Public Health

Rock County, WI

Occurrence of Foodborne Illness Risk Factors In Selected Food Establishments

2019

Baseline Study

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Contents

I. BACKGROUND

Rock County is located in south central Wisconsin and is a mix of rural and urban communities. More than half the 160,000 residents reside in the two largest cities of Beloit and Janesville. The remaining citizens are spread throughout multiple small cities, villages, towns, and hamlets. With a major interstate that runs through the center and several recreational areas, Rock County also hosts a large number of tourists and travelers.

The regulation of food establishments in the State of Wisconsin is overseen by the Department of Agriculture, Trade and Consumer Protection (DATCP). As an agent of DATCP, the Rock County Public Health Department (RCPHD) is responsible for regulating approximately 800 food related establishments located within the borders of Rock County. The RCPHD Environmental Health Division employs six Environmental Health Specialists that are tasked with conducting compliance activities on the permitted food facilities.

Food regulation in Wisconsin is primarily based on Administrative Code ATCP 75 and its Appendix, the Wisconsin Food Code, which is modeled after the U.S. Food and Drug Administration (FDA) Food Code. At the time of this report DACTP was in the process of updating the Wisconsin Food Code.

The RCPHD enrolled in the FDA's Voluntary National Retail Food Regulatory Program Standards (VNRFRPS) in 2016. The VNRFRPS provides a framework for regulatory food programs to improve and enhance their services on a continual basis. DATCP supports this program and encourages all of its agents around the State to enroll. Since being enrolled, the RCPHD has completed a Self-Assessment of all nine program standards of the VNRFRPS (2017) and attended multiple trainings related to meeting the standards. This study reflects RCPHD's continued effort of meeting the requirements of all nine standards.

II. PURPOSE

This Foodborne Illness Risk Factor Study, which is based on VNRFRPS Standard 9: Program Assessment, has three main objectives:

1. Identify the foodborne illness risk factor trends in need of priority attention.
2. Develop intervention strategies designed to reduce the occurrence of the identified risk factors.
3. Establish a baseline that will be compared with future studies in order to measure foodborne illness risk factor trends and intervention strategy effectiveness.

Additional Foodborne Illness Risk Factor Studies will be completed at least every 5 years in order to measure risk factor trends, as well as the effectiveness of implemented intervention strategies.

III. METHODOLOGY

The design of this risk factor study was based on the FDA's *Study on the Occurrence of Foodborne Illness Risk Factors in Selected Retail and Foodservice Facility Types (2013-2024), Protocol for the Data Collection.* The document's protocol guided the study, but modifications were made to account for RCPHD's approach. These changes were mainly driven by the data collection method, which utilized existing inspection data collected during routine inspections of the 2018-2019 licensing year. In Rock County and the State of Wisconsin in general, the licensing year starts on July 1st and ends June 30th of the following year. This method differed from the FDA protocol that calls for dedicated surveys of an appropriate sample size to collect data. The use of routine inspection data presented a few unique challenges. However, since the WI Food Code mostly mirrored the FDA's and the facility inspection format aligned well with the targeted information, the necessary data was able to be captured with few difficulties. One major benefit that was gained using this adjusted collection method was it allowed the study to utilize the data from all eligible food facilities instead of the standard representative sample, minimizing biases and errors and creating a more complete dataset.

A. Selection and Categorization of Facilities

A list of all licensed food facilities and their associated inspection data from the 2018-2019 licensing year were pulled from the inspection database. RCPHD utilizes HealthSpace, a DATCP provided software, for permitting and inspection tracking. Due to the limited nature of their operations, mobile and temporary food establishments were removed from the exported data. The remaining facilities (n=693) were then grouped into categories based on *industry segment* , or type of food business, and facility type, which is defined by how the food is served or sold (see Table 1). The categorization of establishments by industry segment and facility type allowed for a more detailed analysis of food safety practices among similar operations.

Table 1. Description of Facility Types

Industry Segment	Facility Type	Description
Restaurants	Full Service (n=339*)	Establishments where customers place their order at their table; are served their meal at the table, receive the service from wait staff, and pay at the end of the meal.
	Fast Food (n=80*)	Also referred to as quick service restaurants and defined as any restaurant that is not a full service restaurant. Customers generally order and pay for their meals at a counter.
Retail	Retail Food Stores (n=209*)	Retail food store where foods, such as luncheon meats and cheeses, are sliced for the customers and where sandwiches and salads are prepared on-site or received from a commissary in bulk containers, portioned, and displayed.
Institutional	Schools (n=61*)	Public and private school foodservice facilities where meals are either fully prepared in the on-site kitchen, or partially prepared in a central or base kitchen, and served to students on-site.
	Hospitals (n=4*)	Foodservice operations that provide for the nutritional needs of inpatients, by preparing meals and transporting them to the patient's room and/or serving meals in a cafeteria setting (meals in the cafeteria) may also be served to hospital staff and visitors).

**Permanent and fixed location food establishments initially deemed eligible*

Food facilities with no or very limited food handling activities generally provide relatively few opportunities for practices associated with directly contributing to food borne illnesses. An example would be a convenience store that only sells food items that were pre-packaged in a regulated processing plant. These low risk facilities would have provided little value to this study and were deemed ineligible. The removal of the limited establishments was accomplished by utilizing the *Risk Categorization of Food Establishments* table in located in Annex 5 of the 2017 FDA Food Code as a guide. All facilities within the initial eligible pool were assigned a Risk Category based on their food handling practices as described in Table 2. The system is based on a rating classification that associates a higher score with a higher complexity.

Table 2. Risk Categorization of Food Establishments

Risk Category	Description
1	Examples include most convenience store operations, hot dog carts, and coffee shops. Establishments that serve or sell only pre-packaged, non-time/temperature control for safety (TCS) foods. Establishments that prepare only non-TCS foods. Establishments that heat only commercially processed, TCS foods for hot holding. No cooling of TCS foods. (n=106)
2	Examples may include retail food store operations, schools not serving a highly susceptible population, and quick service operations. Limited menu. Most products are prepared/cooked and served immediately. May involve hot and cold holding of TCS foods after preparation or cooking. Complex preparation of TCS foods requiring cooking, cooling, and reheating for hot holding is limited to only a few TCS foods. (n=22)
3	An example is a full service restaurant. Extensive menu and handling of raw ingredients. Complex preparation including cooking, cooling, and reheating for hot holding involves many TCS foods. Variety of processes require hot and cold holding of TCS food. Establishments that would otherwise be grouped in Category 4 but have shown through historical documentation to have achieved active managerial control of foodborne illness risk factors. (n=420)
4	Examples include preschools, hospitals, nursing homes, and establishments conducting processing at retail. Includes establishments serving a highly susceptible population or that conduct specialized processes, e.g., smoking and curing; reduced oxygen packaging for extended shelf-life. (n=145)

All facilities that were assigned the lowest Risk Category of 1 were removed from the eligibility pool. This included 23 full service restaurants and 83 retail stores. The inspection data for the remaining 587 facilities with a Risk Category of 2-4 were then reviewed for data completeness. Five facilities (4 Full Service Restaurants and 1 Retail) were removed from the study due to incomplete data related to the IN/OUT/NA/NO convention that is required to properly calculate out-of-compliance rates. The remaining 582 food establishments were deemed eligible for the study (see Table 3).

Table 3. Final Establishment Selection by Facility Type and Risk Categorization.

Facility Type	Risk Categorization			Total
	2	3	4	
Restaurants – Full Service	6	228	78	312
Restaurants – Fast Food	0	66	14	80
Retail Food Stores	16	95	14	125
Institutional – School	0	26	35	61
Institutional – Hospital	0	0	4	4
			Total=	**582**

B. Data Analysis

The focus of this study was to identify trends in food safety practices associated with the control of foodborne illnesses. This was accomplished by analyzing data related to the 5 major risk factors that contribute to foodborne illness, as identified by the Centers for Disease Control and Prevention (CDC):

1. Poor Personal Hygiene
2. Improper Holding / Time & Temperature
3. Contaminated Equipment / Protection From Contamination
4. Inadequate Cooking
5. Food Obtained From Unsafe Sources

The inspection data collected for the 582 eligible food facilities reflected all violations of the WI Food Code found during routine inspections conducted during the 2018-2019 permit year. Since not all sections of the code directly pertained to the five major risk factors, the relevant violations were separated out. This was accomplished by matching the sections of the inspection report format found in HealthSpace to the respective risk factor. The inspection format in HealthSpace is modeled after the *Food Establishment Inspection Report* found in the 2009 FDA Food Code and utilizes the IN/OUT/NA/NO convention prescribed by VNRFRPS Standard 9. This relationship allowed for the matching of each pertinent violation section with the associated CDC risk factor. It was determined that each risk factor category contained multiple violation sections. In order to help drive a deeper analysis of the data, these section divisions were kept as data items within each risk factor. This allowed for a more focused analysis on the specific practices driving the out-of-compliance rates for each risk factor. Table 4 shows each risk factor and component data items, along with the associated violation sections found in the HealthSpace inspection report format. See Appendix A for the specific WI Food Code sections that make up each data item.

