Retail Cooling: Beyond the Code

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The Problem

- Improper cooling of hot foods is a significant cause of outbreaks
  - Nationally 10% of outbreaks cooling too slow identified as top contributing factor
  - 10% outbreaks in Minnesota are bacterial intoxications
- Even with current code requirements for cooling, restaurants are struggling.
  - FDA Risk Factor study 78% restaurants were failing

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Cooling is Difficult

- Requires extensive monitoring over a six-hour period
- Restaurants are a dynamic setting and difficult to monitor times and temps
- Multiple method options for cooling, varying results of success
- Inspectors have a hard time verifying if proper cooling occurred

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You can’t inspect what you can’t see

Minneapolis (3,532 inspections):

- 71.4% routine inspections cooling was “not observed”
- 15.1% out of compliance

MDH (42,000 inspections):

- 82% of routine inspections cooling was “not observed”
- 20% out of compliance

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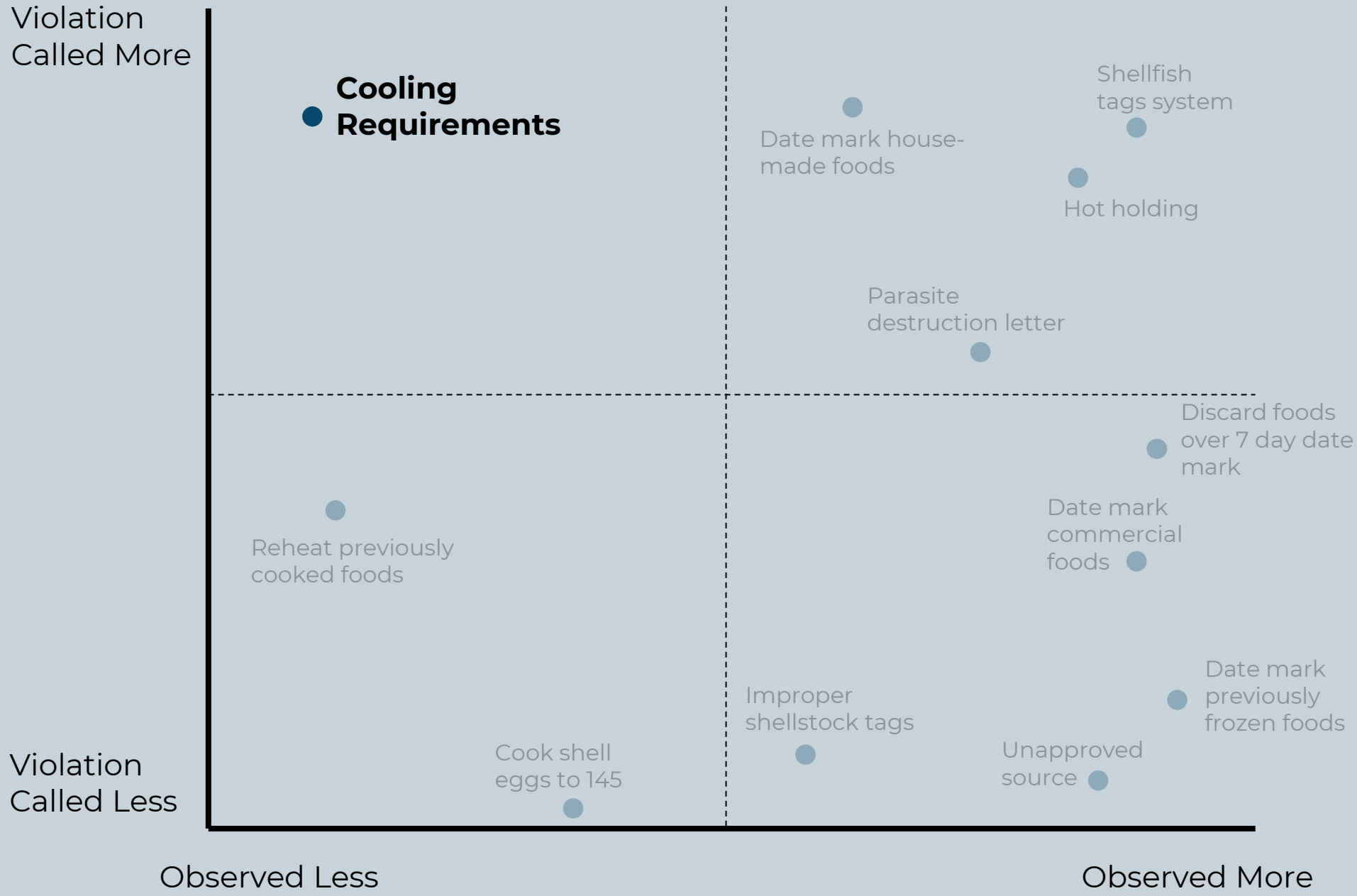

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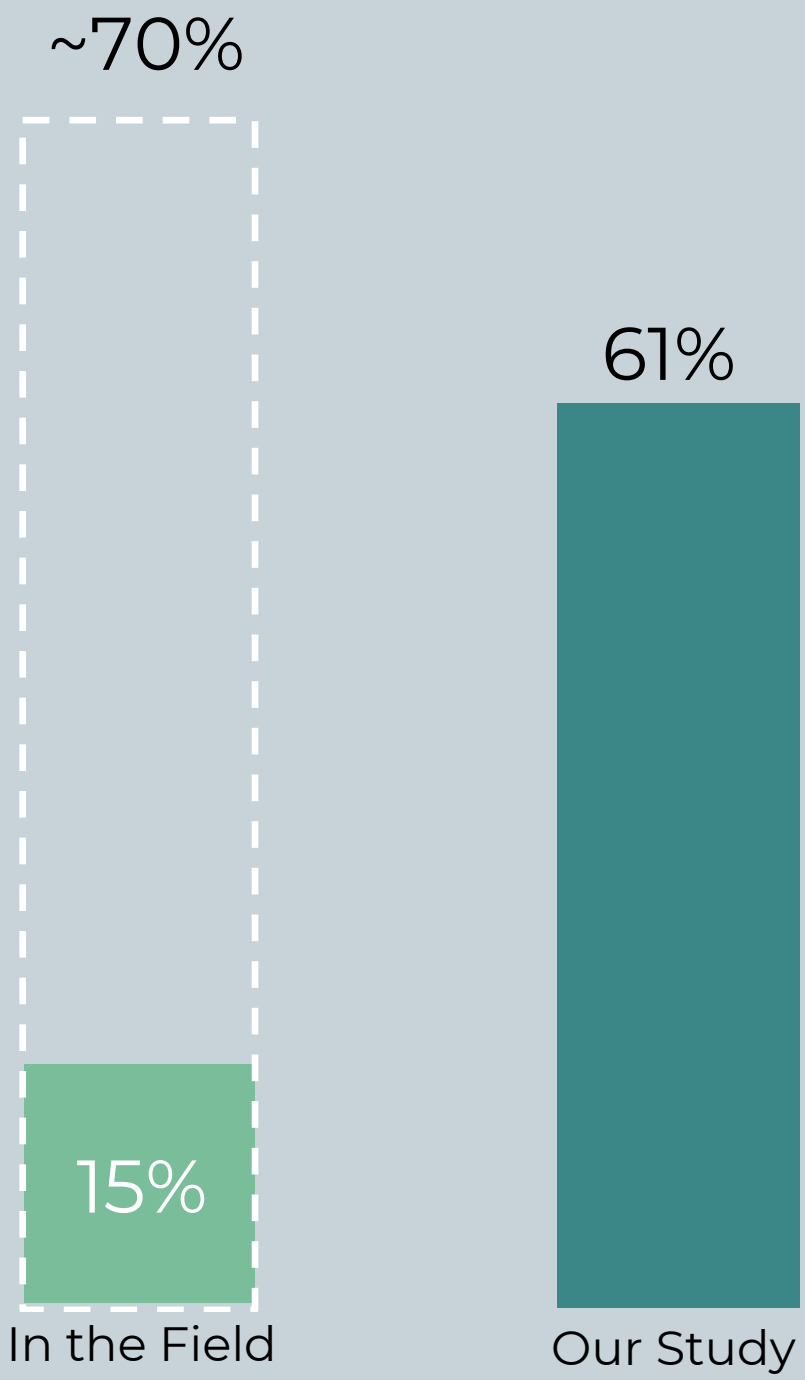

