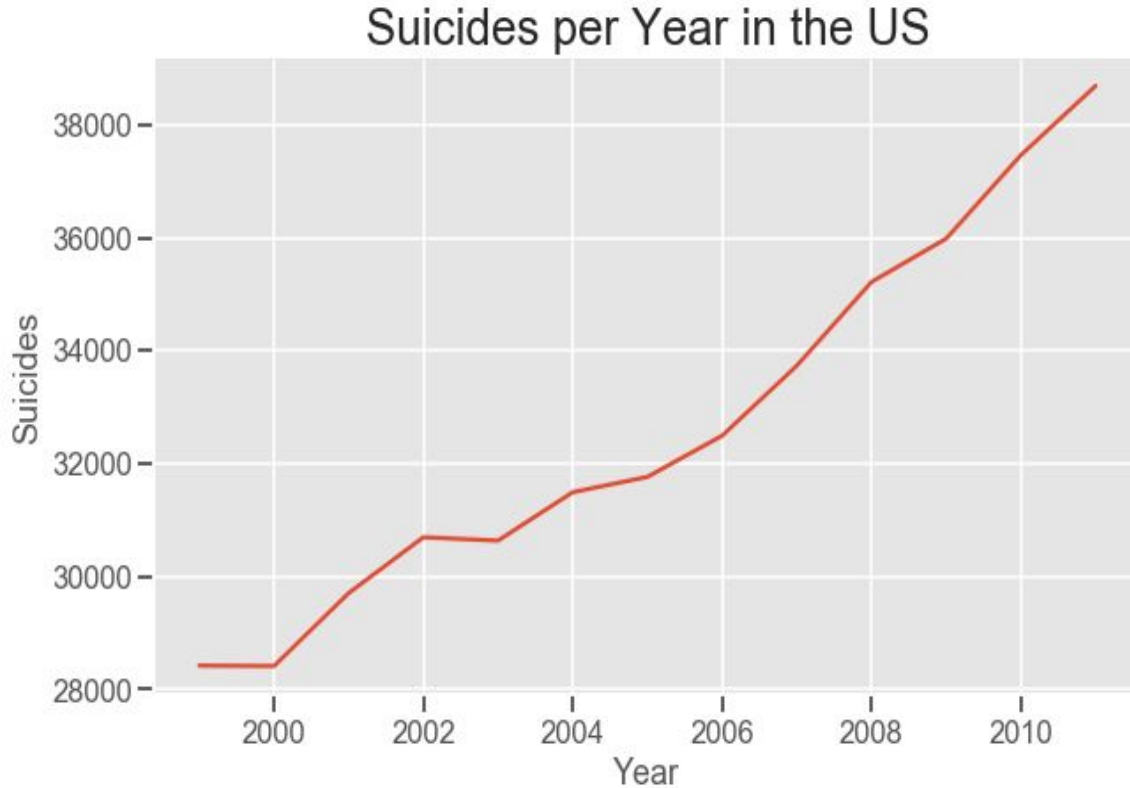
★ What we know:

- Overall rise in temperature
- Overall rise in suicide rates

★ Our study:

- U.S. 1999-2011
- Difference in **suicide rate** between periods of **higher and lower temperature**
- Data from Center for Disease Control
WONDER (Wide-ranging ONline Data for Epidemiologic Research)