Table 4. Risk Factors, Data Items, & HealthSpace Inspection Report Sections

Risk Factor	Data Item	HealthSpace Inspection Report Section
Poor Personal Hygiene	P1 – Proper Handwashing	6
	P2 – Prevention From Contamination From Hands	7
	P3 – Adequate Handwashing Facilities	8
	P4 – Good Employee Hygienic Practices	4
	P5 – Ill Employees Restricted	5
Improper Food Holding / Time & Temperature	H1 – Proper Cooling	18
	H2 – Proper Cold Holding	20
	H3 – Proper Hot Holding	19
	H4 – Time As A Public Health Control	22
	H5 – Proper Date Marking	21
Contaminated Equipment / Protection From Contamination	E1 – Food Separated & Protected	13
	E2 – Food Contact Surfaces Cleaned & Sanitized	14
	E3 – Proper Disposition of Food	15
Inadequate Cooking	C1 – Proper Cooking	16
	C2 – Proper Reheating for Hot Holding	17
Food Obtained From Unsafe Sources	S1 – Approved Source	9
	S2 – Received at Proper Temperature	10
	S3 – Food in Good Condition & Safe	11
	S4 – Required Records Available	12

Data analysis was conducted for each of the five risk factors and also the individual data items. Data elements were excluded from the analysis if the data was not applicable or not observed during the inspection for a specific data item (coded as N/A or N/O in the dataset). This exclusion was used to enhance the accuracy of the analysis since violations that are not applicable or unable to be observed would skew out of compliance rates. The data elements were included in this study if each data item was observed for a given data element in the analysis regarding specific risk factors (coded as IN or OUT). For the data analysis of the general risk factors, which included multiple data items, the inspection data was excluded for any record that did not have at least one IN or OUT data item within the given risk factor. Diagram 1 below illustrates the results of the data cleaning process.

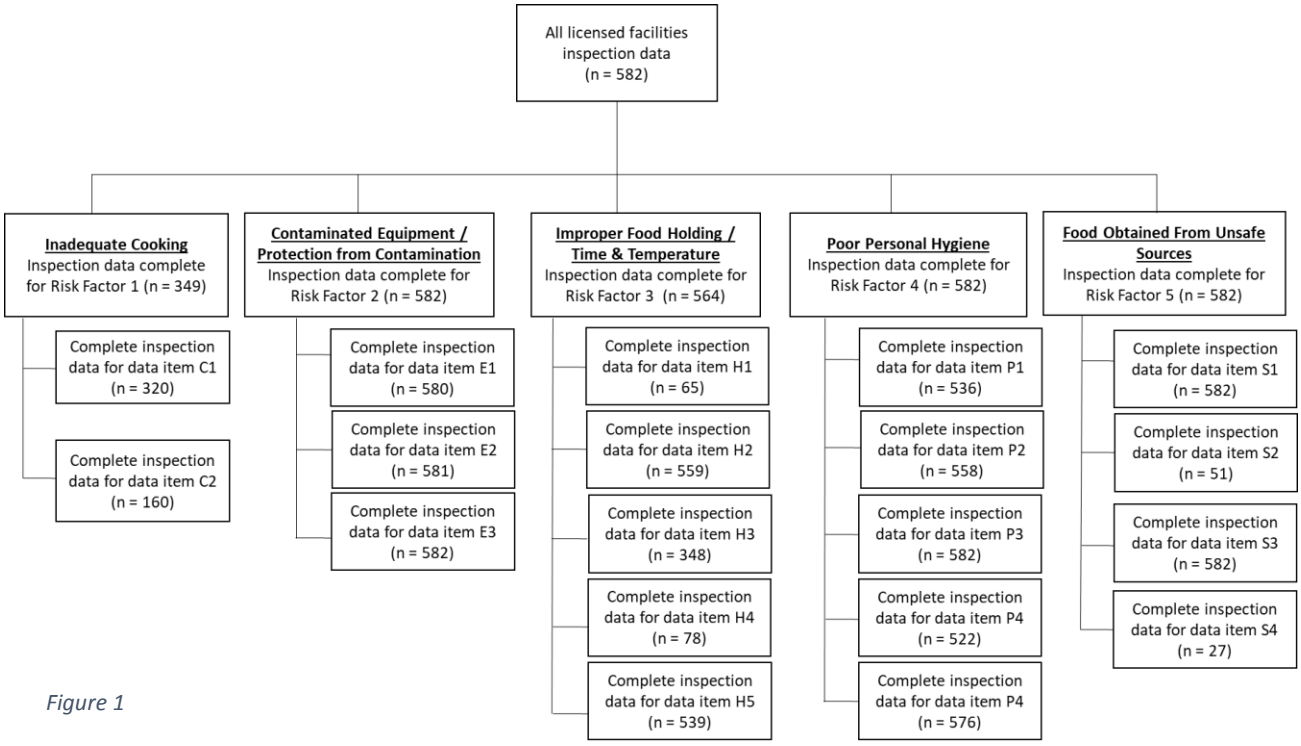


Figure 1

After removing the facility records not applicable to the respective data item or risk factor, analysis was conducted. Percentages of facilities out-of-compliance were calculated. These calculations were made for each data item and risk factor. These rates were calculated using the following formulas:

Risk Factors

$$Percent\ Out\ of\ Compliance = \frac{c\ (number\ of\ facilities\ OUT\ of\ compliance\ for\ one\ or\ more\ data\ item\ within\ the\ risk\ factor)}{n\ (total\ number\ of\ facilites) - x\ (number\ of\ facilities\ for\ which\ all\ data\ items\ were\ not\ applicable\ or\ not\ observed)}$$

Data Items

$$Percent\ Out\ of\ Compliance = \frac{c\ (number\ of\ facilities\ OUT\ of\ compliance\ for\ the\ data\ item)}{n\ (total\ number\ of\ facilities) - x\ (number\ of\ facilities\ for\ which\ the\ data\ item\ is\ not\ applicable\ or\ not\ observed)}$$

Based on these formulas, out-of-compliance rates were calculated for each of the risk factors and their component data items. Rates were compared across industry segments (Retail Food Stores, Full Service Restaurants, Fast Food Restaurants, Schools, and Hospitals) to determine the most common infractions by each segment.

IV. RESULTS AND DISCUSSION

The intent of the data analysis was to identify foodborne illness risk factors that occur most frequently in Rock County food establishments. The results are the driving force of intervention strategies that will be designed to reduce the occurrence of the CDC risk factors. Focusing on the risk factors most commonly found (highest percent out-of-compliance) is seen as the most effective and efficient way to reduce the occurrence of foodborne illness and should be a main goal of any food safety regulatory program.

A. Overall Risk Factors

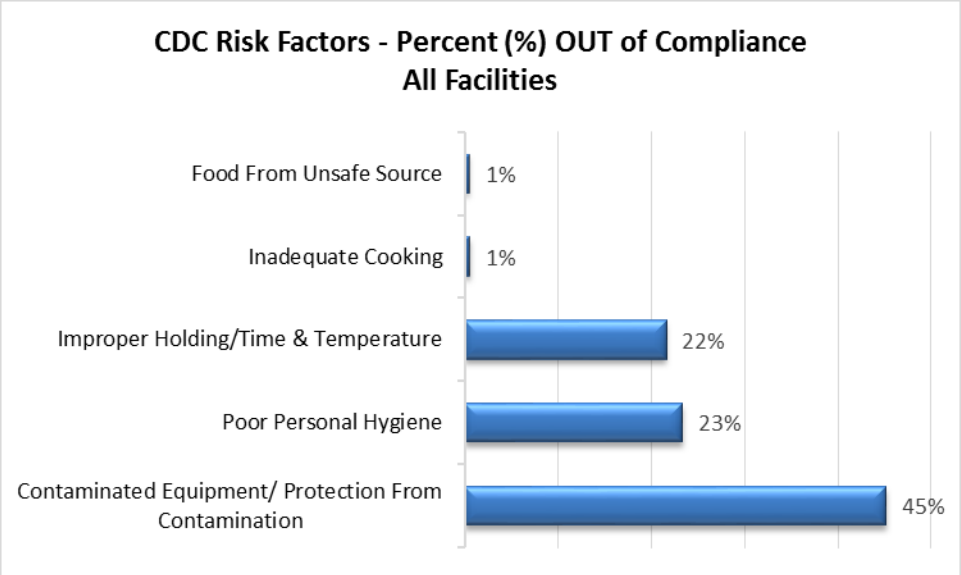


Figure 2

Overall, Contaminated Equipment / Protection From Contamination was the most frequent risk factor out-of-compliance. Forty-five percent of all facilities had at least one violation that fell into that risk factor category. This was approximately double the rate of the second and third most out-of-compliance risk factors, Poor Personal Hygiene (23%) and Improper Holding / Time & Temperature (22%). Inadequate Cooking and Food From Unsafe Sources had very low rates, with each only being out-of-compliance in one percent of all facilities included in this study.