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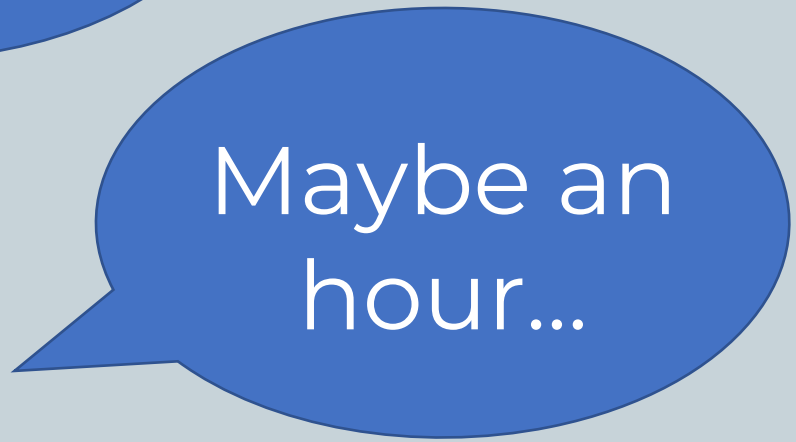
The basis for determining IN or OUT of compliance can also be supported through discussion and/or record review which would provide the inspector reliable data of the “start time” for cooling.



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Cooling Log

The total cooling time for time/temperature control for safety (TCS) foods may not exceed 6 hours.

TCS foods must be cooled from 135 °F to 70 °F WITHIN 2 hours, and from 70 °F to 41 °F WITHIN the remaining 4 hours.

Check TCS food temperatures BEFORE 2 hour limit and BEFORE 6 hour limit.

TCS foods may be reheated to 165°F ONLY if reheating is done before 2 hours.

After 2 hours, TCS foods not cooled to 70°F must be discarded to prevent foodborne illness from spore-forming bacteria.

TCS foods which do not cool to 41°F or below in 6 hours must be discarded to prevent foodborne illness.

				135°F - 70°F within 2 hours			70°F - 41°F within 4 hours						
Date	**Food**	**Cooling Temps BEFORE 135°F**	**Time Food is 135 °F**	**1 Hour**	**2 Hour must be 70°F or lower**	**Correct-Reheat**	**3 Hour**	**4 Hour**	**5 Hour**	**6 Hour must be 41°F or lower**	**Correct-Discard**	**Intials**	**Verified By / Date**
1-Jun	RICE	192°, 167°, 151°	time: 2:10	3:10	4:10	none needed	5:10	6:10	7:10	8:10	none needed	L.P.	S.N. 1 Jun
			temp: 135°	84°	62°		55°	47°	43°	39°			
			time:										
			temp 135°										
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			time:										
			temp 135°										

Cooling Methods: Ice bath Ice wands Metal containers Stirring Food in shallow pans Add ice to food

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www.minneapolismn.gov/foodsafety

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Para asistencia 612-673-2700, Rau kev pab 612-673-2800, Hadii aad Caawimaad u baahantahay 612-673-3500.

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3-501.15A Cooling must be accomplished according to the time and temperature criteria in part 4626.0385 by using one or more of the following methods based on the type of food being cooled:

(1) placing the food in **shallow** pans;$_{P2}$
(2) separating the food into **smaller** or **thinner** portions;$_{P2}$
(3) using **rapid cooling equipment**;$_{P2}$
(4) stirring the food in a container placed in an ice water bath;$_{P2}$
(5) using **containers that facilitate** heat transfer;$_{P2}$
(6) adding ice as an ingredient;$_{P2}$ or
(7) **other** effective methods.$_{P2}$

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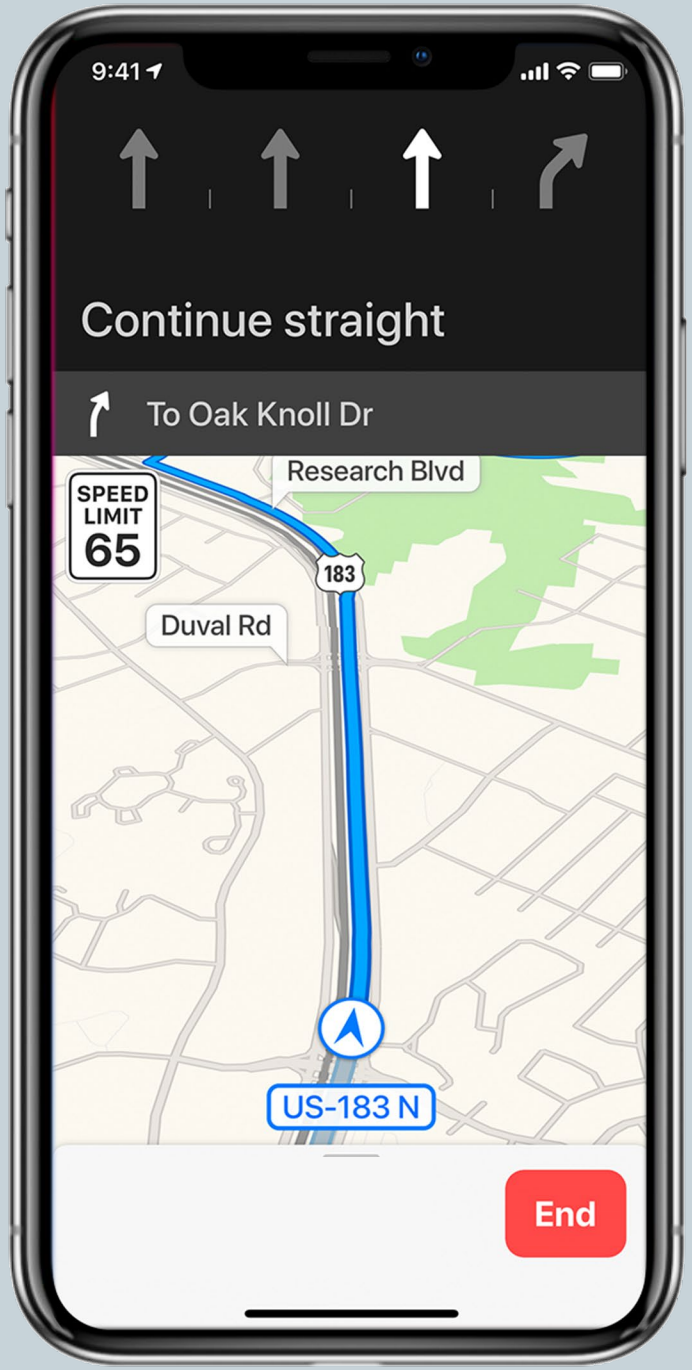

