

Hot Weather and Restaurant Food Safety

Wendy McKelvey, PhD, MS
Bureau of Environmental
Surveillance and Policy

NYC Department of Health
and Mental Hygiene



Background

- Heat waves are becoming more frequent.
- Bacteria and some toxins proliferate more rapidly in a warm environment.
- 11% of New Yorkers reported getting sick from a restaurant meal in the past year, according to a recent survey.

Research Question

Are risk factors for foodborne illness in restaurants more likely during hot weather?

What we did...

Created a dataset from routine restaurant inspections.

Correlated temperature with related violations during warm months.

Conducted focus groups with restaurant operators to help interpret findings.

Maintaining safe food temperature is critical.

- Which violations are relevant?
 - Cold food held above 41°F
 - Hot food held under 140°F
 - Insufficient equipment for cold or hot holding
 - Cooling hot food outside ~6 hours
 - Not using time as a public health control

Exposure and Outcomes

- Inspections limited to warm season (May-Sep, 2011-2015)
- Exposure: Daily maximum temperature
- Outcomes:
 - Cold-holding $>41^{\circ}\text{F}$
 - Hot-holding $<140^{\circ}\text{F}$
 - No or insufficient refrigeration or hot holding equipment

The restaurants and inspections we used...

Restaurant Characteristics	N (%)
Total	29,614
Borough	
Manhattan	11,389 (38)
Brooklyn	7,430 (25)
Queens	6,872 (23)
Bronx	2,886 (10)
Staten Island	1,037 (4)
Chain Status	
No	26,507 (90)
Yes	3,107 (10)
Restaurant Type	
Quick Service	13,758 (46)
Full Service	11,160 (38)
Other	4,696 (16)

64,661 inspections	median per restaurant: 2 (range: 1-7)
Cold Holding Violations	29,614
Hot Holding Violations	13,499
Insufficient Equipment Violations	1,095