Yearly Rise in Suicides

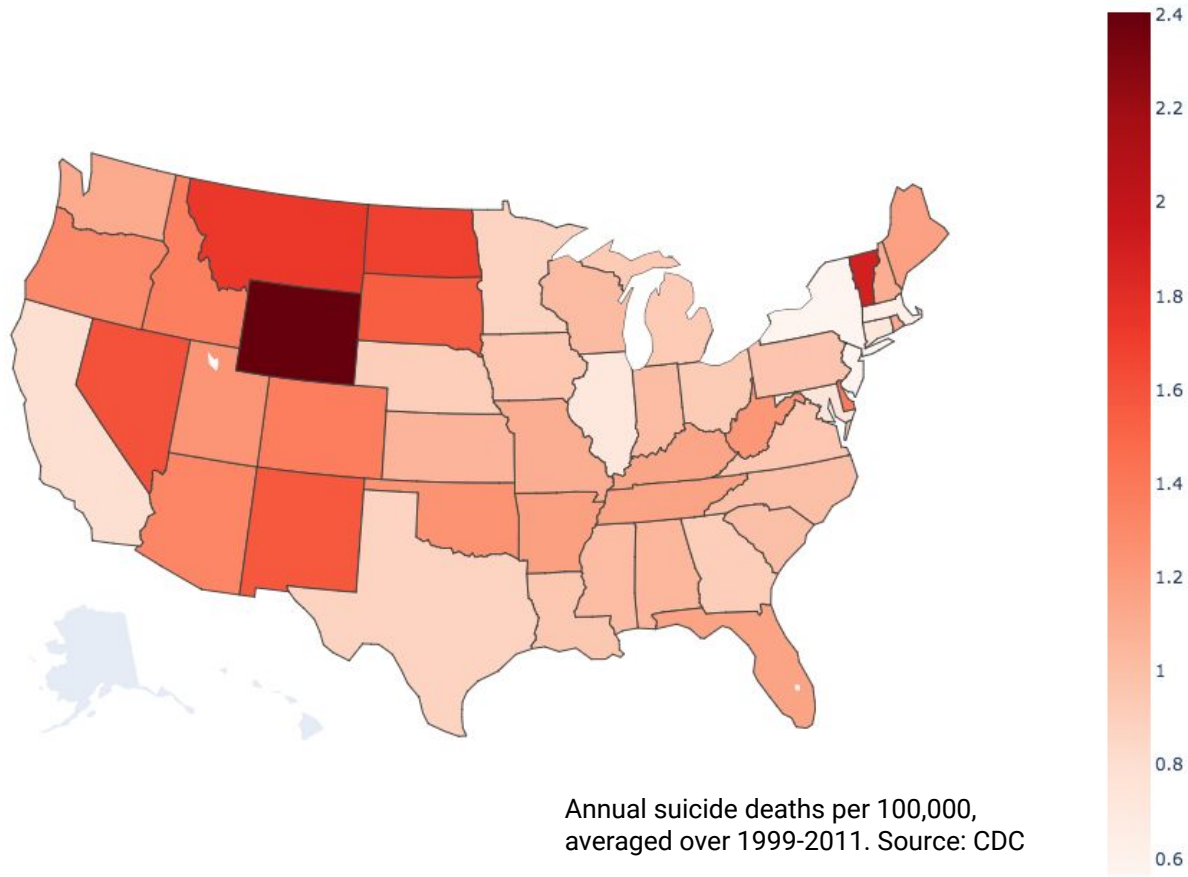


There are many possible explanations for the rise in suicides from 1999 to 2011.

Our analysis is preliminary and does not attempt to explain this trend.

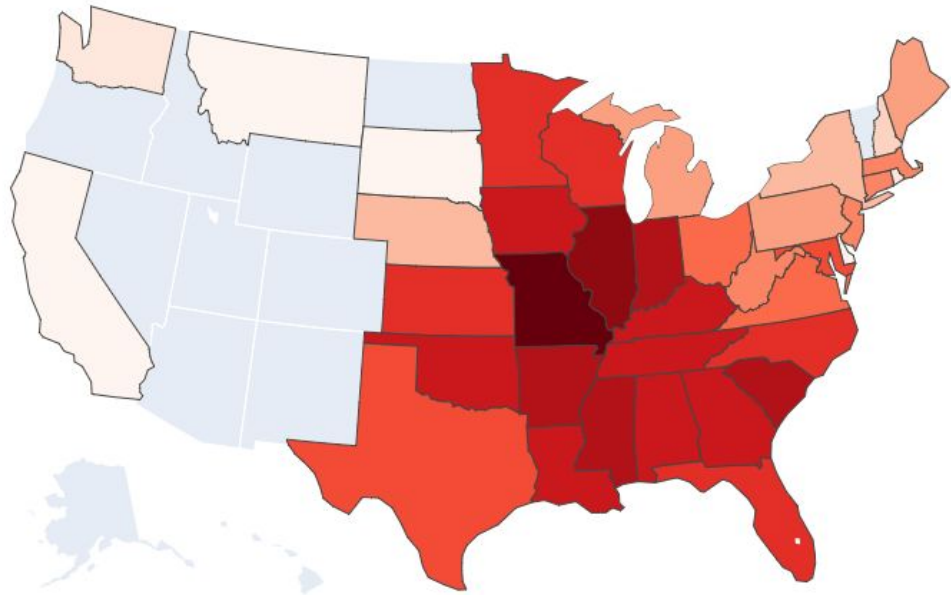
U.S. Suicide Rates

- Wide variation by state.



U.S. Unusual Heat

- Heat index is the “feels-like temperature,” increases with humidity
- Heat index variation calculated from the 1999-2011 mean for each state for each month.



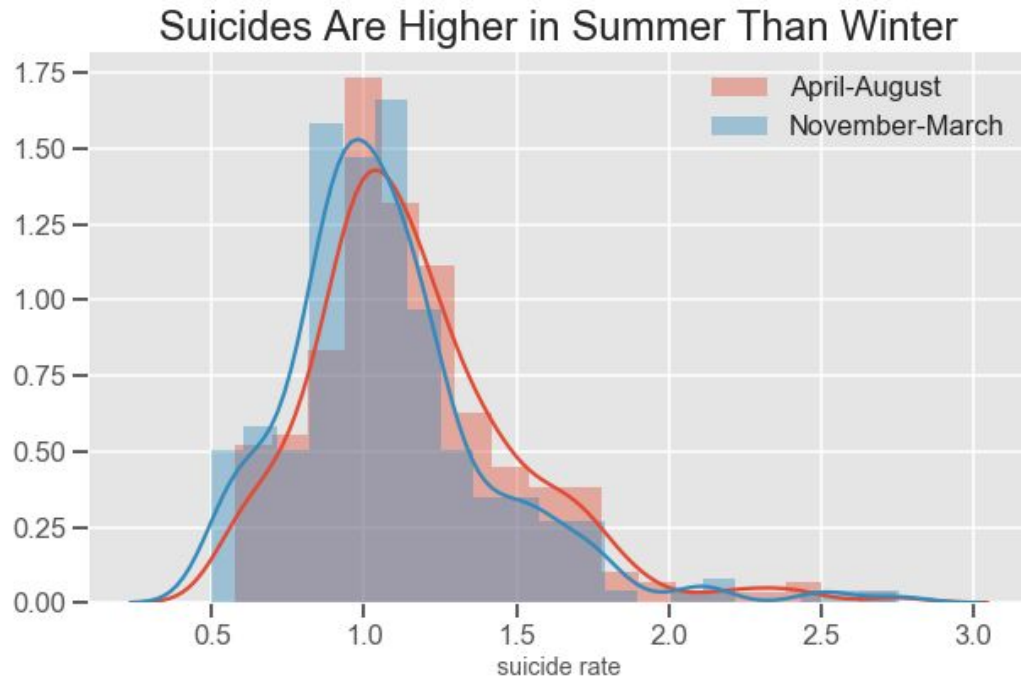
Count of unusual (90th percentile) heat-index months over 1999-2011 April-August. Source: CDC