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EHS Net Study

“Quantitative Data Analysis To Determine Best Food Cooling Practices in U.S. Restaurants”

Schaffner, Hedeen, et all., 2013

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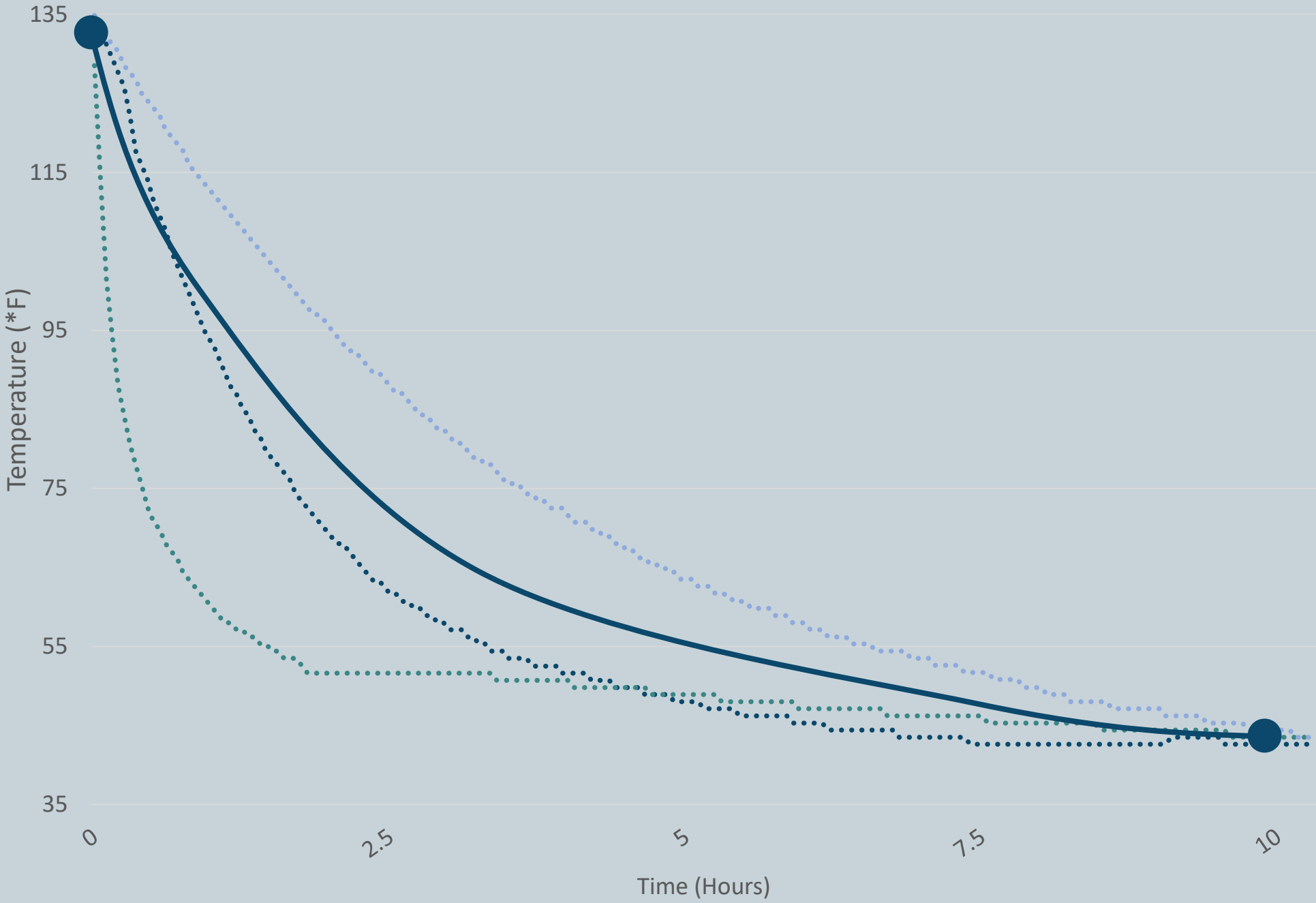

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Type of Cooling Unit		Container Type (Metal or Plastic)	
Covered? (Yes, No, Partial)		Mixed? **	
Ice as Ingredient? **		2 Inch Air Gap?	

Ice Wand Used? **		If so, used correctly?	
Ice Bath Used?**		If so, used correctly?	
Substance (Solid or Liquid)		If liquid, consistency? (smooth or chunky)	
Food Depth (In.)		Surface Area (Sq. In.)	
Sample Volume (mL)		Sample Mass (g)	
Ambient Air Temp of Cooling Unit			

** No, Observed, or PIC COnfirmed

Notes/ Narrative	


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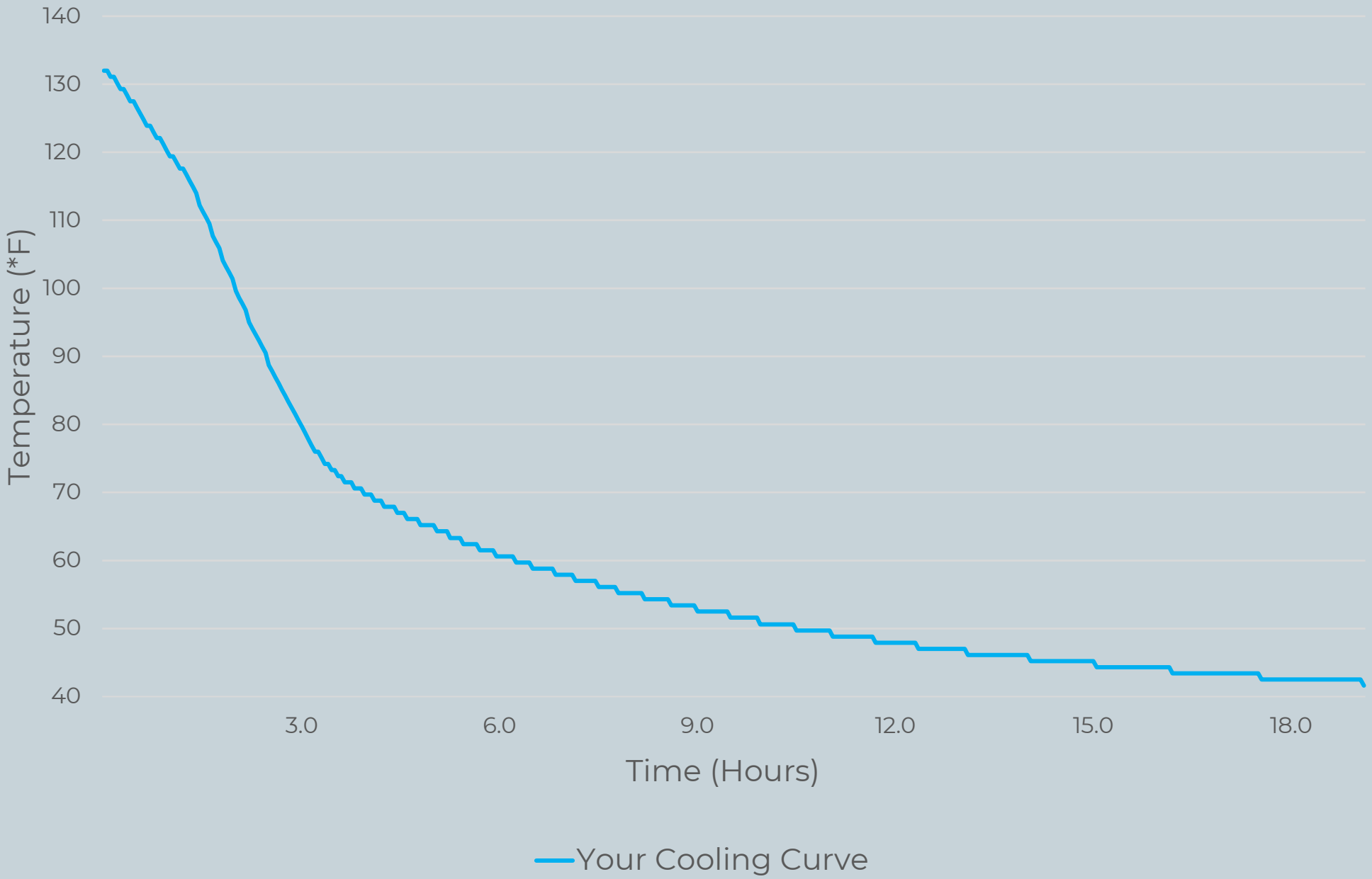
Chicken Curry Cooling Curve