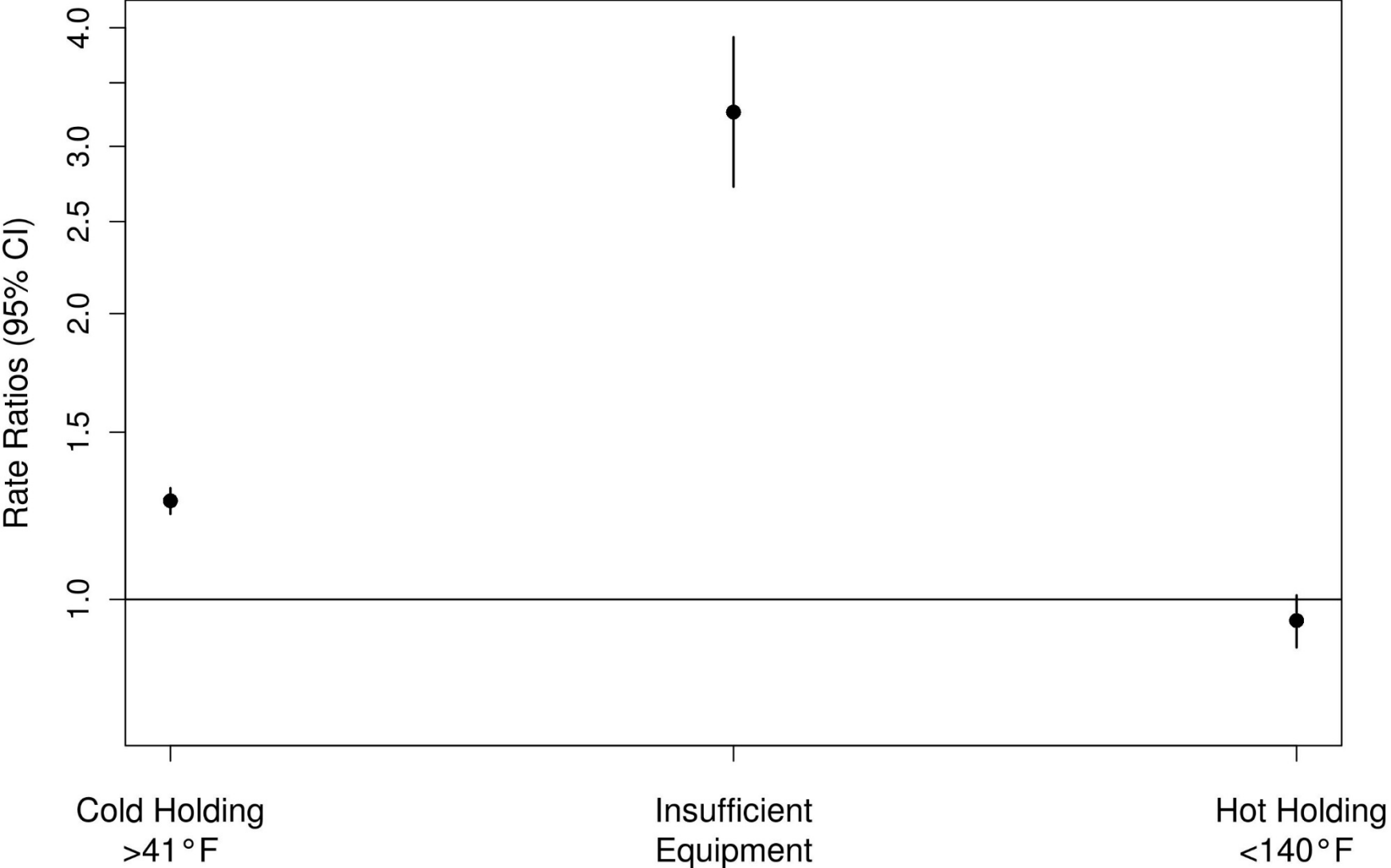
Statistical Analysis

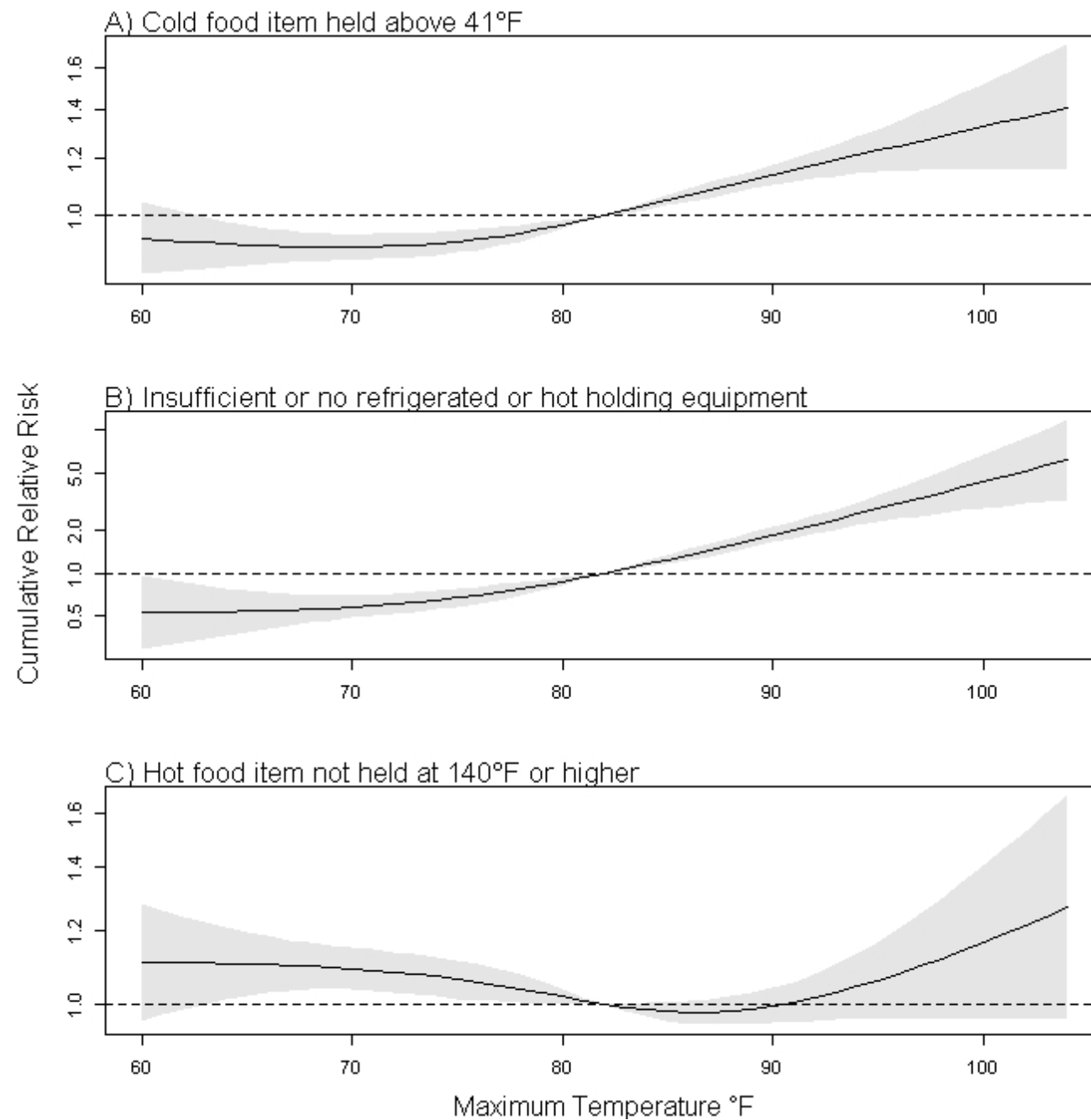
- We estimated crude rate ratios comparing violations on hotter days (temperature $\geq 95^{\text{th}}$ percentile) with cooler days (temperature $\leq 50\%$ percentile)
- We controlled for confounding using Poisson time series regression, trying 0-3 day lags.
 - Adjusted for day of week, holiday, calendar year and number of inspections conducted on a given day