The results strongly indicate that any intervention strategy should focus on the highest three out-of-compliance risk factors. These areas should be heavily prioritized over the Inadequate Cooking and Food From Unsafe Sources risk factors. The deeper analysis that follows this section supports this view as the rates are consistently low for these two risk factors when broken down by data item and facility type.

B. Overall Data Items

Table 5. Data Items Percent (%) OUT for All Facilities

Risk Factor	DATA ITEM	% OUT
Inadequate Cooking	C1 - Proper Cooking	1%
	C2 - Proper Reheating for Hot Holding	0%
Contaminated Equipment / Protection From Contamination	E1 - Food Separated and Protected	17%
	E2 - Food Contact Surfaces Cleand & Sanitized	38%
	E3 - Proper Disposition of Food	0%
Improper Holding / Time & Temperature	H1 - Proper Cooling	12%
	H2 - Proper Cold Holding	13%
	H3 - Proper Hot Holding	7%
	H4 - Time as a Public Health Control	4%
	H5 - Poper Date Marking	9%
Poor Personal Hygiene	P1 - Proper Handwashing	5%
	P2 - Prevention from Contamination from Hands	2%
	P3 - Adequate Handwashing Facilities	19%
	P4 - Good Employee Hygienic Practicies	3%
	P5 - Ill Employees restricted	0%
Food From Unsafe Source	S1 - Approved Food Source	0%
	S2 - Food Received at Proper Temperature	0%
	S3 - Food in Good Condition & Safe	1%
	S4 - Required Records Available	0%

The data items represent employee behaviors or facility practices that contribute to each risk factor. As expected, the results generally mirror the out-of-compliance rates of the parent risk factors. Data item E2 had the highest out-of-compliance rate at 38% and is a component of the highest rate risk factor, Contaminated Equipment. However, the breakdown of each risk factor shows that not all data item components have equal influence on the associated risk factor. This can be clearly seen in E3, which has no statistical contribution (0%) to the most common out-of-compliance risk factor. This demonstrates the need to focus on the data items as opposed to the parent risk factors for identifying areas in need of attention and developing intervention strategies.

C. Risk Factor – Contaminated Equipment / Protection From Contamination

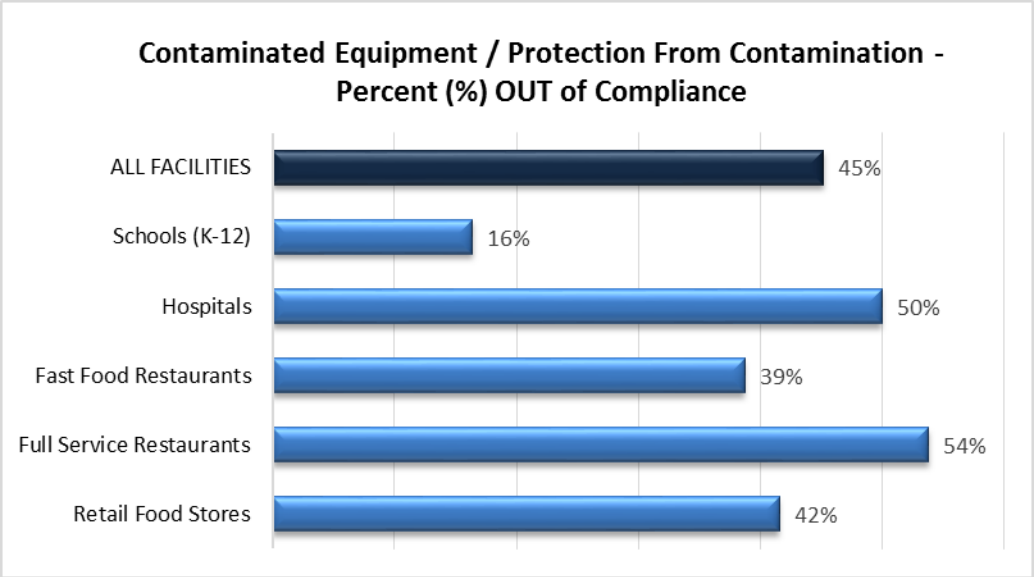


Figure 3

This risk factor involves protecting foods from a variety of contamination sources and had the highest out-of-compliance rate among all risk factors. With the exception of schools, at least 39% of all facility types were out of compliance for this risk factor. It is suspected the lower rates in the schools (16%) is due to the more streamlined and simplified operation compared to the other segments. The schools involved in this study are predominately elementary through high school that serve the same meal once a day. However, the school out-of-compliance rate is significant considering the limited opportunities within this segment and the fact that it includes serving food to the vulnerable population of young children.

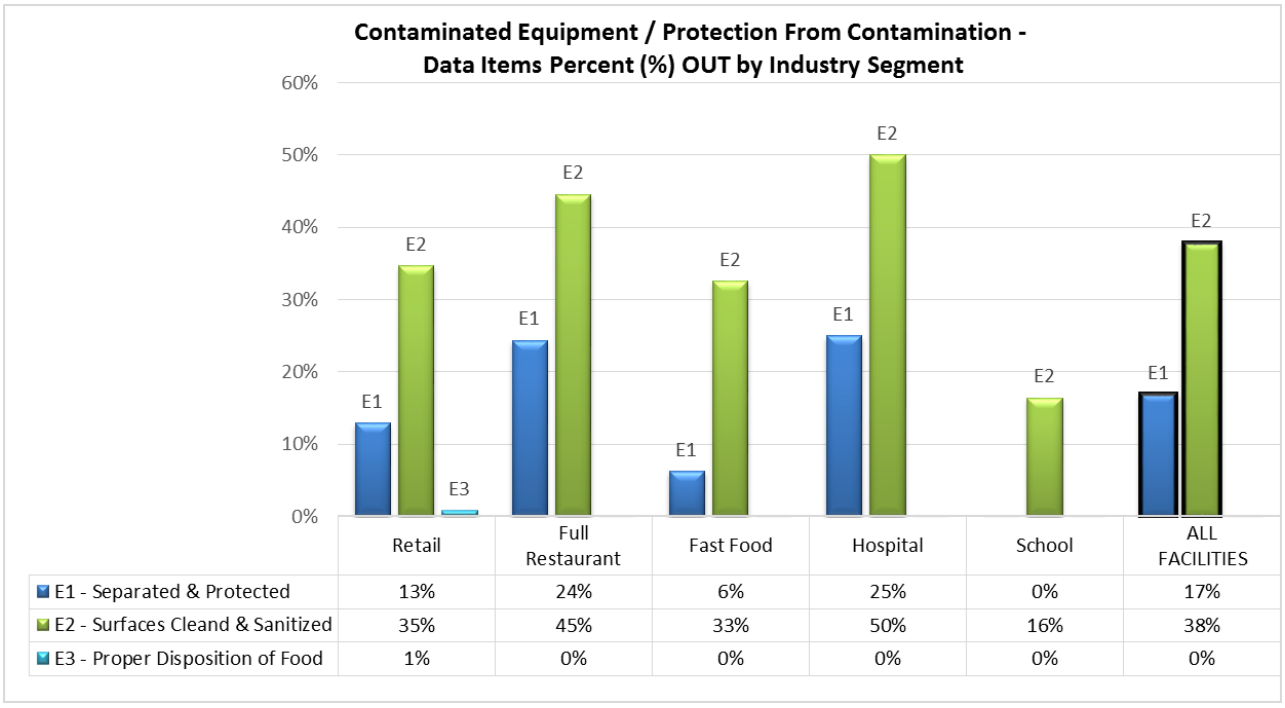


Figure 4

The Contaminated Equipment / Protection From Contamination risk factor is composed of three distinct data items:

- *E1 – Food Separated and Protected*

  E1 is associated with protecting foods from contacting contaminated sources, such as raw animal foods, soiled food contact surfaces, and damaged or soiled food containers. It also includes protection from single-use gloves that may have become damaged or contaminated while an employee was conducting other tasks. The overall out-of-compliance rate of 17% was the third highest across all risk factor data items (see Table 5).

  Schools (0%) were the only facility type that did not have a violation with this item. All of the other segments had out-of-compliance rates ranging from 6 % to 25%. Full Service Restaurants and Hospitals had rates about 50% greater than the average.

