EcoSure

2007 U.S. Cold Temperature Evaluation

Design and Summary Pages

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2007 U.S. Cold Temperature Evaluation Design and Study Summary

Project Design

Participants

Field activities for this project were handled by the EcoSure network of auditors. These individuals are dispersed across the U.S. with a focus towards metropolitan areas. Our field auditors have been specifically trained to provide technical retail product quality information as a routine part of their activities with EcoSure. For this project EcoSure auditors identified shoppers, supplied each shopper with needed materials, information and training. The project was designed to collect data from primary shoppers of over 900 households geographically dispersed across the country.

Materials

Each participant (shopper) was supplied with the following:

- a pre-calibrated thermometer
- both verbal and written project instructions
- forms for recording the required information

Upon completion, participants returned their survey to the EcoSure auditor and were paid for performing the survey.

Participants Instructions

Specific participant instructions included (1) proper use of the thermometer, (2) specific products to be tested and (3) specific time and temperature information required.

Each participant collected product temperatures and specific time information during their primary food shopping excursion in the supermarket or grocery store at which they usually shop.

Specific instructions for returning home after shopping were not given. If consumers normally play golf/tennis, visit the barber/hair stylist, run other errands or talk for extended periods of time in parking lots, they were not told to alter this behavior. It was our desire that consumers behave normally no matter how abusive this might be to their purchases.

Case Types & Products

Listed below are the refrigerated and frozen cases, the product category, and primary package size (if specified) evaluated during this study.

Location	Case Type	Product	Primary Size
Backroom	Refrigerator	semi-solid - yogurt	6 oz.
	Freezer	whipped topping	8 oz.
Retail	Dairy	semi-solid - cottage cheese	none specified
	Dairy	semi-solid - yogurt	6 oz.
	Lunch meat	pre-packaged lunch meat	6 oz.
	Fresh meat	ground beef	1 pound
	Fresh fish	fish fillet	none specified
	Deli counter	sliced meat	none specified
	Pre-packaged deli	potato salad or equivalent	none specified
	Frozen food	frozen whipped topping	8 oz.
	Frozen food	frozen entrée	12 oz.
	Ice cream	ice cream	1/2 gallon
	Frozen novelty	novelty	1 box
Home	Refrigerator	semi-solid - yogurt	6 oz.
	Refrigerator	semi-solid - cottage cheese	none specified
	Freezer	ice cream	1/2 gallon

Field Data Collected

The temperature data reported in this document represents product temperatures collected using pre-calibrated probe thermometers. Actual product temperatures were taken for all cases evaluated. When evaluating the frozen entrée case, shoppers were instructed to wrap the bagged product around the thermometer probe, until the temperature stabilized. Temperature for the frozen novelty was obtained by opening the novelty box, and piercing the individually wrapped product with the probe thermometer, yielding the actual product temperature.

Backroom Temperatures - Upon arriving at the retail market, participants requested back storeroom samples. If these samples were made available, temperatures were recorded and the participant returned to the front of the store to start their normal shopping pattern *(476 backroom freezer and 579 backroom refrigerator evaluations were completed)*.

Display Case Temperatures and Time - When reaching a desired display case within their normal shopping pattern, participants removed the product to be purchased and inserted the thermometer directly into product. Participants left the thermometer in the product until the temperature stabilized and then recorded the product temperature and time of day on their form.

Transit Temperature - Before leaving the store, participants were instructed to place their thermometer in a shopping bag containing only shelf stable product. Upon returning home, participants recorded the temperature their groceries reached during transit.

Ambient Temperature - Upon arriving home, participants were asked to record the outside temperature using their probe thermometer. This ambient temperature data has been presented in a format designed to permit an evaluation of the impact of ambient temperature on home product temperatures.

Home Temperature (Zero Hour) and Time - Immediately before placing products in the home refrigerator or freezer, the temperature of each product was taken and the time recorded. The change in temperature from the retail case to home is considered to be short term high temperature abuse resulting from shopping, excessive ambient temperatures and delays between removal of product from its display and re-refrigeration at home.