Questions (Hypotheses)

- **Seasonal Affective Disorder:** Are suicides more likely in winter than summer?
- **Extreme Heat:** Are suicides more likely during extreme heat?

FINDING 1:

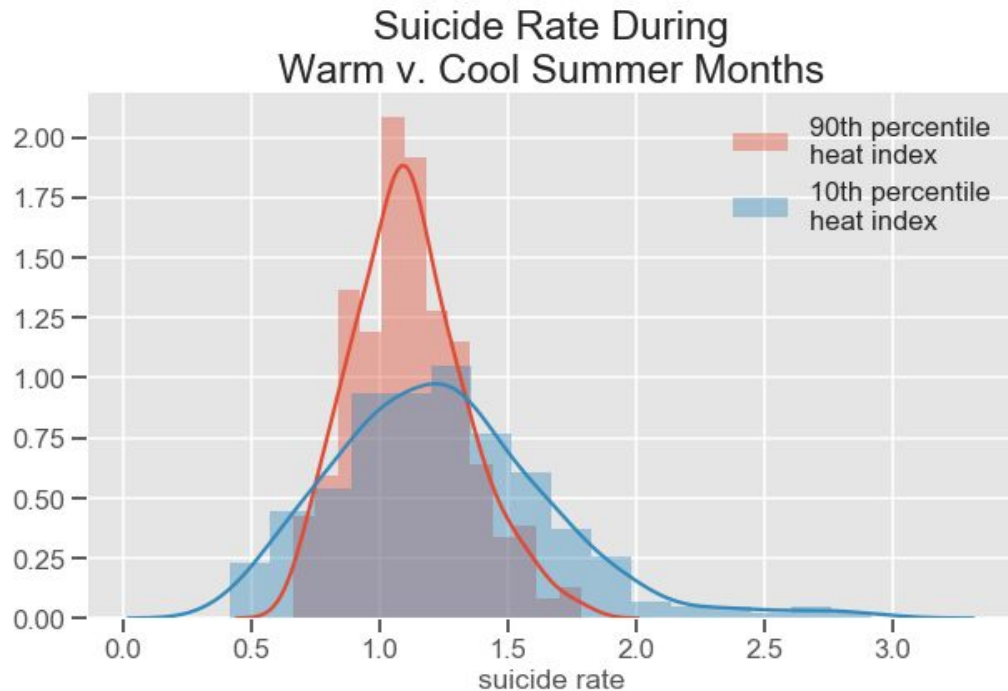
Suicides Are Higher in Summer Than Winter



There is a small but statistically significant **higher rate of suicides** during **warmer** versus colder months.

FINDING 2:

Simply HOT vs. NOT does not matter



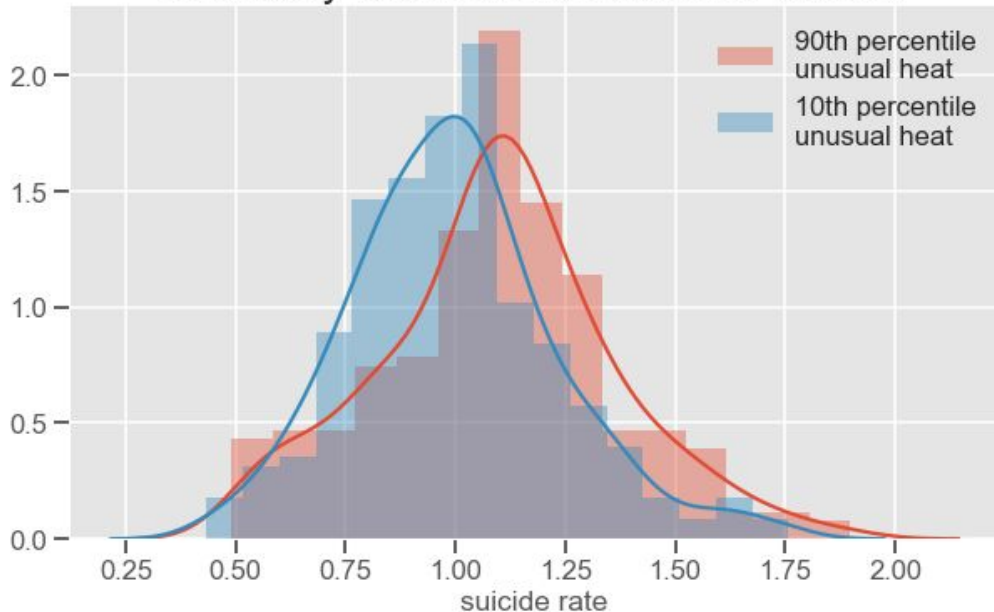
Suicide rates are not higher
when it's just very hot

HOWEVER...