- *E2 – Food contact Surfaces Cleaned & Sanitized*

  E2 is associated with ensuring food contact surfaces are properly cleaned and sanitized. It involves the using approved methods and at the required frequency. This data item was the most common (38%) across all risk factors with twice the out-of-compliance as the second highest, P3 at 19% (see Table 5).

  All facility types displayed high out-of-compliance rates. E2 also had the highest rate among all data items within each facility category (see Appendix B). The rates for hospitals and full service restaurants were alarmingly high near or at 50% non-compliance. This data item clearly should be considered in need of priority attention.

- *E3 – Proper Disposition of Food*

  E3 is associated with preventing the service of foods that are required to be discarded. This typically involves returned food items that cannot be re-conditioned, contaminated by an employee or customer, adulterated, or from an unapproved source. High compliance was observed for this data item and it did not contribute to the parent risk factor's high out-of-compliance rate. In fact there was only one facility, a retail food establishment, out of the 582 included in this study that had an E3 violation (see Appendix B).

D. Risk Factor - Poor Personal Hygiene

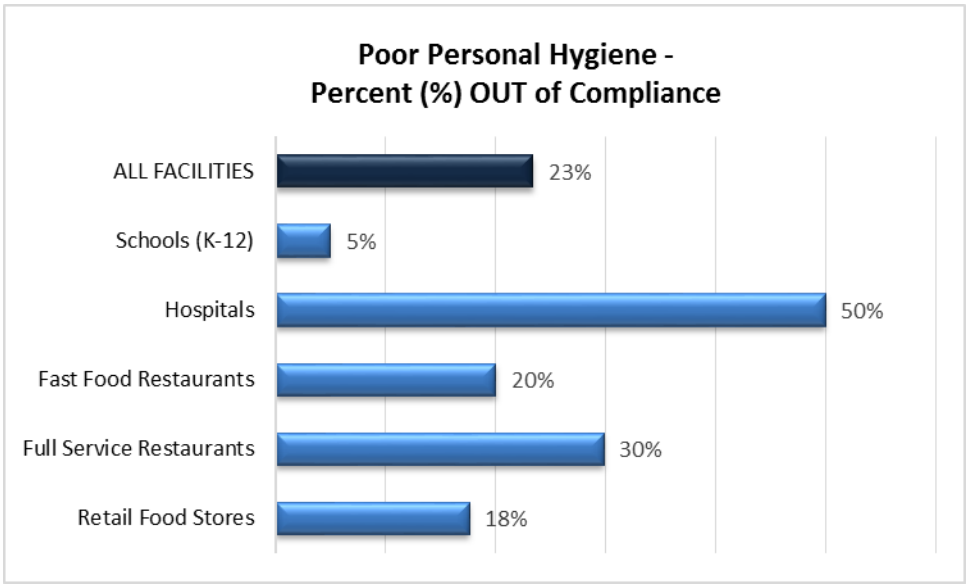
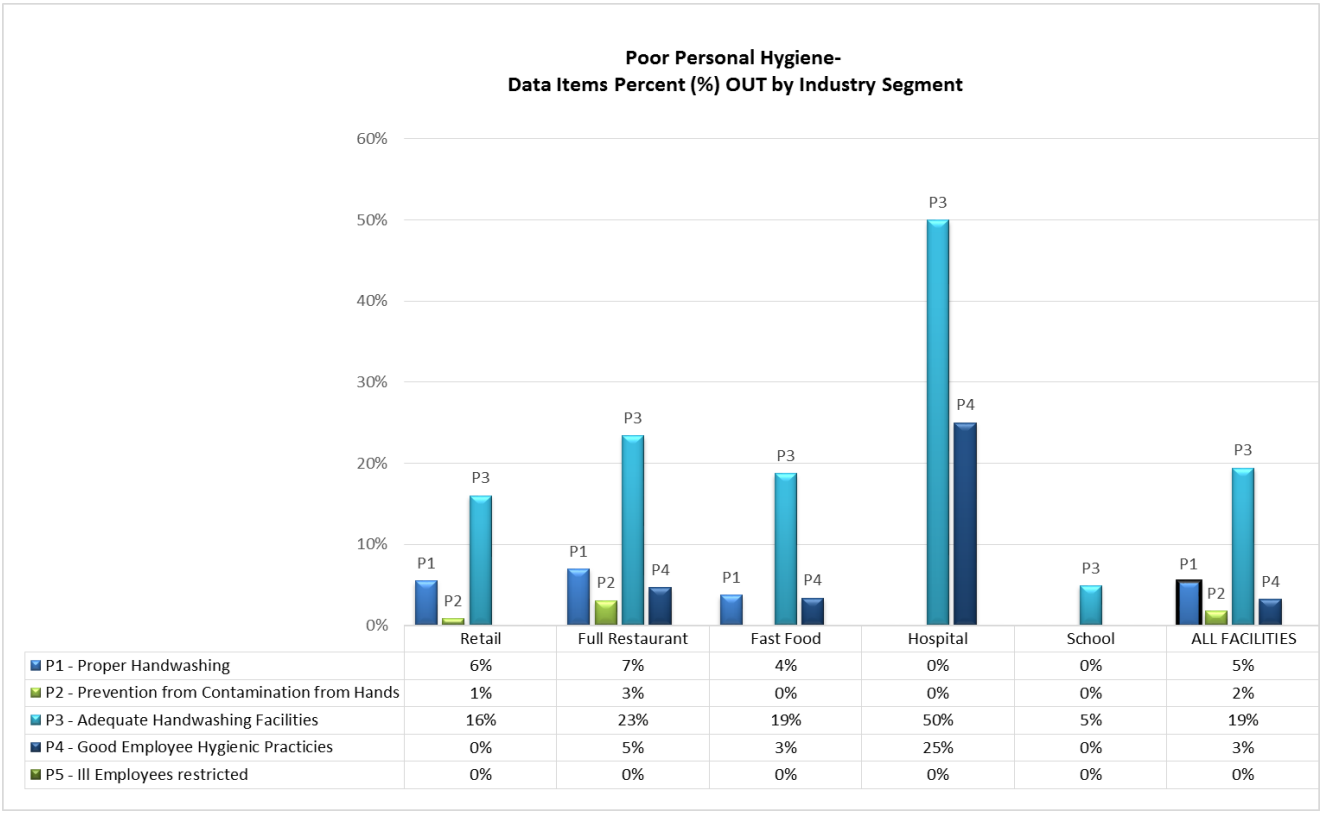


Figure 5

The Poor Personal Hygiene risk factor involves protecting foods from contamination from improper hand washing, sick employees, and handling practices. The overall out-of-compliance rate of 23% was the second highest out of the five risk factors. With the exception of schools (5%), the rates for all facility types were at levels of at least 18%. The hospital segment at 50% is initially alarming, but is subject to high variability due to the low sample size (n=4).



	Retail	Full Restaurant	Fast Food	Hospital	School	ALL FACILITIES
P1 - Proper Handwashing	6%	7%	4%	0%	0%	5%
P2 - Prevention from Contamination from Hands	1%	3%	0%	0%	0%	2%
P3 - Adequate Handwashing Facilities	16%	23%	19%	50%	5%	19%
P4 - Good Employee Hygienic Practicies	0%	5%	3%	25%	0%	3%
P5 - Ill Employees restricted	0%	0%	0%	0%	0%	0%

Figure 6

The Poor Personal Hygiene risk factor is composed of five distinct data items:

- *P1 – Proper Handwashing*

  P1 is associated with employees washing their hands using the proper technique, at the required frequency, and at approved locations in order to minimize the risk of food contamination. The overall rate (5%) was low when looking at the data items across all risk factors. The breakdown by facility type did not show significant deviations from the overall mean with all out-of-compliance rates being at or below 7%. No P1 violations were observed in Hospitals and Schools.

- *P2 – Prevention From Contamination From Hands*

  P2 is associated with preventing contamination of food from employee bare hand contact. The overall data item rate (2%) was very low in comparison to all of the data items in all risk factors. Full Restaurants (3%) and Retail Food Stores (1%) were the only facility types to have an observed P2 out-of-compliance violation.

- *P3 – Adequate Handwashing Facilities*

  P3 is associated with facilities having accessible, properly operating, and sufficiently supplied handwashing sinks in all required areas. This had the second highest out-of-compliance rate (19%) across all risk factor data items (see Table 5). P3 is the data item primarily responsible for the high out-of-compliance rate for the Poor Personal Hygiene risk factor. Schools had a comparatively low out-of-compliance rate (5%) among the facility types. All of the others were within a significant range of 16 % to 50%. The Hospital rate is initially alarming, but as mentioned before this may be more reflective of the small sample size (n=4). The data item is considered in need of priority attention.

- *P4 – Good Employee Hygienic Practices*

  P4 is associated with employees utilizing safe practices when eating and drinking personal or facility foods. The data item had a low (3%) out-of-compliance rate overall and was not a significant factor in the high parent risk factor rate. Hospitals were the only industry segment with a compliance rate greater than 5%. The high hospital rate (25%) is seen as a product of the low sample size (n=4) since there was only one observed P4 violation.