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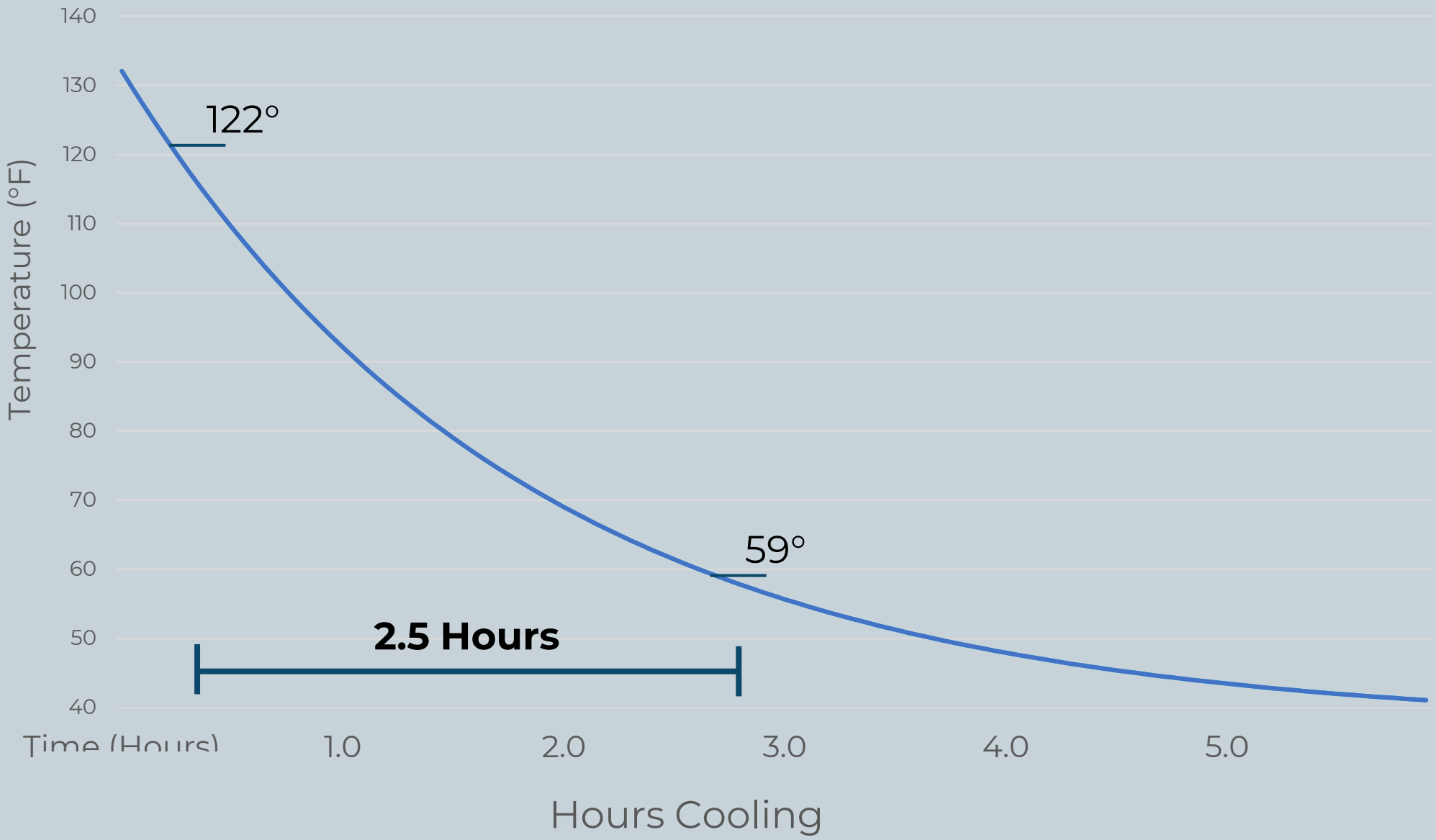
Food Code Minimum Required Cooling Curve



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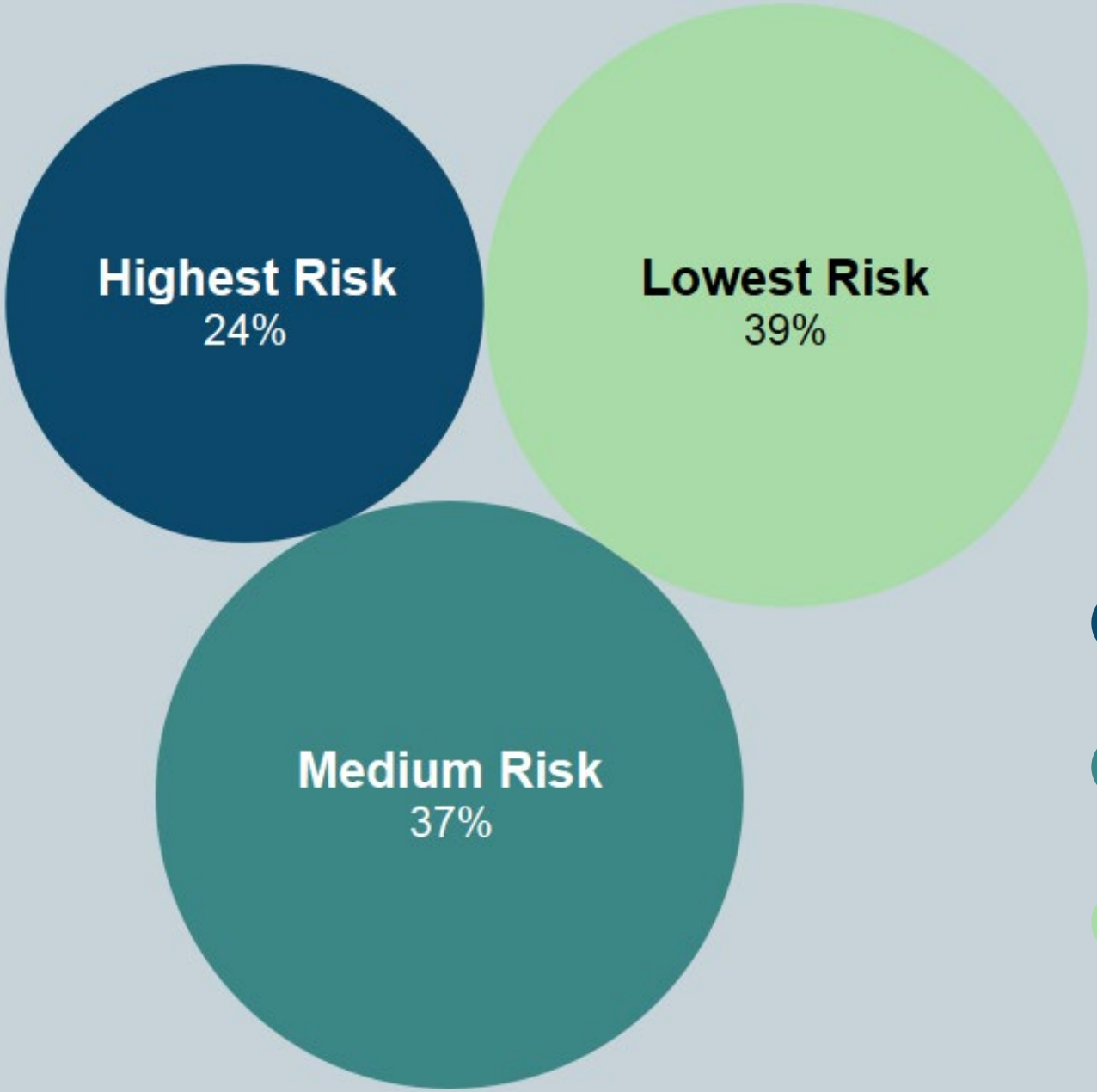