FINDING 3:

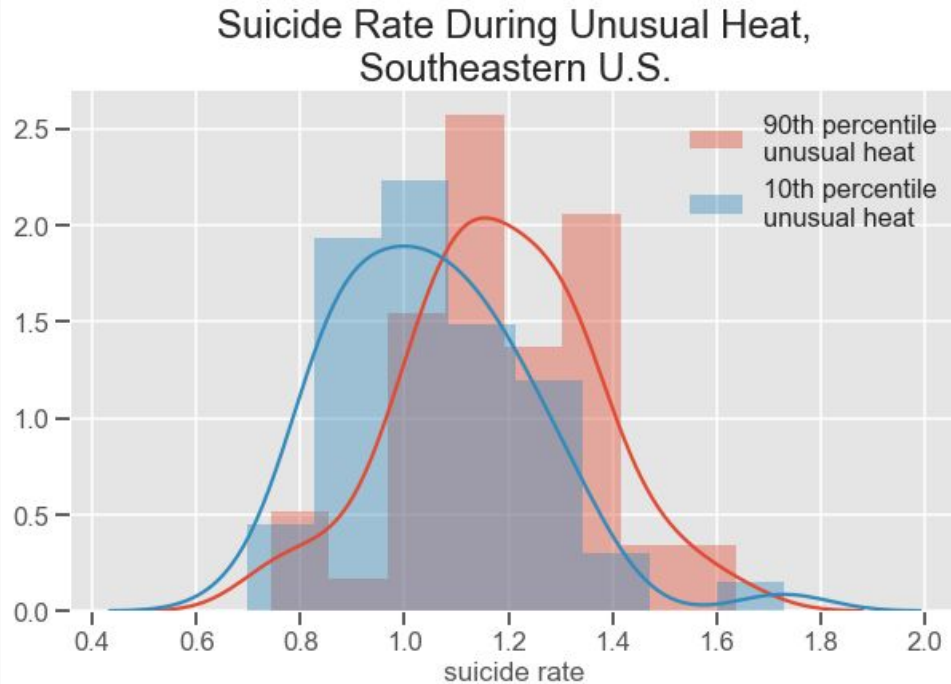
More Suicides in **UNUSUAL** Heat

Suicide Rate During
Unusually Warm v. Cool Summer Months



Suicide rates **are higher**
when it's **unusually** hot.
Significant but small.

FINDING 3 continued: More Suicides in **UNUSUAL** Heat (Southeast)



This effect is largest in the
Southeastern US.

HYPOTHESIS REVIEW

1. Suicides are NOT higher during winter than summer. In fact, the opposite appears to be the case.
2. Suicides do appear to be more frequent during UNUSUALLY hot months.

Future Directions

- Detrend all states' monthly suicide numbers and redo our analysis
- Run analysis with other factors such as gun ownership, rurality, unemployment rate, etc.
- Run analysis with finer grained data—county level, daily temperatures

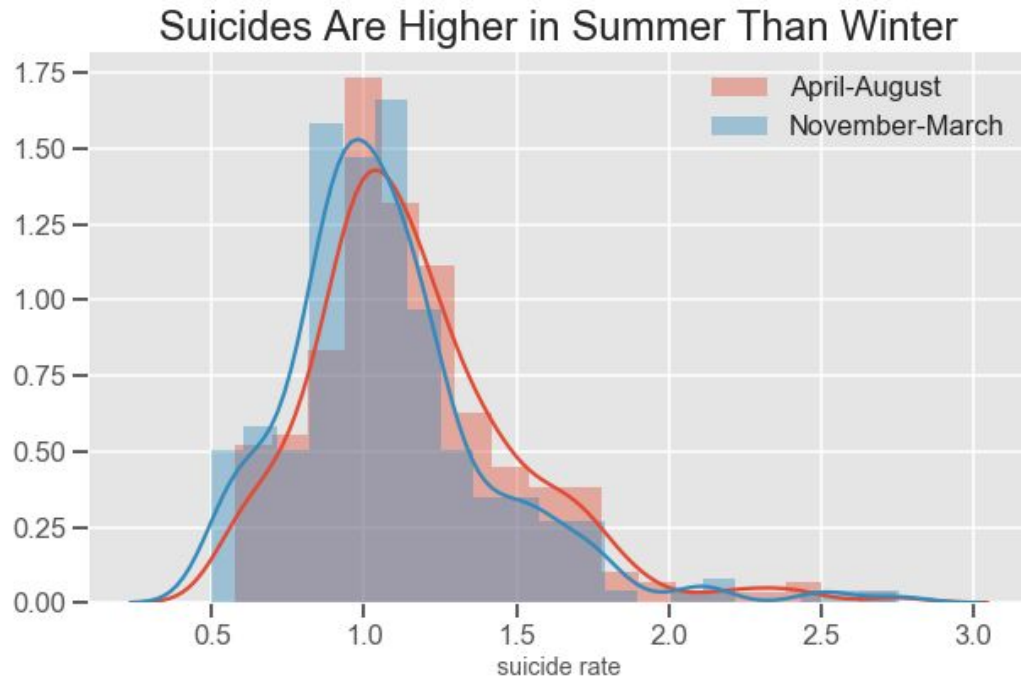
Thanks!