- *P5 – Ill Employees Restricted*

  P5 is associated with employees being excluded from certain duties when exhibiting certain illness symptoms. No single out-of-compliance violation was observed for this data item in any facility included in the study.

E. Risk Factor – Improper Holding / Time & Temperature

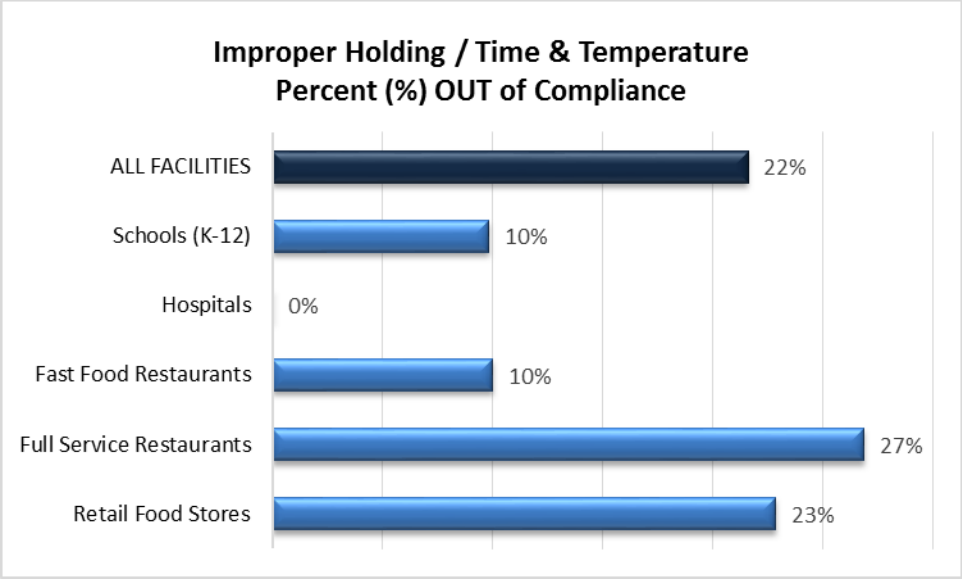
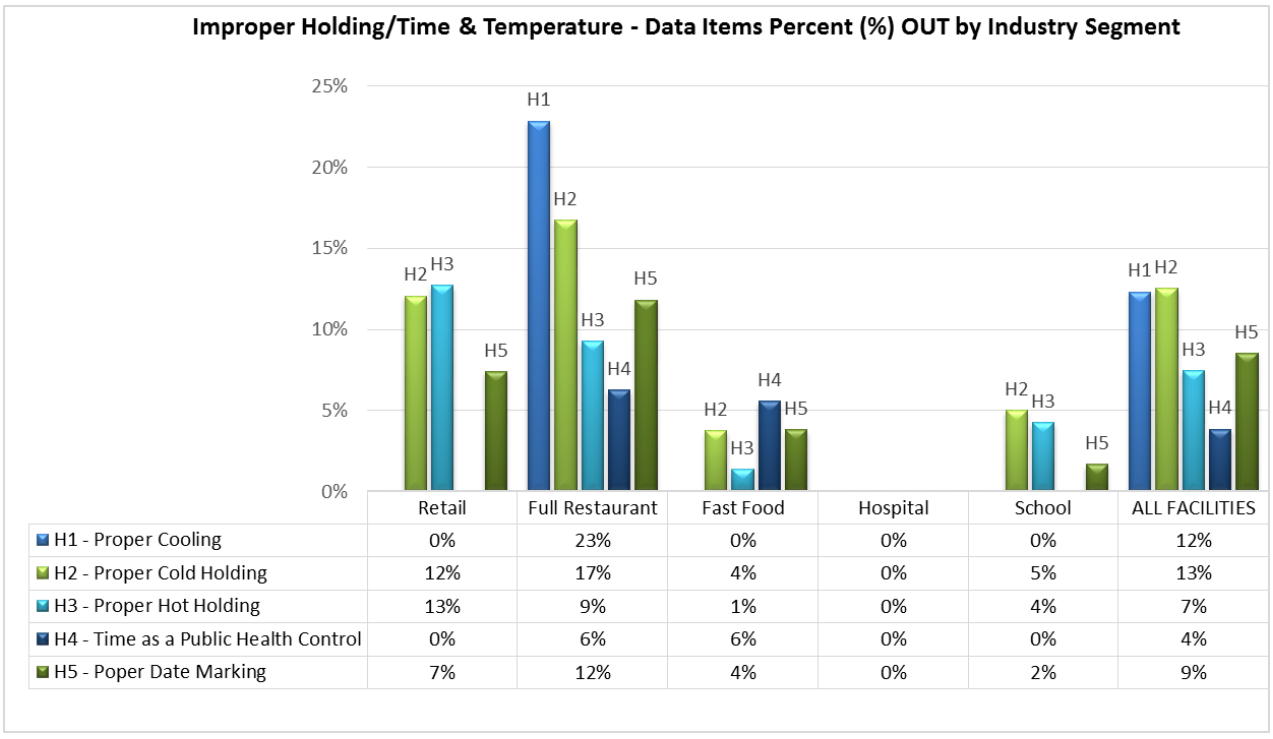


Figure 7

The Improper Holding / Time & Temperature risk factor involves minimizing the potential for pathogenic growth on food through temperature and/or time controls. This was the third highest out-of-compliance rate among the five risk factors. All facility types, except Hospitals, had a 10% or greater out-of-compliance rate. The full compliance rate of this risk factor for Hospitals is likely a result of the small sample size (n=4) and not necessarily a countertrend for this data item.



	Retail	Full Restaurant	Fast Food	Hospital	School	ALL FACILITIES
H1 - Proper Cooling	0%	23%	0%	0%	0%	12%
H2 - Proper Cold Holding	12%	17%	4%	0%	5%	13%
H3 - Proper Hot Holding	13%	9%	1%	0%	4%	7%
H4 - Time as a Public Health Control	0%	6%	6%	0%	0%	4%
H5 - Poper Date Marking	7%	12%	4%	0%	2%	9%

Figure 8

The Improper Holding / Time & Temperature risk factor is composed of five distinct data items:

- *H1 – Proper Cooling*

H1 is associated with limiting pathogen growth on cooked foods undergoing a cooling process. Full service restaurants (23%) were the only segment that had documented violations for this data item. All other segments were at full compliance for this data item. See section H, *Top Out-of-Compliance Risk Factor Data Items*, for a discussion on the low observable opportunities for this data item.

- *H2 – Proper Cold Holding*

H2 is associated with maintaining proper temperatures for cold held foods to limit pathogen growth. This was the most frequent (13%) out-of-compliance violation for this risk factor. Observed violations were more prominent in the Full Restaurants (17%) and Retail Food Stores (12%). The other three facility types were at or below 5%.

- *H3 – Proper Hot Holding*

H3 is associated with maintaining proper temperatures for hot held foods to limit pathogen growth. The overall out-of-compliance rate (7%) was low. Retail Food Stores were the only segment with a rate above 10%. It is suspected that the rising practice of hot held grab-in-go cases in retail convenience stores provides for more opportunities for violations and higher rates.

- *H4 – Time as a Public Health Control*

H4 is associated with utilizing time in lieu of temperature to limit the risk of foodborne illness due to pathogen growth on ready-to-eat foods. This data item had the lowest (4%) out-of-compliance rate within the risk factor. The two restaurant industry segments, Full Service and Fast Food, were the only categories have an observed violations, but were relatively low at 6%.

- *H5 – Proper Date Marking*

H5 is associated with limiting the time potentially hazardous foods can be kept and had a 9% overall out-of-compliance rate. Full service restaurants (12%) was the only facility type with a rate of at least 10%.