- Highest Risk
  >5 hours in high risk
- Medium-most Risk
  2.5-5 hours in high risk
- Lowest Risk
  <2.5 hours in high risk

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3-501.15B (Cooling Methods Subpart B)

B. When placed in cooling or cold holding equipment, food containers in which food is being cooled must be:

(1) arranged in the equipment to provide maximum heat transfer through the container walls; and
(2) loosely covered or uncovered if protected from overhead contamination as specified in part 4626.0300, item A, subitem (2), during the cooling period to facilitate heat transfer from the surface of the food.

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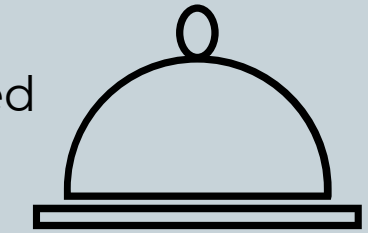
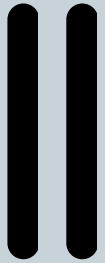
3-501.15B (Cover & Gap)

12% covered



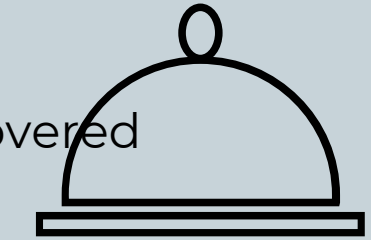
5.1 hours average

21% no air gap



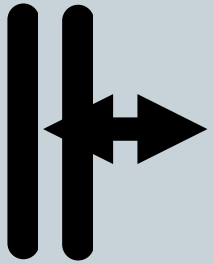
5.1 hours average

88% uncovered



3.5 hours average

79% air gap



3.3 hours average

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Two Cooling Concepts

Passive
65%

Active
35%

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Summary of Passive Data

- It's popular
  - Minneapolis survey
  - Washington State risk factor
- 143 total curves
  - 76 Complete FDA cooling curves
  - 103 Complete C. perfringens growth range curves
- Industry already skews greatly to metal
- 36% filled to depths at or below 2 inches

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How is passive cooling regulated?

- Program Manager Survey
  - ~60% don't suggest a max fill depth
  - ~40% do suggest a max fill depth
  - **Equally distribution from 2-4 inches**
- Factsheet summary (multiple sources)
  - 66% suggest a max fill depth
  - 33% don't suggest a max fill depth
  - **Equally distribution from 2-4 inches**
- Everyone is guessing = dangerous consequences
  - 2 inches = very low risk, if any at all
  - 4 inches = Almost 90% failure rate and roughly 50% chance of double failure
  - **High occurrence rate = 50%!**

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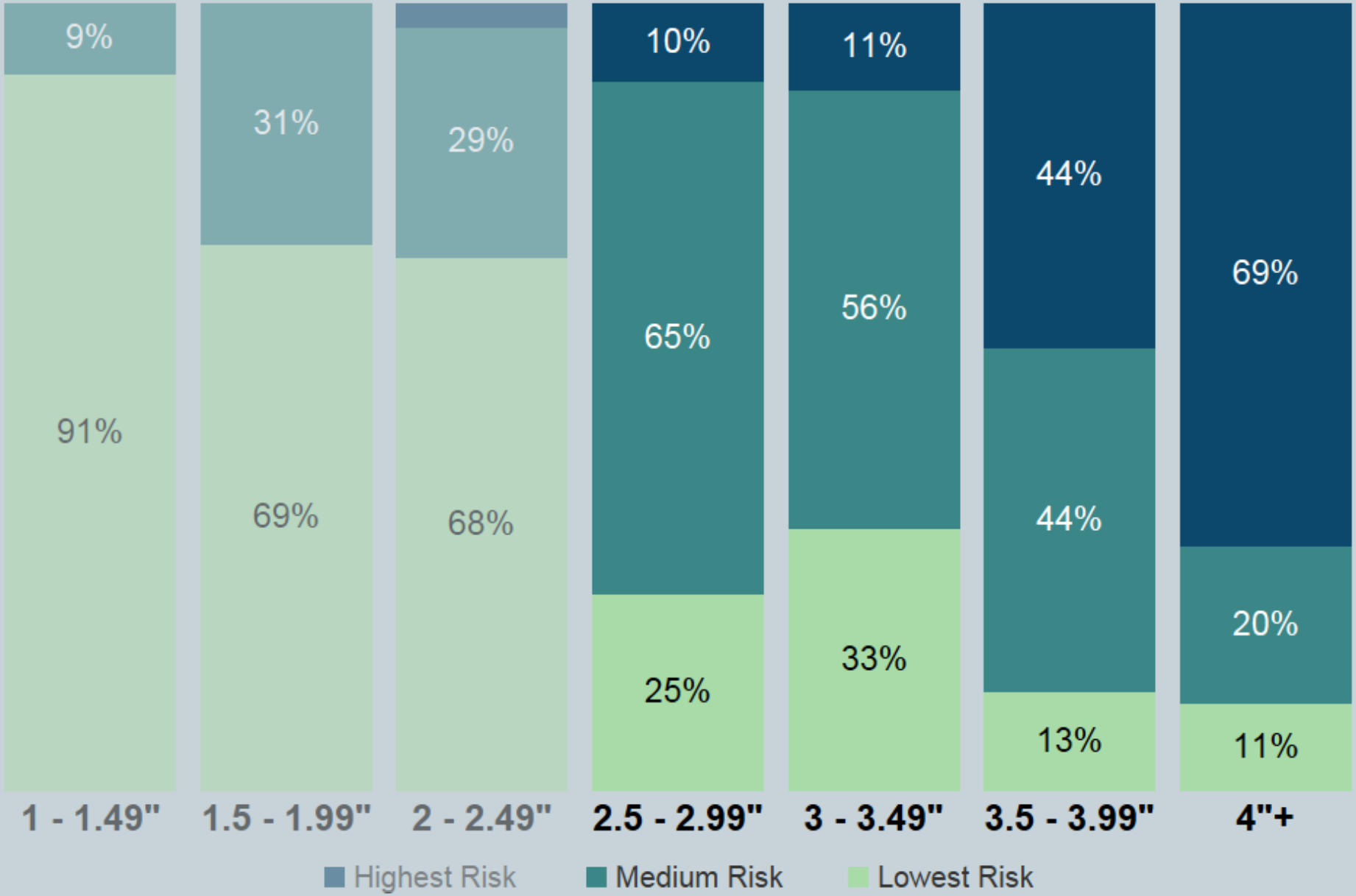
Passive Technique and Fill Depth