Additional Material

FINDING 1:

Suicides Are Higher in Summer Than Winter

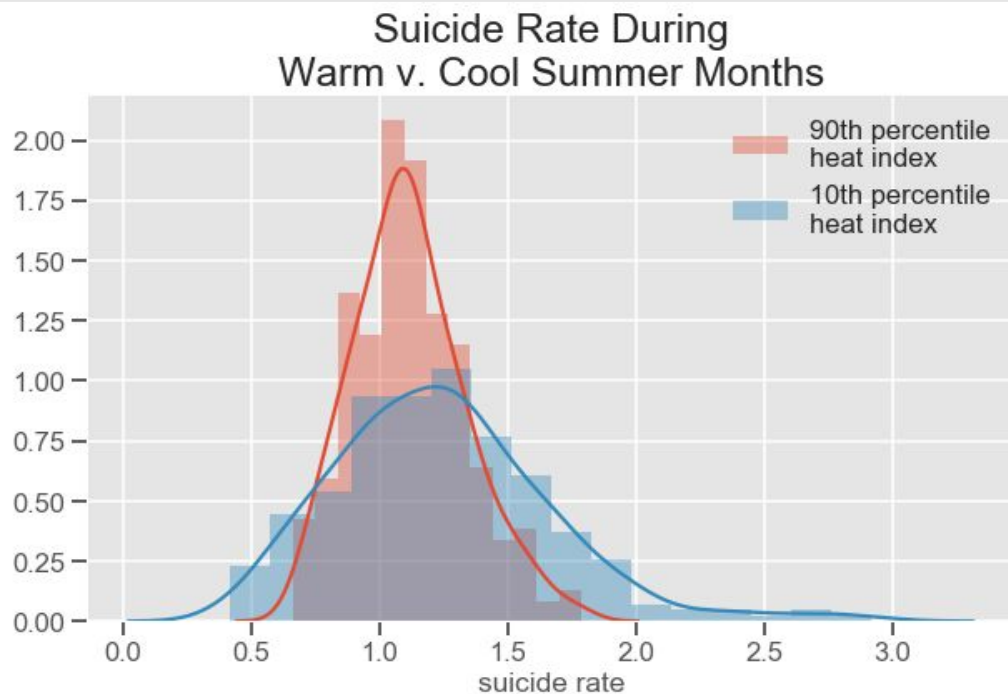


There is a small but statistically significant **higher rate of suicides** during **warmer** versus colder months.

One-tailed t-test: t-statistic: 2.652;
p-value: 0.004138193445808668
Cohen's D score: 0.245

FINDING 2:

Simply HOT vs. NOT does not matter



Suicide rates are not higher
when it's just very hot

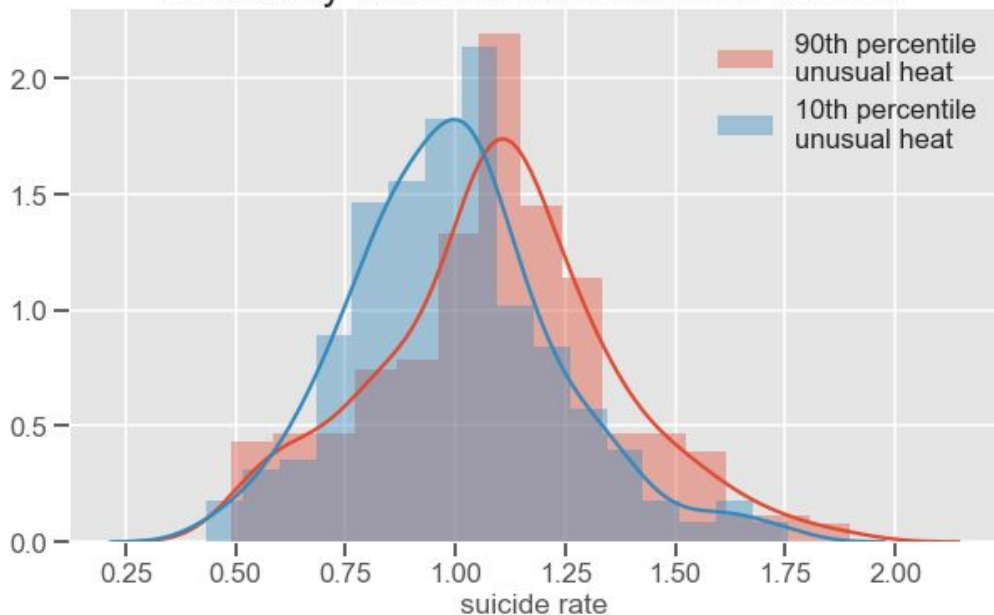
One-tailed t-test: t-statistic:
-4.330; p-value: 0.000009
Cohen's D score: 0.370

HOWEVER...