Home (24 hour) Refrigerator and Freezer Temperatures - After 24 hours in home refrigerators, temperatures of the semi-solid refrigerated dairy products (yogurt and cottage cheese) and the frozen ½ gallon of ice cream were collected and recorded.

Additional Data Collected

Participants answered questionnaires addressing mode of travel to and from the store, where in their cars groceries were placed, if they lived in an area considered city, suburban or rural, and whether the store they shopped at was in an area considered city, suburban or rural. In addition, they recorded how often they typically shopped for groceries and if they handled groceries differently because of the seasonal temperatures.

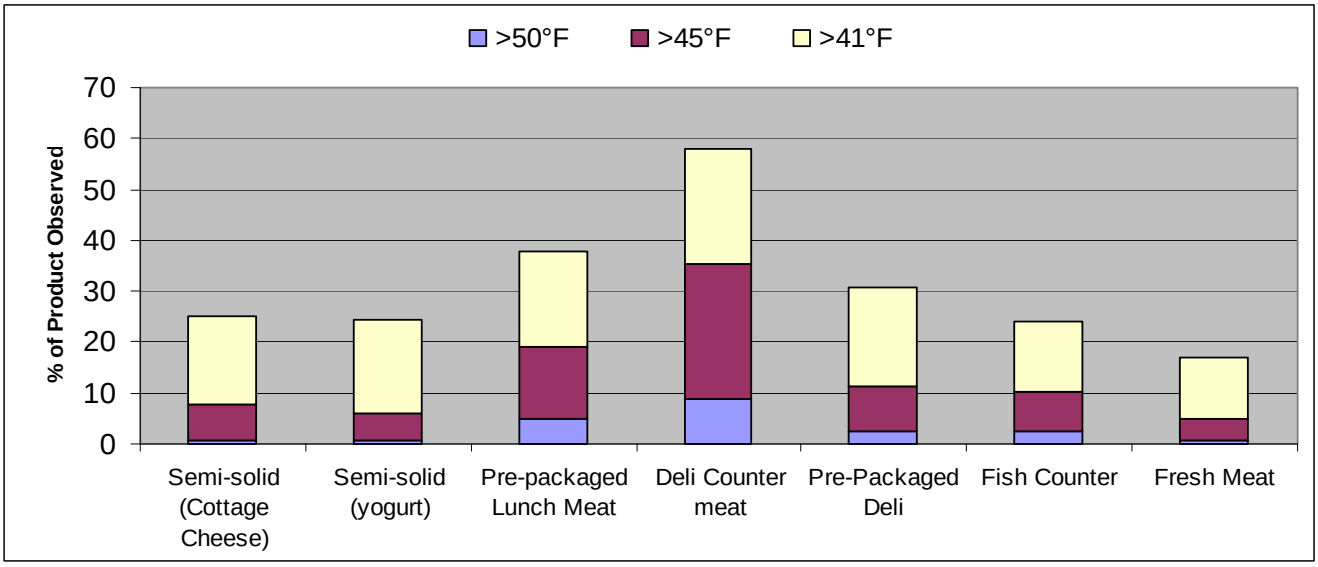
Participants were also asked to record the final cooking temperature and name/main ingredient of any entrée they prepared during the week of the study. Upon completion of cooking and removal from heat, participants immediately recorded the finished cooking temperature with a calibrated probe thermometer. Respondent data were scrutinized on a case by case basis upon their return to EcoSure. Questionable data suggesting severe undercooking were reviewed with the field participant.

Basic demographic data was also requested from each of the participants, including: marital, educational and financial status, number and age of children, and number of people in household.