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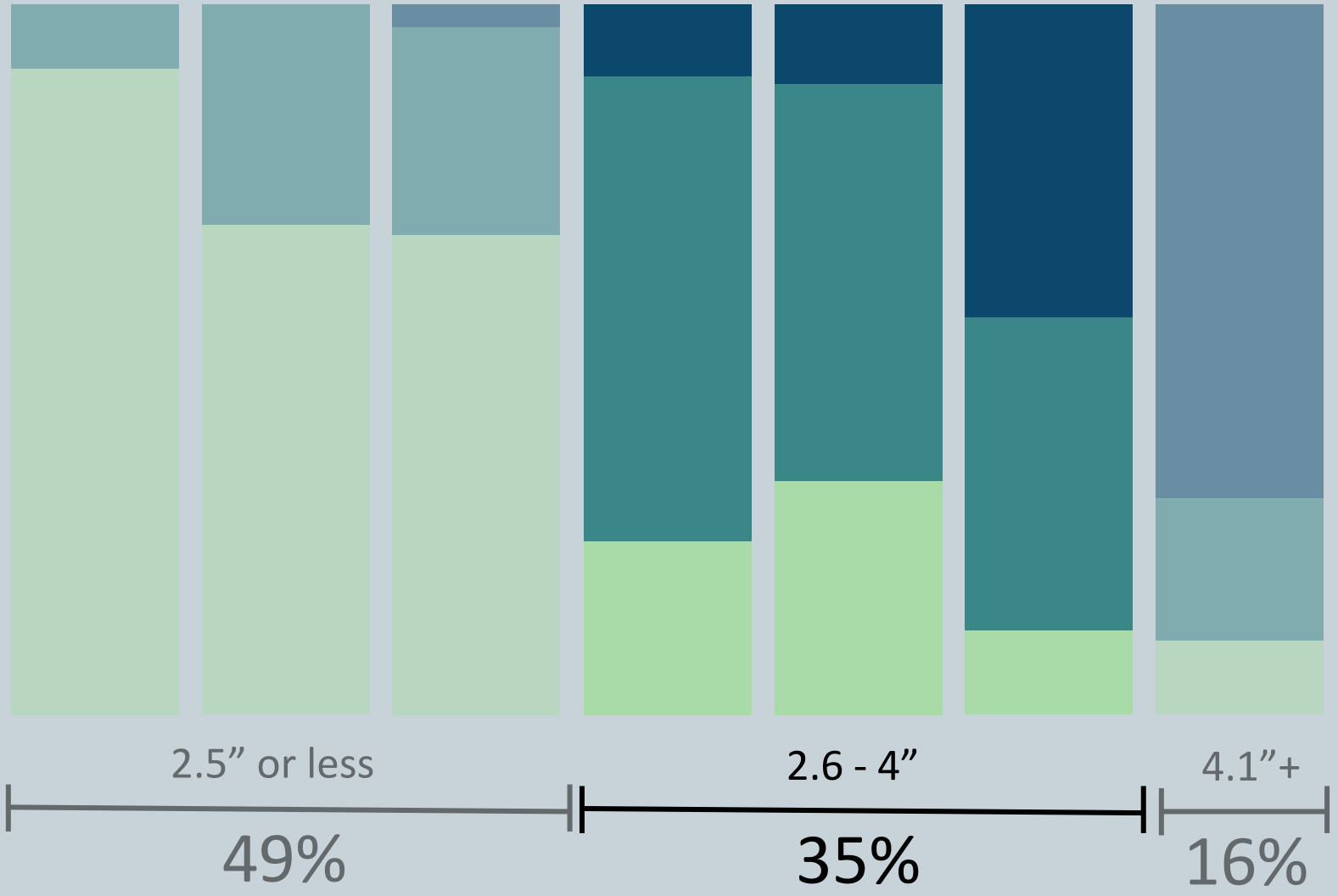
Shallow Defined



9.2 Hours Avg. Cooling Time

3.5 Hours Avg. High Risk Time

88% Failure Rate

Which Variables Matter?

- Required Variables (Subpart B reminder)
  - Uncovered = .646
  - Air Gap = .112
- Variables impacting passive technique
  - **Depth = .001**
  - Container Type = .629
  - Mixing = .798
  - Air Temperature = .305

Washington as a Model

3-501.14 Cooling.

(A) Except as specified under (B) of this section, cooked TCS food must be cooled:

within 2 hours from 135 degrees F (57 degrees C) to 70 degrees F (21 degrees C);$_{P1}$ and

(2) within a total of 6 hours from 135 degrees F (57 degrees C) to 41 degrees F (5 degrees C) or less.$_{P1}$

(B) As an alternative to the cooling provisions of subsection A of this section, cooked TCS food must be cooled at a depth of two inches or less, uncovered, in refrigerated equipment that maintains an ambient air temperature of 41 degrees F (5 degrees C).

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2-inch Support

Food Depth (Inches)	Perf predictor Log Increase	Recipe
2	**1.87**	**Sausage Gravy***
2	0.652	Garden Veggie Soup
2	0.18	Chicken Curry
2	0.081	Tomato Soup
2	0.242	Corn Chowder
2	0.479	Chorizo
2	0.028	Cherry Compote
2	0.028	Black Beans
1.75	0.11	Chicken Rice
1.5	0.02	Empanadas
1.5	0.011	Ground Beef
1.5	0.018	Mushroom Sauce
1.5	0.013	Mushroom Sauce #2
1.5	**1.28**	**Shallow Kraut***
1.5	0.138	Marinara
1.5	0.202	Marinara
1.5	0.123	Au Jus
1.5	0.115	Cheese Sauce
1.5	0.089	Squash Soup
1.5	0.008	Butternut Squash Soup
1.5	0.005	Mashed Potatoes
1.5	0.004	Turkey Chili
1.5	0.167	Refried Beans

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Cooling in Shallow Pans

The most effective method to cool food is in shallow pans. Fill the pan two inches deep or less.

When cooling in a shallow pan:

- Fill the pan two inches deep or less.
- Keep food uncovered while it is cooling.
- Keep two inches of space around the pan.

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Active Technique Options

24% of recipes used an **Ice Bath**

19% of recipes used an **Ice Wand**

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How do we inspect ice baths?

- **Ice Bath <u>without</u> a wand at depths above 4 inches**
  - This is the riskiest method we observed.
    - Median total cooling 11.6 hours
    - 94% failure rate
    - Negatively associated with success
  - But what if they mix it?
    - No mathematical support
    - Insignificant P value
    - Inconsistent

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How do we regulate ice wands?