FINDING 3:

More Suicides in **UNUSUAL** Heat

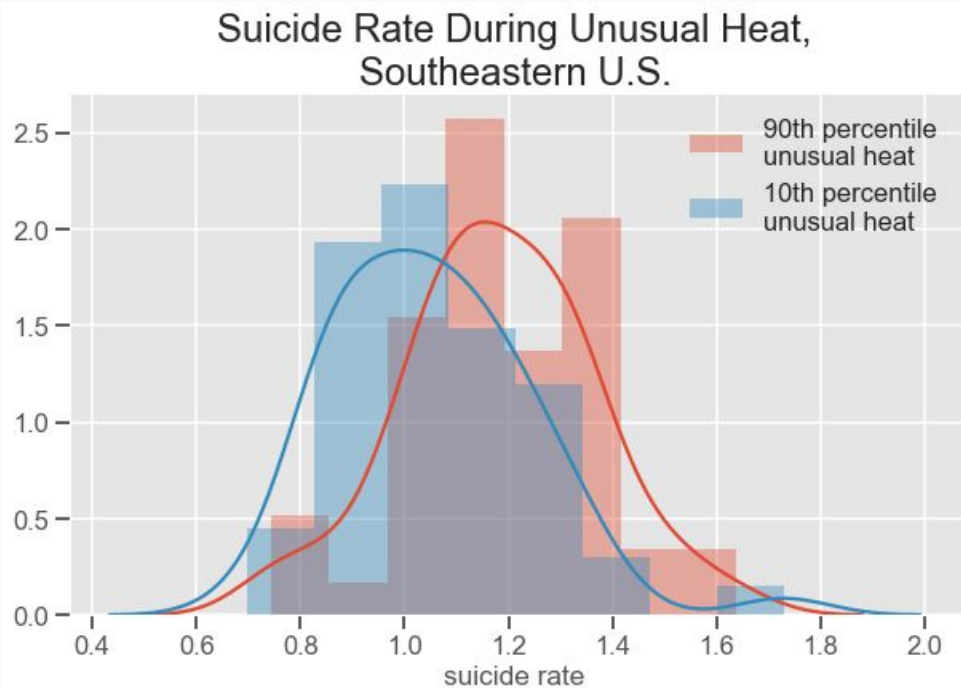
Suicide Rate During
Unusually Warm v. Cool Summer Months



Suicide rates **are higher**
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Significant but small.