Retail Refrigerator Product Temperatures

Location of Temperatures	All Cases	Dairy Semi-solid - Cottage Cheese	Dairy Semi-solid - Yogurt	Pre-Packaged Lunch Meat	Deli Counter Meat	Pre-Packaged Deli	Fish Counter	Fresh Meat
Mean (°F)	40.0	39.4	39.1	41.3	43.6	39.9	38.6	38.1
Standard Deviation	5.34	4.21	4.43	5.49	5.66	4.84	5.87	4.70
Minimum (°F)	16	22	21	26	26	20	16	20
Maximum (°F)	69	64	58	69	65	60	64	67
Percent above 41°F	31	25	24	38	58	31	24	17
Percent above 45°F	13	8	6	19	35	11	10	5
Percent above 50°F	3	0.8	0.9	5	9	3	3	0.8
Product Temperature Frequency Distribution (%)								
≤26°F	0.7	0.1	0.6	0.3	0.1	0.4	2	1
27 - 29	0.7	0.4	2	0.2	0	0.1	2	1
30 - 32	6	5	6	3	1	6	11	10
33 - 35	8	10	8	6	3	8	13	11
36 - 38	22	25	22	19	13	23	19	28
39 - 41	32	35	38	33	24	32	29	31
42 - 44	15	15	15	16	17	17	10	11
45 - 47	7	5	5	8	15	6	7	3
48 - 50	6	4	3	9	18	6	4	2
51 - 53	1	0.4	0.4	2	4	2	0.9	0.3
54 - 56	0.8	0.1	0.3	1	2	0.7	0.6	0.1
57 - 59	0.3	0	0.1	0.7	0.7	0.2	0.4	0
60 - 62	0.4	0.1	0	0.7	1	0.1	0.5	0.2
63 - 65	0.1	0.1	0	0	0.2	0	0.1	0
≥66°F	0.05	0	0	0.2	0	0	0	0.1

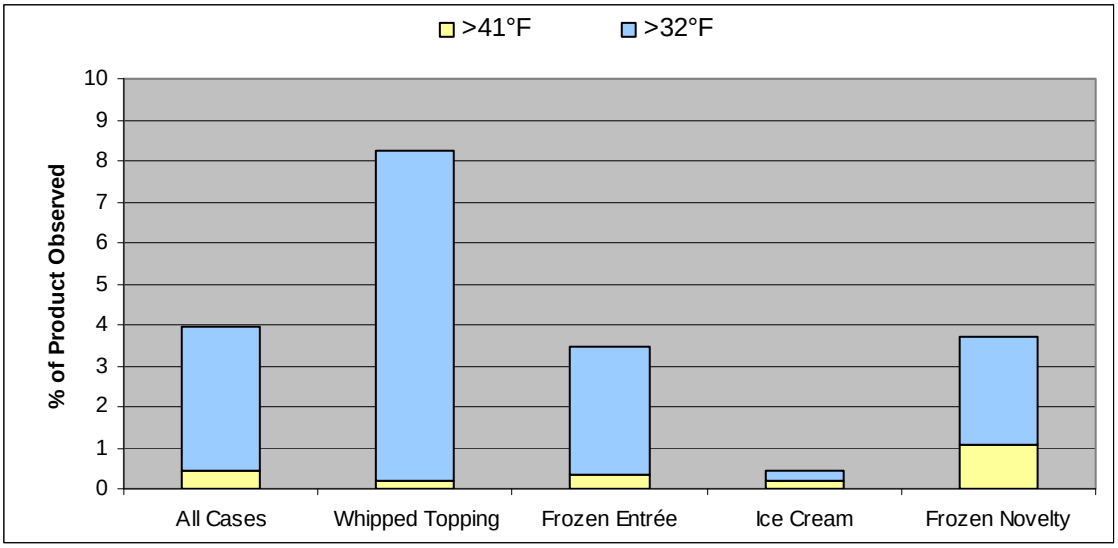
Percent of Product Observed Above 41°F, 45°F, and 50°F



Retail Freezer Product Temperatures

Location of Temperatures	All Cases	Whipped Topping	Frozen Entrée	Ice Cream	Frozen Novelty
Mean (°F)	7.8	10.0	13.1	1.4	6.8
Standard Deviation	11.12	11.76	9.58	7.64	11.48
Minimum (°F)	-28	-20	-28	-20	-24
Maximum (°F)	60	60	60	52	56
Percent above 0°F	67	77	90	39	61
Percent above 10°F	31	35	55	8	25
Percent above 20°F	11	13	16	2	11
Product Temperature Frequency Distribution (%)					
≤-15°F	0.5	0.3	0.1	0.8	0.8
-14 to -10	1	0.9	0.3	4	1
-9 to -5	5	3	0.9	10	4
-4 to 0	27	19	9	46	33
1 - 5	17	17	14	18	19
6 - 10	19	25	21	14	17
11 - 15	9	12	15	3	6
16 - 20	11	10	25	3	8
21 - 25	3	2	7	0.8	3
26 - 30	2	2	4	0.5	3
31 - 35	1	1	2	0.3	2
36 - 40	3	7	2	0.2	2
≥41°F	0.7	0.8	0.3	0.2	1