Results from the crude analysis...

- Temperature
 - Median: 82°F (Range: 56-104°F)
 - 95th Percentile: 93°F
- Crude rate ratios for violations on hotter days:
 - Cold-holding >41°F: **1.27** (1.23, 1.31)
 - Insufficient equipment: **3.26** (2.72, 3.91)
 - Hot-holding <140°F: **0.95** (0.89, 1.01)

Risk of Violations on Hot Days ($\geq 93^{\circ}\text{F}$) vs. Cool Days ($\leq 82^{\circ}\text{F}$)





We asked 17 restaurant operators how they prepare for or respond to a heat emergency...

- Move food to reliable units or add ice to keep temperatures lower in refrigerators.
- No plans for hot weather or power outages and limited knowledge on ensuring food safety during power outages.
- Many expressed interest in receiving easy-to-access checklists.

Limitations

- Violations are only a snapshot of restaurant operations.
- Refrigeration and hot holding equipment violations are cited together.
- Did not account for same restaurants having multiple inspections during the study period.
- Could not model variation of effects across different types of restaurants.

We published findings in Journal of Food Protection.

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Research Paper

Hot Weather Impacts on New York City Restaurant Food Safety Violations and Operations

CHRISTINE DOMINIANNI,* KATHRYN LANE, MUNERAH AHMED, SARAH JOHNSON, WENDY McKELVEY,
AND KAZUHIKO ITO

*New York City Department of Health and Mental Hygiene (NYC DOHMH), Bureau of Environmental Surveillance and Policy, 125 Worth Street,
New York, New York 10013, USA*

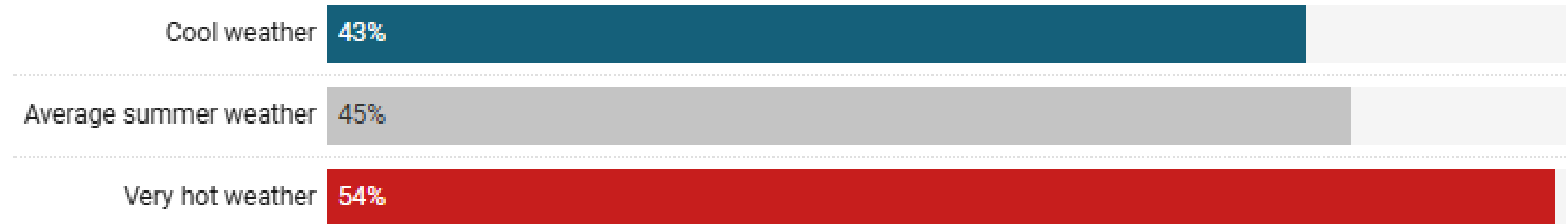
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ABSTRACT

We also released a data story for the general public on our public data portal.

Hot weather means more cold food holding violations

Percent of inspections with cold food holding violations



Recommendations

- Ensure equipment is working properly:
 - Refrigeration maintenance before the summer
 - Monitor temperature of equipment
- Monitor temperature of foods in hot storage and during cooling
- Have an emergency plan in case of a power outage:
 - Keep refrigerator and freezer doors closed
 - Do not place hot foods in refrigerators
- To DOHMH: Disseminate information:
 - Email/newsletters
 - Postcards/fliers/magnets
 - Checklists

Thank you!

**Environment and
Health Data Portal**