One-tailed t-test: t-statistic: 4.594;
p-value: 0.000003
Cohen's D score: 0.394

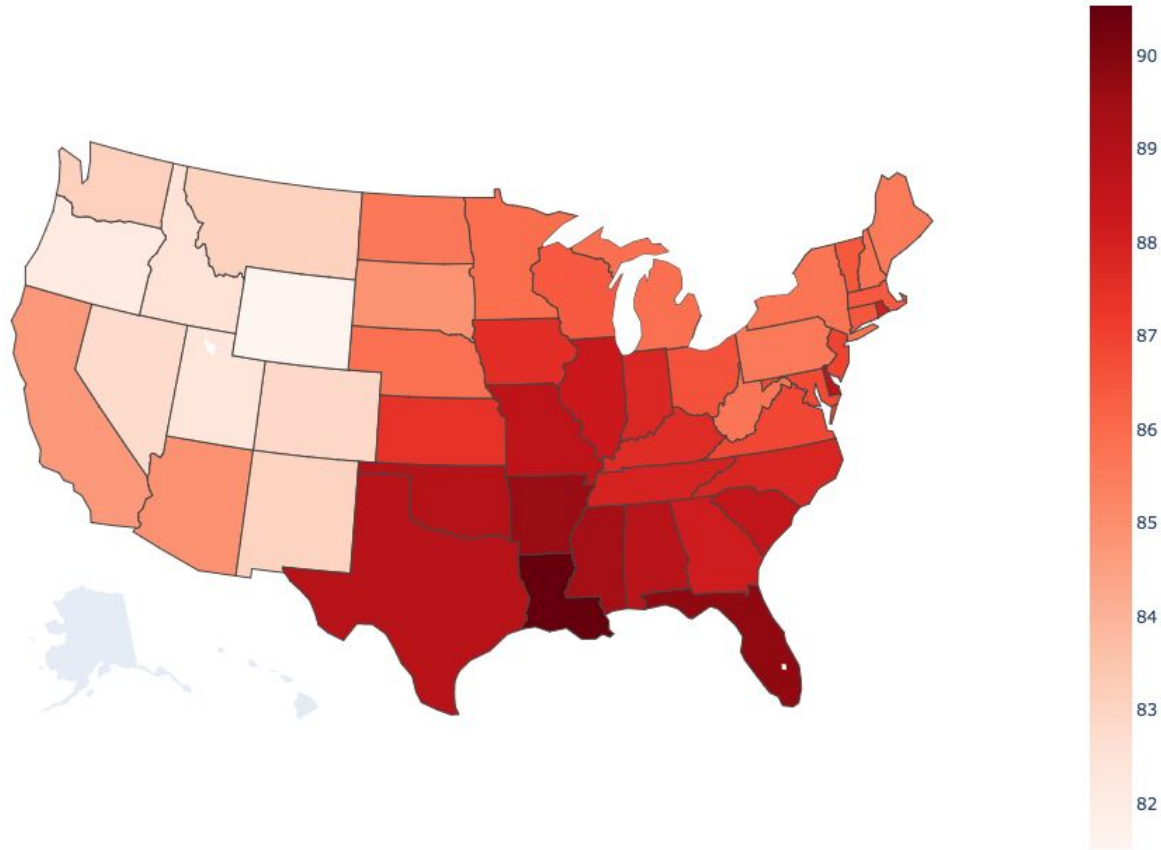
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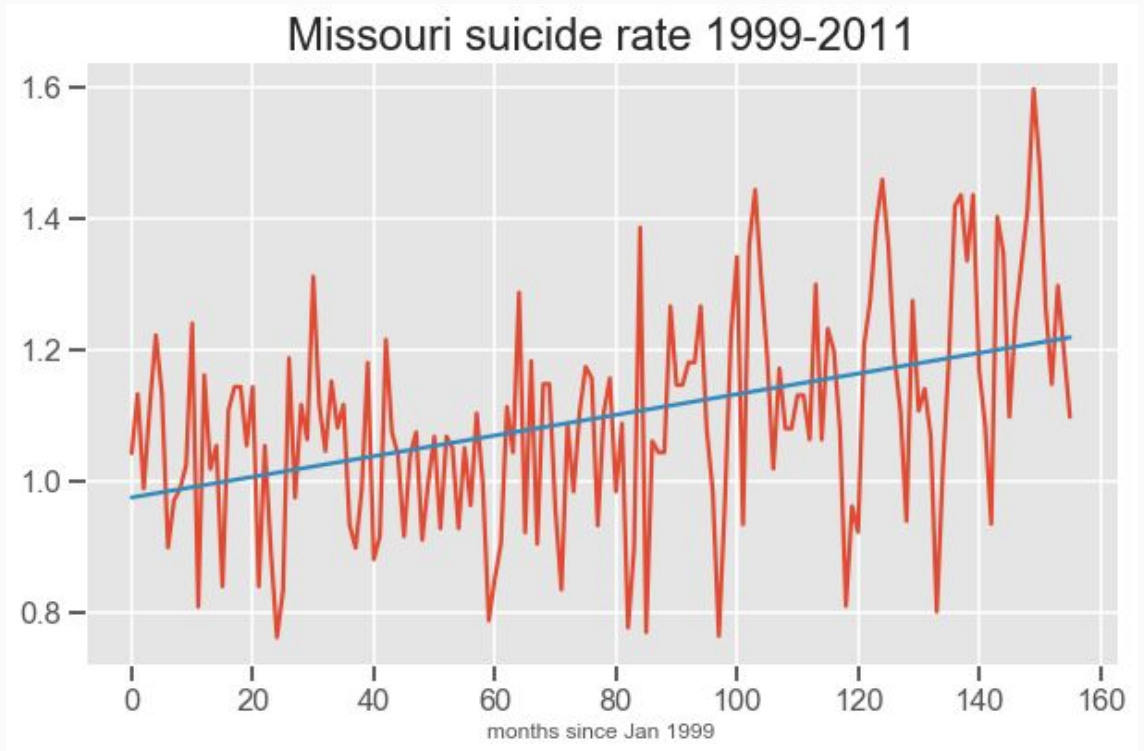
One-tailed t-test: t-statistic: 3.489;
p-value: 0.000358
Cohen's D score: 0.684