Percent of Product Observed Above 32°F and 41°F



Retail Backroom Refrigerator and Freezer Summary

	Backroom Refrigerator	Backroom Freezer
Number of Samples	**579**	**476**
Mean Product Temperature (°F)	35.9	6.4
Standard Deviation	6.99	10.78
Minimum (°F)	0	-10
Maximum (°F)	57	50
Percent above 0°F	-	59
Percent above 32°F	-	5
Percent above 41°F	9	1
Percent above 45°F	3	-
Percent above 50°F	0.3	-

Product Temperature Frequency Distribution (%)

Backroom Refrigerator		Backroom Freezer	
Product Temperature	**Frequency (%)**	**Product Temperature**	**Frequency (%)**
≤26°F	6		
27 - 29	2	≤-15°F	0
30 - 32	10	-14 to -10	3
33 - 35	16	-9 to -5	5
36 - 38	35	-4 to 0	34
39 - 41	22		
		1 - 5	17
42 - 44	5	6 - 10	21
45 - 47	2	11 - 15	6
48 - 50	2	16 - 20	7
51 - 53	0.2	21 - 25	1
54 - 56	0.0	26 - 30	2
57 - 59	0.2	31 - 35	2
60 - 62	0	36 - 40	2
63 - 65	0	≥41°F	1
≥66°F	0		

What Happens to Product Temperature During Transportation?

	All Refrigerated Products	All Frozen Products
Mean Time Out of Refrigeration (h:mm)	1:10	0:56
Mean Change in Product Temperature from Store to Home Based on Time Out of Refrigeration (°F)		
0 - 15 minutes	5.2	6.3
16 - 30	5.3	7.9
31 - 45	5.9	9.1
46 - 60	6.4	9.8
61 - 75	7.4	10.5
76 - 90	8.0	10.6
91 - 105	8.8	9.9
106 - 120	7.0	7.7
>2 hours	8.6	12.4
Mean Change in Product Temperature from Store to Home (°F)		
Overall Change	7.1	9.5
Urban Home	6.5	8.7
Suburban Home	7.6	9.8
Rural Home	6.9	9.9
Δ if Outside Air Temperature <70°F	5.9	8.5
Δ if Outside Air Temperature Between 70-89°F	7.8	10.0
Δ if Outside Air Temperature ≥90°F	9.2	11.1
Product Temperature at Home†		
Mean (°F)	47.1	17.3
Standard Deviation	6.90	11.47
Minimum (°F)	22	-20
Maximum (°F)	76	64
Percent above 32°F	-	10
Percent above 41°F	78	3
Percent above 45°F	57	1
Percent above 50°F	27	0.3
Percent above 60°F	3	0.03

† Product temperatures taken upon arrival home before placing products in home refrigeration.

Home Refrigerator and Freezer Product Temperatures†

	Home Refrigerator	Home Freezer
Number of Samples	**1793**	**874**
Mean Product Temperature (°F)	38.2	3.6
Standard Deviation	4.40	6.56
Minimum (°F)	23	-16
Maximum (°F)	63	40
Percent above 0°F	-	59
Percent above 32°F	-	0.2
Percent above 41°F	17	0
Percent above 45°F	5	-
Percent above 50°F	0.7	-

† Product temperatures taken 24 hours after being placed in home refrigerator and freezer.