- Very inconsistent results by themselves (no ice bath)
- **Ice bath <u>without</u> a wand above 6 inches:**
  - Food fill depths above 6 inches without a significant help.
  - Melted wands
  - Premature storage mode (probably calling both 3-501.15 A and B).

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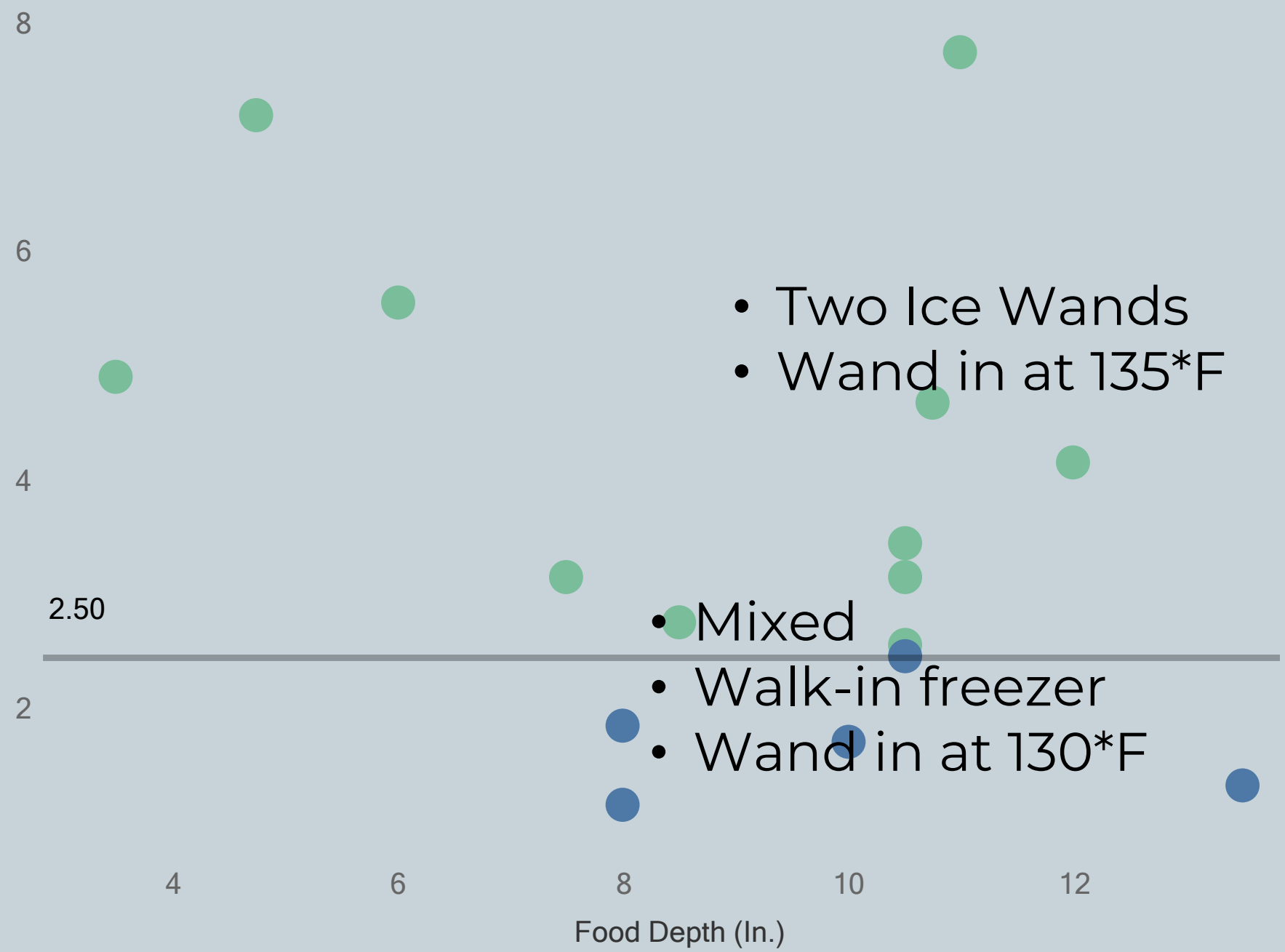
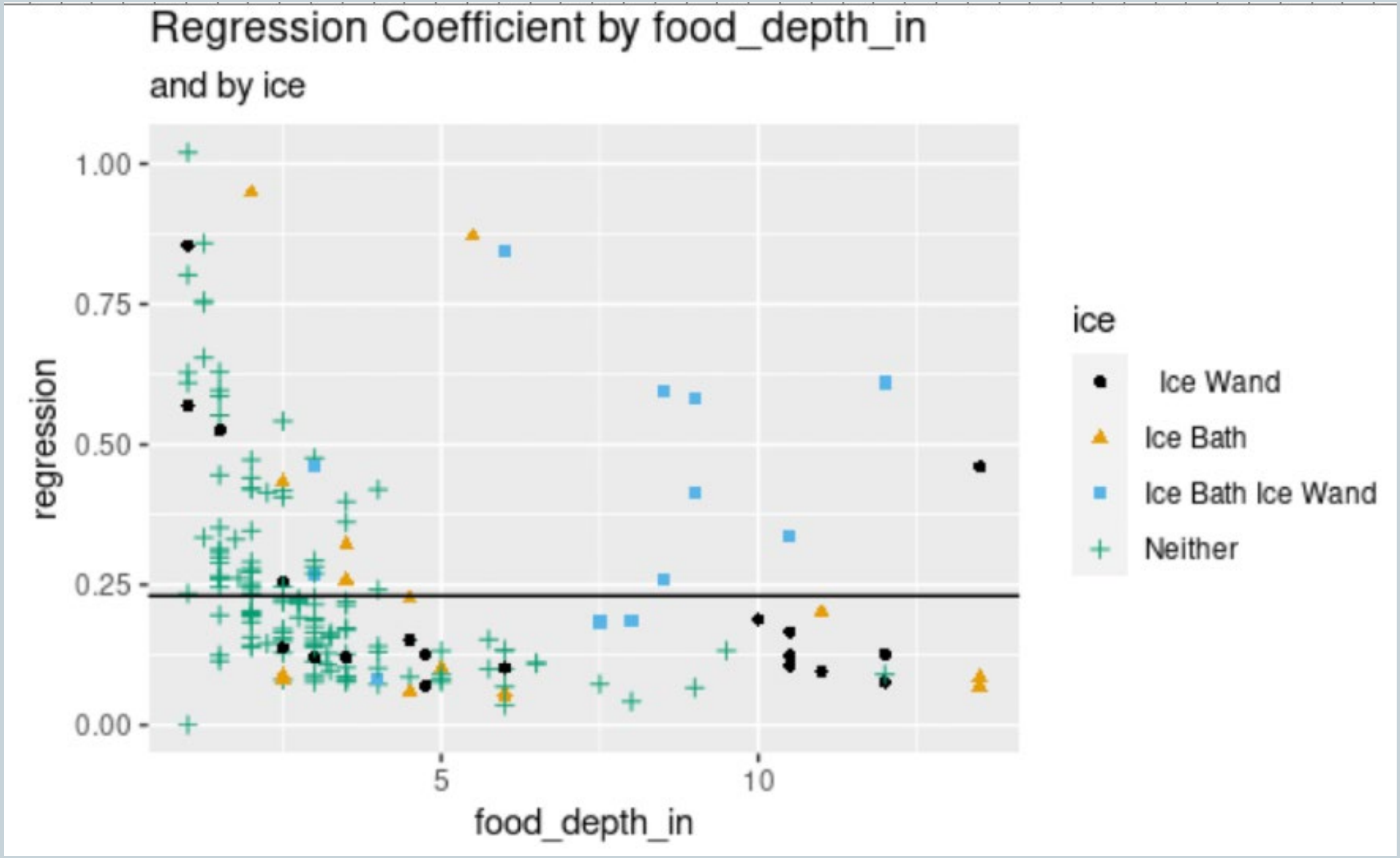
- Same operator
- Add ice
- Walk-in freezer
- Half size Cambro