F. Risk Factor – Inadequate Cooking

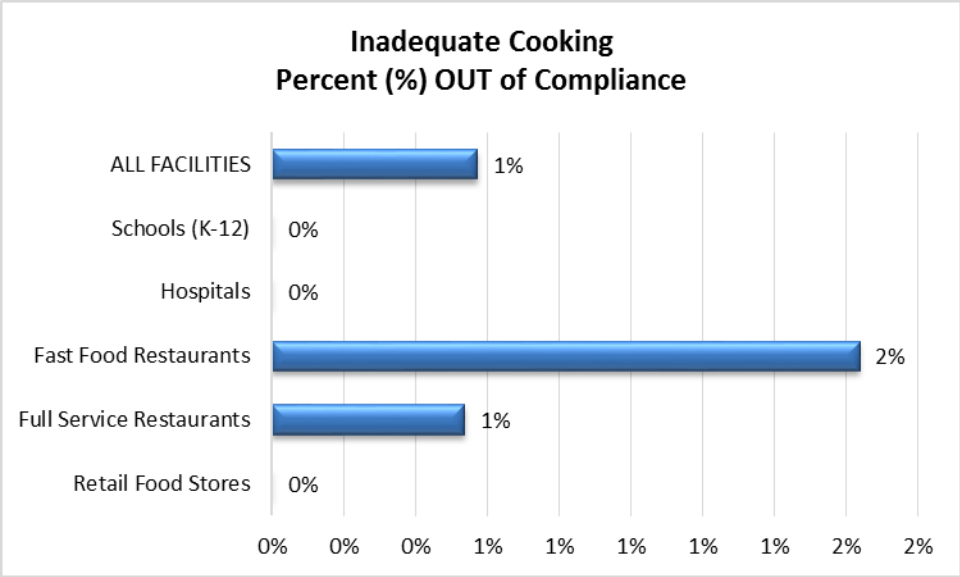
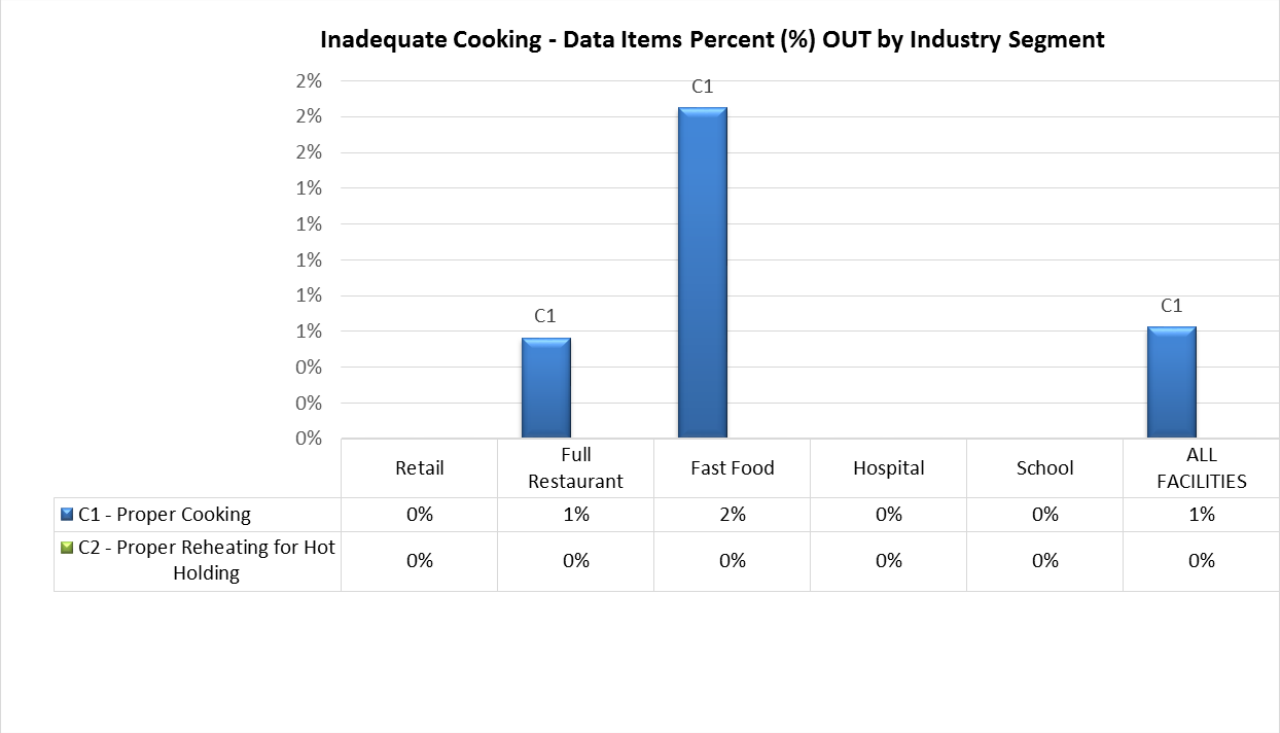


Figure 9

The Inadequate Cooking risk factor involves ensuring raw animal and other applicable foods are properly heat treated in order to kill pathogens that may come from either from natural sources or cross-contamination. This risk factor had a very low out-of-compliance rate overall (1%) and within each facility type (0-2%). Based on the data analysis, this risk factor and the associated data items are not considered in need of priority attention.



	Retail	Full Restaurant	Fast Food	Hospital	School	ALL FACILITIES
C1 - Proper Cooking	0%	1%	2%	0%	0%	1%
C2 - Proper Reheating for Hot Holding	0%	0%	0%	0%	0%	0%

Figure 10

The Inadequate Cooking risk factor is composed of two distinct data items:

- *C1 – Proper Cooking*

C1 is associated with destruction of pathogens on foods through a proper combination of temperature and time. This data item accounted for all observed out-of-compliance violations for this risk factor. Full restaurants (1%) and Fast Food Restaurants (2%) were the only facility types not at full compliance for this data item.

- *C2 – Proper Reheating for Hot Holding*

C2 is associated with parasite destruction on foods that are cooked, cooled, and reheated for hot holding. No out-of-compliance violations were observed for the data item in all facilities.

G. Risk Factor – Food From Unsafe Source

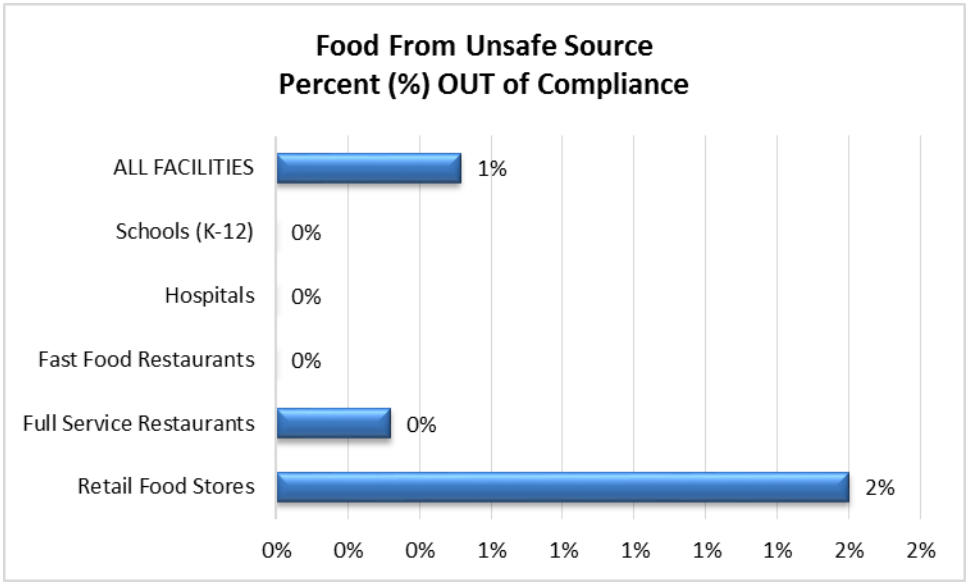
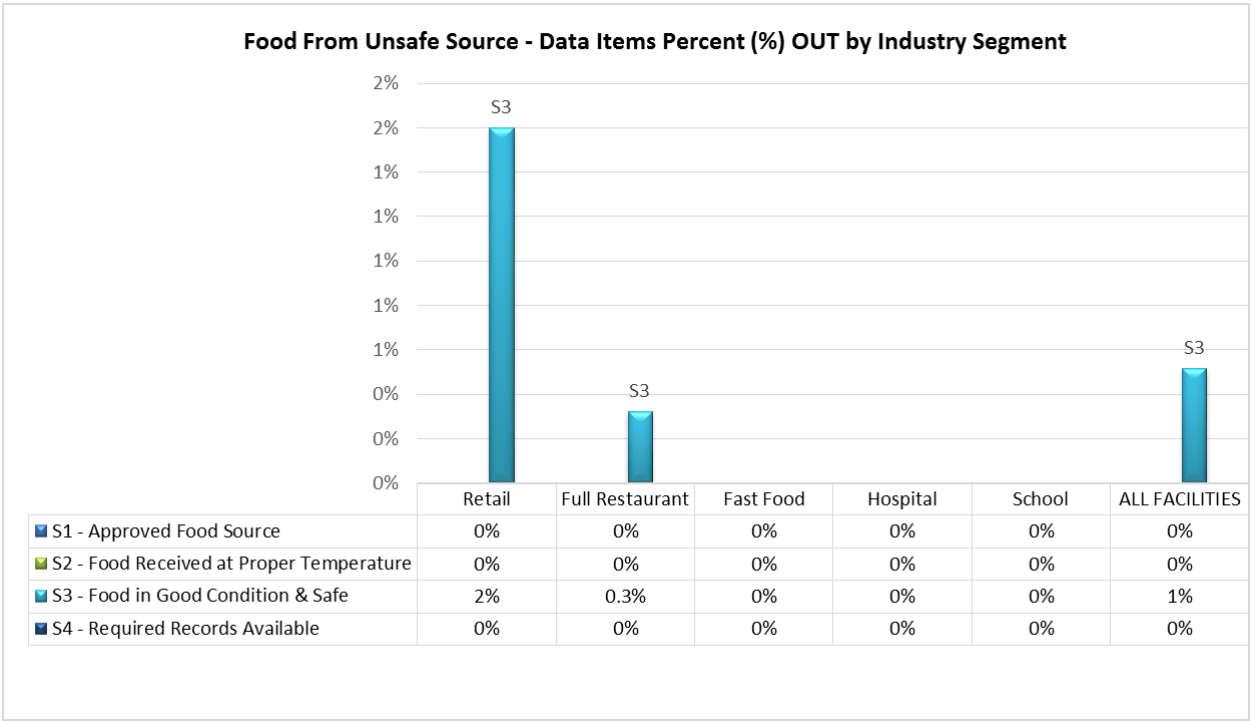