Product Temperature Frequency Distribution (%)

Home Refrigerator		Home Freezer	
Product Temperature	**Frequency (%)**	**Product Temperature**	**Frequency (%)**
≤26°F	0.5		
27 - 29	3	≤-15°F	0.2
30 - 32	7	-14 to -10	1
33 - 35	13	-9 to -5	5
36 - 38	28	-4 to 0	35
39 - 41	32		
		1 - 5	30
42 - 44	10	6 - 10	20
45 - 47	4	11 - 15	5
48 - 50	2	16 - 20	3
51 - 53	0.2	21 - 25	0.7
54 - 56	0.2	26 - 30	0.7
57 - 59	0.2	31 - 35	0.2
60 - 62	0.1	36 - 40	0.2
63 - 65	0.1	≥41°F	0
≥66°F	0		

Time Out of Refrigeration

Time Out of Refrigeration†

Product Category	(n =)	Mean (h:mm)	Standard Deviation (h:mm)	Range (h:mm)
Refrigerated				
Dairy- Semi-solid - Yogurt	*927*	1:07	0:27	0:18 - 3:09
Dairy- Semi-solid - Cottage Cheese	*930*	1:07	0:27	0:19 - 3:39
Pre-packaged lunch meat	*919*	1:12	0:27	0:12 - 3:50
Deli counter meat	*890*	1:12	0:28	0:19 - 3:52
Pre-packaged deli	*918*	1:11	0:28	0:11 - 3:52
Fish counter	*850*	1:10	0:27	0:17 - 3:45
Fresh meat	*928*	1:10	0:26	0:18 - 3:42
Frozen				
Frozen Entrée	*926*	0:59	0:26	0:17 - 3:35
Whipped topping	*921*	0:59	0:26	0:12 - 3:35
Ice cream	*920*	0:53	0:26	0:10 - 3:35
Frozen novelty	*915*	0:53	0:26	0:12 - 3:33

† Time between removal of product from store display until placement in home refrigeration.

Outside Ambient Temperature

Temperature (°F)	Number of Temperatures 908	Frequency (%)
<55°F	154	17
55 - 59	53	6
60 - 64	71	8
65 - 69	77	9
70 - 74	142	16
75 - 79	149	16
80 - 84	119	13
85 - 89	90	10
90 - 94	41	5
95 - 99	8	0.9
100 - 104	3	0.3
≥105°F	1	0.1

Home Cooking Temperature Summary

Product	Ground Beef	Beef	Poultry	Pork	Fish	Starch Dairy Proteins	Vege-tables	Pre-Cooked Foods	Left-Overs
Number of Samples	**580**	**319**	**595**	**275**	**328**	**600**	**98**	**225**	**237**
Mean (°F)	158.1	156.7	162.8	156.7	153.2	155.4	148.2	157.9	150.6
Standard Deviation	22.00	24.62	23.05	24.16	22.02	26.29	26.41	23.95	26.64
Minimum (°F)	75	82	76	82	92	73	90	90	70
Maximum (°F)	210	280	220	213	225	275	202	212	212
% Under Specification†	39%	28%	40%	24%	27%	30%	31%	20%	62%
Cooking Temperature Frequency Distribution (%)									
< 100°F	1%	1%	2%	3%	1%	3%	2%	2%	4%
100 - 109	1%	2%	2%	3%	2%	2%	8%	2%	3%
110 - 119	2%	3%	3%	3%	3%	4%	5%	3%	6%
120 - 129	5%	6%	3%	5%	5%	6%	11%	4%	8%
130 - 139	7%	8%	6%	7%	9%	7%	5%	10%	8%
140 - 149	13%	12%	7%	8%	17%	13%	16%	12%	12%
150 - 159	17%	17%	8%	16%	24%	17%	12%	15%	13%
160 - 169	20%	19%	23%	23%	19%	18%	15%	20%	18%
170 - 179	18%	10%	23%	16%	8%	12%	13%	12%	15%
180 - 189	11%	14%	15%	11%	6%	10%	5%	14%	11%
190 - 199	4%	4%	6%	2%	3%	5%	4%	3%	2%
≥ 200°F	2%	3%	3%	3%	2%	4%	2%	5%	1%

†Cooked product temperature specifications are as follows: Ground Beef ≥155°F, Beef ≥145°F, Poultry ≥165°F, Pork ≥145°F, Fish and Seafood ≥145°F, Starch/Dairy/other Protein ≥145°F, Vegetables ≥135°F, Commercially Pre-Cooked Foods ≥135°F, and Reheated Leftovers ≥165°F.

Note: Product temperatures were taken immediately upon removal from heat.

Distribution of Products Cooked Under and In Specification