- Two Ice Wands
- Wand in at 135*F

- Mixed
- Walk-in freezer
- Wand in at 130*F


Regression Coefficient by food_depth_in
and by ice
1.00
0.75
0.50
0.25
0.00
regression
5
10
food_depth_in
ice
Ice Wand
Ice Bath
Ice Bath Ice Wand
Neither

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Recommended Active Cooling Method

- Combine Wand with Bath
- Replace the wand as it melts
  - First hour
- Replenish the bath as it melts
  - First hour
- Stick with the method until food is completely cooled
  - Reintroduces the need to monitor (therefore passive is considered the best way to rapidly cool foods)
  - This will take 4-6 hours to complete (premature storage mode was commonly seen)

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Cooling with Ice

Cooling food with ice needs regular attention and will take several hours.

When cooling with ice:

- Use both an ice wand and an ice bath.
- Add more ice as the ice bath melts.
- Replace the ice wand as it melts.
- Keep using this process until the food is 41° F or below.

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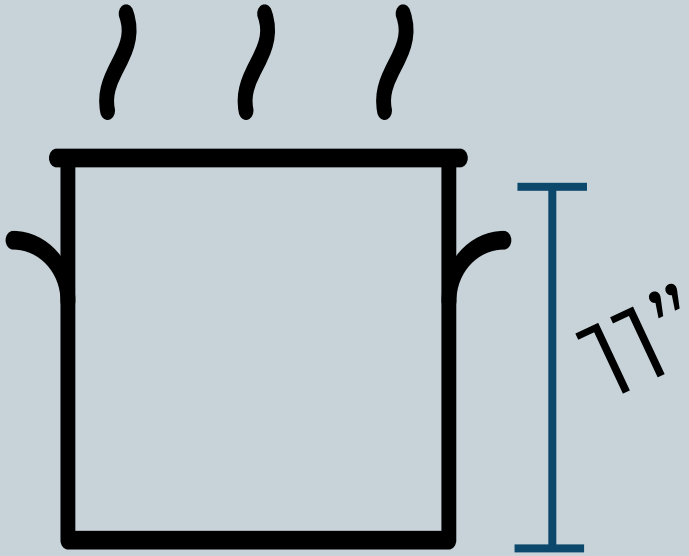
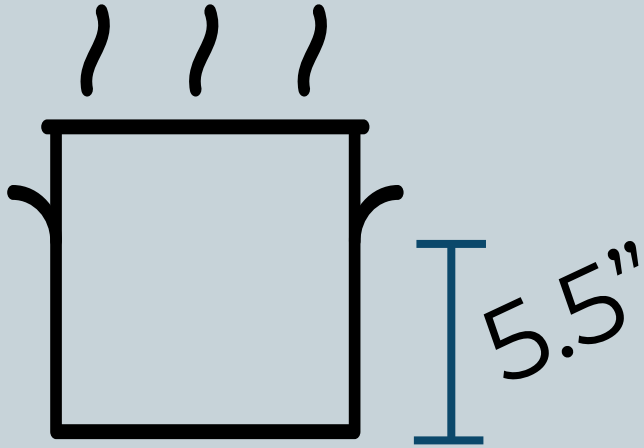
Should I Vent?



190*F-135*F

6 hours



160*F-135*F

3 hours

Stock Pot by Michael Finlay from Noun Project

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Should I Vent?

First Attempt:
Walk-in
90 minutes
135-75 F

Second Attempt:
Vented
45 minutes
135-75 F

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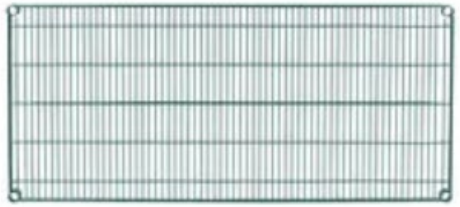
Are Cooling Modifications Expensive?

Steelton 20 Pan End Load Bun / Sheet Pan Rack - Unassembled

plus

#109RACKECON

$119.99/Each



COLORS

Metro 2448NK3 Super Erecta Metroseal 3 Wire Shelf - 24" x 48"

plus

#4612448NK3

$82.50/Each

Choice Full Size 2 1/2" Deep 24 Gauge Anti-Jam Stainless Steel Steam Table / Hotel Pan

plus

#4070029

FROM

$9.47/Each

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That's going to take so many pans though…

Steam Table Pan Capacity							
Pan Size	Depth	Full Topped-off Capacity			85% Capacity		
		Cup	Qt	Ltr	Cup	Qt	Ltr
Full/Hotel Pan	2"	33.2	8.3	7.9	28.2	7.1	6.7
	4"	56.0	14	13.25	47.6	11.9	11.3
	6"	84.0	21	19.87	71.4	17.9	16.9
Half Pan	2"	17.2	4.3	4.07	14.6	3.7	3.5
	4"	26.8	6.7	6.34	22.8	5.7	5.4
	6"	40.0	10	9.46	34.0	8.5	8.0
Torpedo Pan	1"	8.4	2.1	1.99	7.1	1.8	1.7
	2"	14.8	3.7	3.5	12.6	3.1	3.0
	4"	22.8	5.7	5.39	19.4	4.8	4.6
	6"	32.8	8.2	7.76	27.9	7.0	6.6
Two-thirds Pan	1"	16.0	4	3.79	13.6	3.4	3.2
	2"	22.4	5.6	5.3	19.0	4.8	4.5
	4"	37.2	9.3	8.8	31.6	7.9	7.5
	6"	56.0	14	13.25	47.6	11.9	11.3
Third Pan	2"	10.4	2.6	2.46	8.8	2.2	2.1
	4"	16.4	4.1	3.88	13.9	3.5	3.3
	6"	24.4	6.1	5.77	20.7	5.2	4.9

2-inch fill = ~ 2 Gallons

Convert a full 22 Quart
Cambro into 3 hotel pans

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Strengthen Your Inspections Through Observations

- Conduct initial walkthrough
- Review all cooling steps
- Temp food with a purpose
  - Consider temperature variance
- Small wares inventory

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Strengthen Your Inspections Through Observations

- Supporting data and questions
- Be patient with data points
- Avoid asking “When did you cook this?”
- Ask When and Who?
- Discuss recipe yield and frequency
- Be confident!

Approaching Department Changes: Policy

- Interpret 3-501.15A in a way that defines shallow
- Call method violations without cooling data points
- Clarify your marking instructions
- Measure your success

Approaching Department Changes: Procedural

- Call both 3-501.15A and 3-501.15B when applicable
- Active Managerial Control violation
- Call insufficient cooling equipment for lack of smallwares
- Rethink the value of cooling logs

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Thank You!

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