Figure 11

The Food From Unsafe Source risk factor involves ensuring foods are received from an approved source, at the required temperatures, in a safe condition, and unaltered. It also relates to the retention of documentation for certain received foods, such as shell stock. This risk factor had a very low out-of-compliance rate overall (1%), with only the Retail Food Stores (2%) having a rate greater than half of a percent. Based on the data analysis, this risk factor and the associated data items are not considered in need of priority attention.



	Retail	Full Restaurant	Fast Food	Hospital	School	ALL FACILITIES
S1 - Approved Food Source	0%	0%	0%	0%	0%	0%
S2 - Food Received at Proper Temperature	0%	0%	0%	0%	0%	0%
S3 - Food in Good Condition & Safe	2%	0.3%	0%	0%	0%	1%
S4 - Required Records Available	0%	0%	0%	0%	0%	0%

Figure 12

The Food From Unsafe Source risk factor is composed of four distinct data items:

- *S1 – Approved Food Source*

S1 is associated with ensuring foods used by or sold by a facility are obtained from an approved sources. There were no out-of-compliance violations for this data item.

- *S2 – Food Received at Proper Temperature*

S2 is associated with ensuring foods are received at the required temperatures. There were no out-of-compliance violations for this data item. It should be noted that there were few opportunities for inspectors to view this practice due to the general infrequency of inspections and product deliveries to facilities. Only 9% (51) of the 582 facilities had observable opportunities (IN or OUT) marked in the inspection data (see Appendix B).

- *S3 – Food in Good & Safe Condition*

S3 is associated with ensuring foods are received safe, unadulterated, and honestly presented. This data item accounted for all violations within the risk factor. However, there were only three total observed out-of-compliance violations, two in Retail Food and one in Full Service Restaurants, for this risk factor.

- *S4 – Required Records Available.*

S4 is associated with ensuring the proper documentation is received with certain foods and is retained for the required time periods. There were no out-of-compliance violations for this data items. It should be noted that this data item provided the fewest observable opportunities. Only 5% (27) of the 582 facilities had observable opportunities (IN or OUT) marked in the inspection data. This is reflective of the infrequency foods requiring document retention are served at facilities within Rock County.

H. Top Out-of-Compliance Risk Factor Data Items

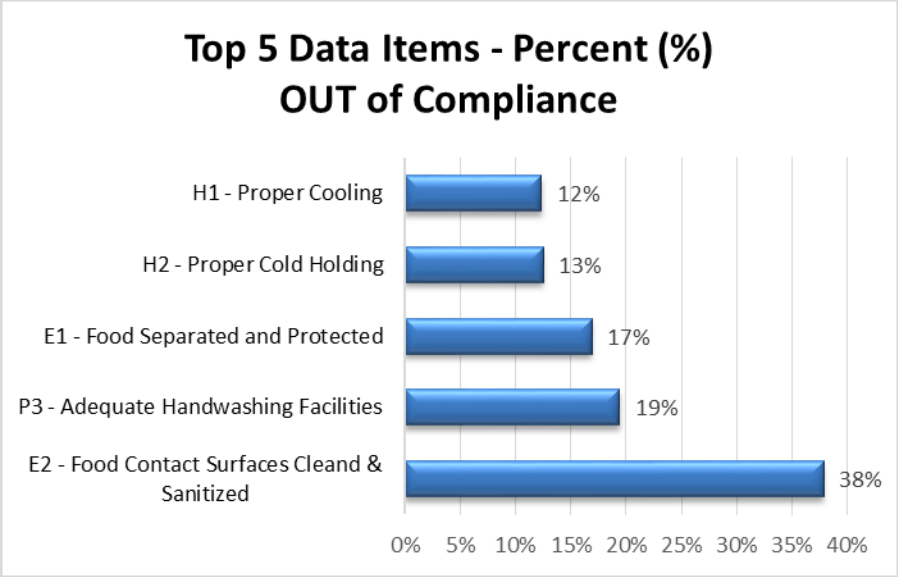


Figure 13

One of the main purposes of this study was identify foodborne illness risk factors in need of priority attention. Since each risk factor encompasses multiple data items that can vary significantly with out-of-compliance rates, focusing on the data items provides a more narrowed view of the behaviors and practices that are driving the risk factor rates. It also allows for more effective and efficient intervention strategy development.

The top five data items are shown in *Figure 13* above and represent an out-of-compliance range of 12% to 38%. All other data items had an overall rates below 10%. The 10% threshold will serve as the targeted benchmark for all data items in follow-up risk factor studies and intervention strategy effectiveness.

Below is the prioritized list of data item risk factors in need of priority attention and is based on the overall out-of-compliance rates. They are further broken down by industry segment, which should be a consideration for intervention strategy development.

#1: E2 – Food Contact Surfaces Cleaned & Sanitized

Risk Factor – Contaminated Equipment / Protection From Contamination

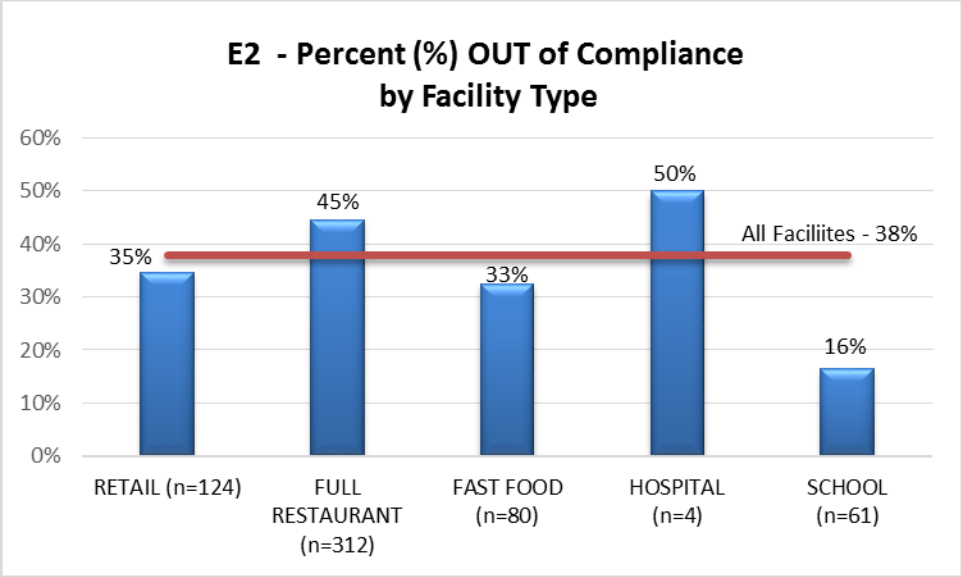


Figure 14

The data shows Food Contact Surfaces Clean & Sanitized is the risk factor data item most in need of priority attention. This is true from an overall facility viewpoint and when breaking the data down by facility type. In both cases E2 represents the highest out-of-compliance rate. The overall out-of-compliance rate (38%) was double the next highest data item (P3 - 19%). It was also the most frequent violation within each of the five facility types (see Appendix B). Based on this analysis any intervention strategy for E2 should be done globally across the industry segments. However, this data item encompasses 17 specific WI Food Code sections (see Appendix A) and a further analysis to identify the most frequent code violations would be beneficial in the intervention strategy development process.