U.S. Heat Index

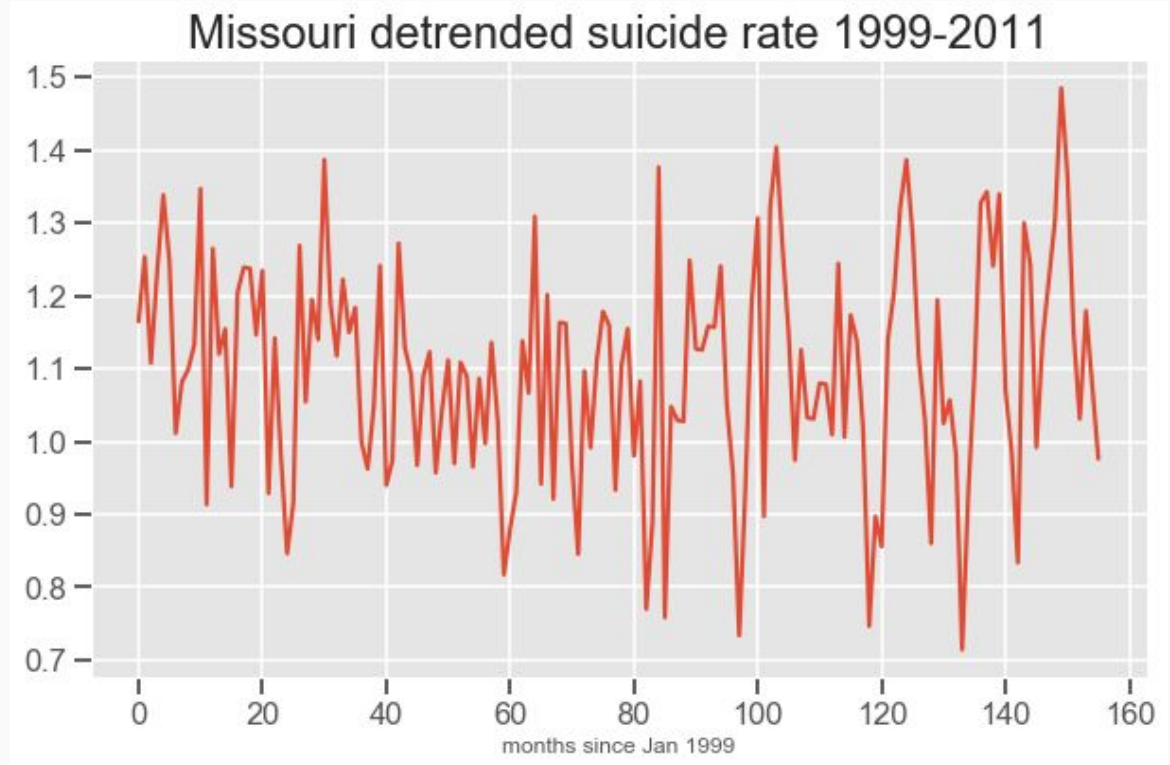


*Daily max heat index averaged per month, averaged over 1999-2011. Source: CDC

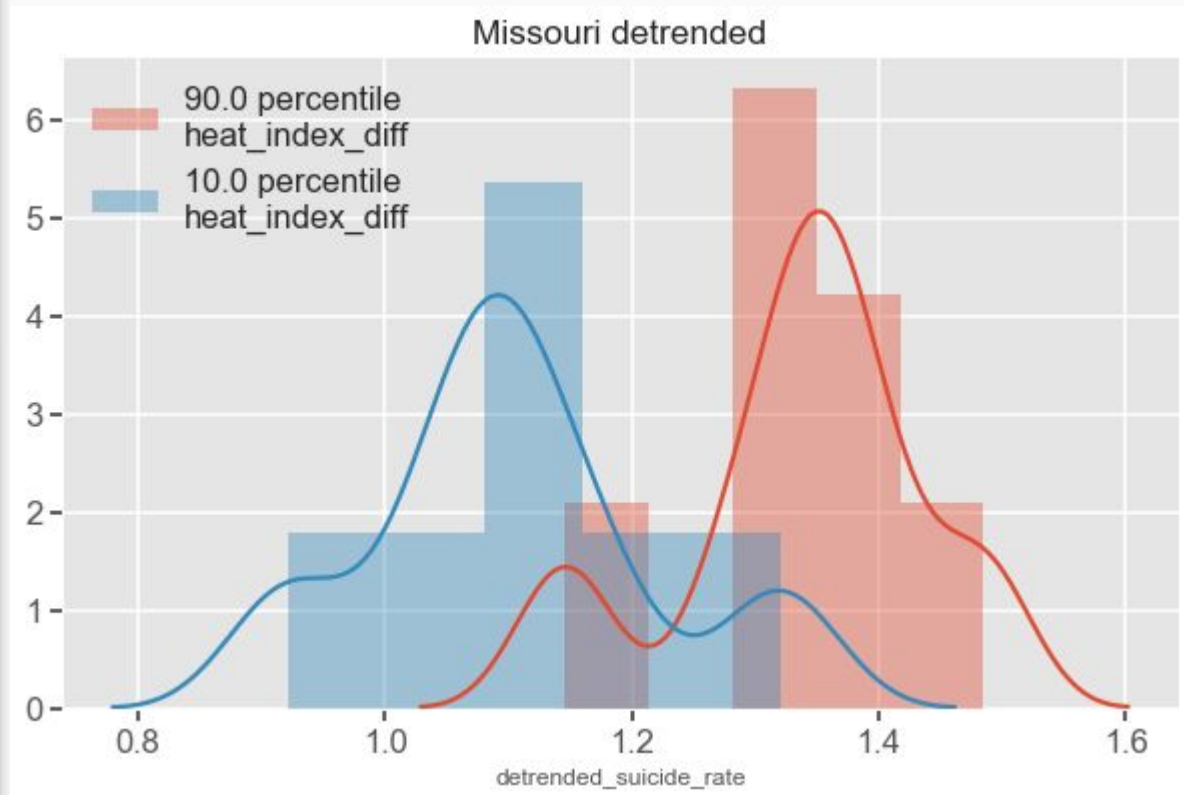
Detrending experiment



Detrending experiment



Detrending experiment



Definitions

★ Suicide rate

- For every state
- # of completed suicides / population

★ What is “unusual”

- For every state
- For every month
- Difference in the heat index (average of the max daily heat index over the month) for a given year from the average over all years
- “Climatic mean” = average over 1999-2011 for each month for each state