#2: P3 – Adequate Handwashing Facilities

Risk Factor – Poor Personal Hygiene

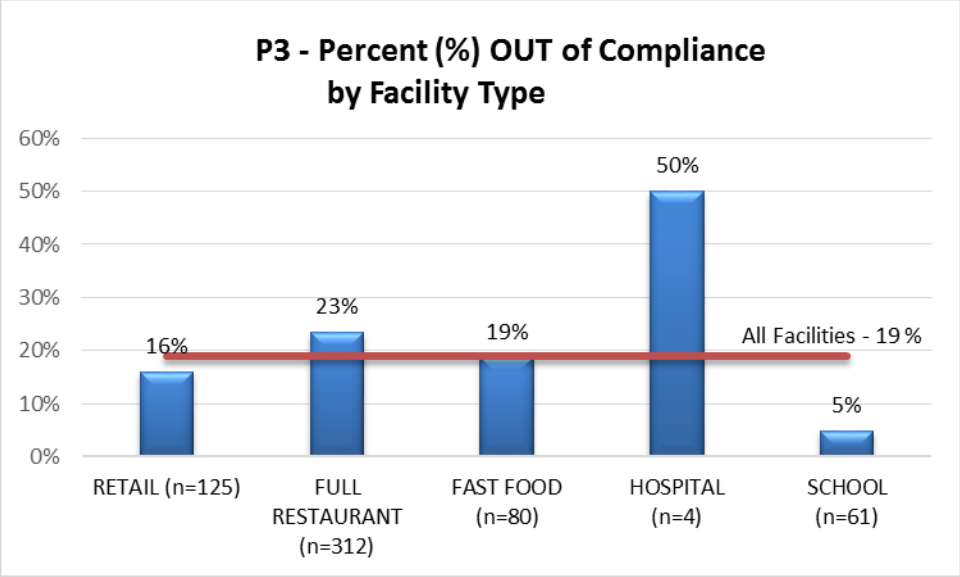


Figure 15

Adequate Handwashing Facilities represented the second highest out-of-compliance rate (19%) for all data items. The breakdown by facility type shows two outliers relative to the mean, with Hospitals (50%) well above and Schools (5%) significantly lower. As previously discussed, the Hospital rate may a product of the small sample size (n=4) as opposed to a segment countertrend. The low rate should not exclude Schools from intervention strategies due to the high susceptible population of young children and the fact that P3 is the third highest out-of-compliance data item within the facility type (see Appendix B). Just as the case for the E2, P3 contains several (12) WI Food Code violations and should be further dissected in order to create more effective intervention strategies.

#3: E1 – Food Separated & Protected

Risk Factor – Contaminated Equipment / Protection From Contamination

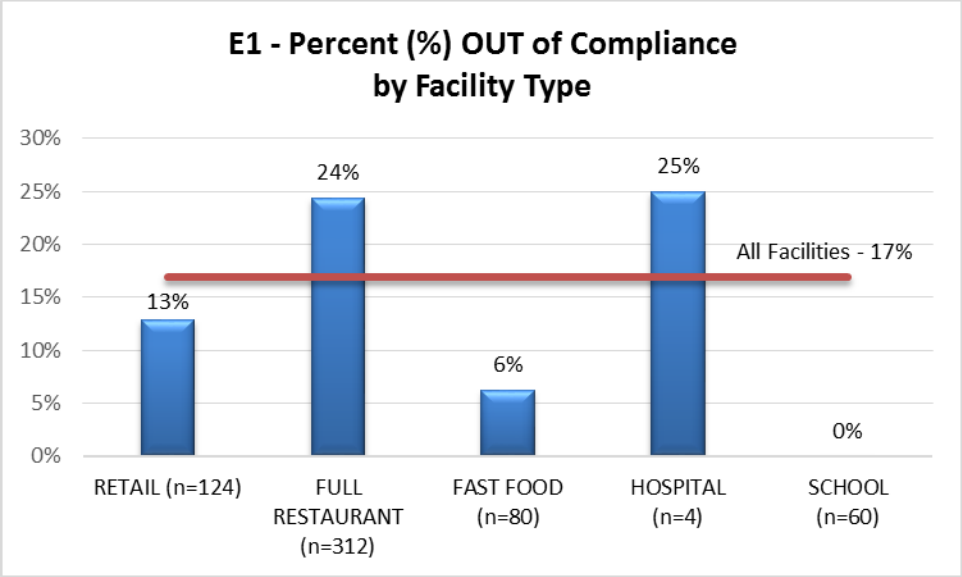


Figure 16

Food Separated & Protected was the overall third highest data item out-of-compliance. E1 is also a component of the same parent risk factor, Contaminated Equipment / Protection From Contamination, as the top out-of-compliance data item, E2. The breakdown by segment found Schools to be full compliance for this data item and Fast Food Restaurants had a relatively low out-of-compliance rate. Any intervention strategy developed for this data item should have a heavier focus on the other three industry segments.

#4: H2 – Proper Cold Holding

Risk Factor – Improper Food Holding / Time & Temperature

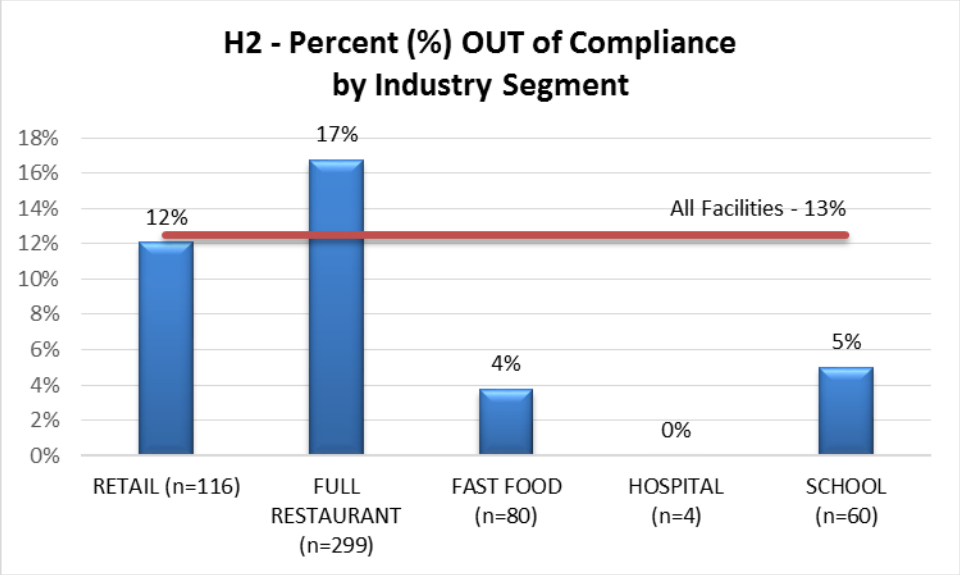


Figure 17

Proper Cold Holding was the fourth highest data item out-of-compliance with a 13% rate. Looking at H2 by facility type found that Full Service Restaurants (17%) and Retail food Stores (12%) were the primary contributors to the data item's elevated rate. The other categories were at or below 5%. Intervention strategies should mainly target the Retail and Full Restaurant segments.

#5: H1 – Proper Cooling

Risk Factor – Contaminated Equipment / Protection From Contamination

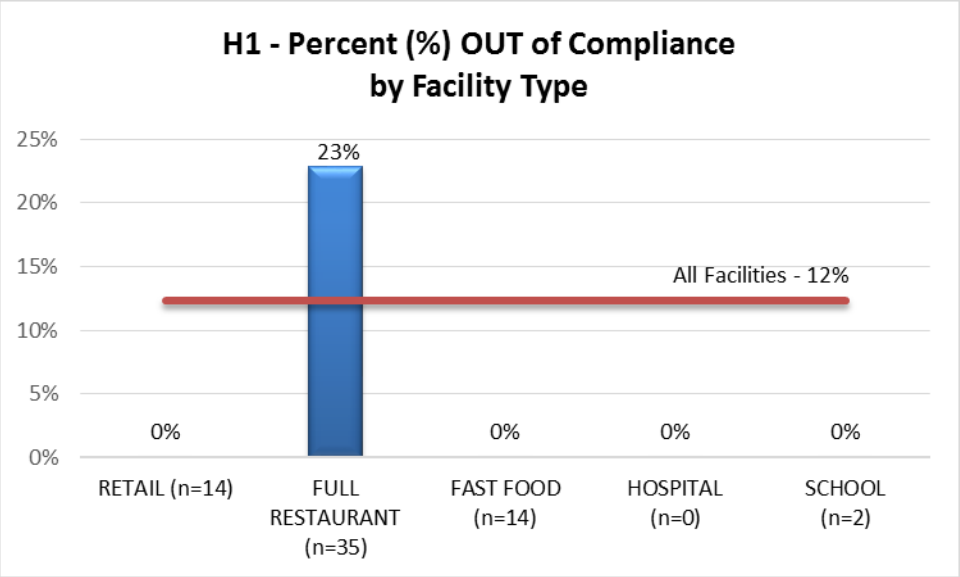


Figure 18

Proper Cooling (12%) was the last risk factor data that had an overall out-of-compliance rate greater than the previously designated 10% threshold. Full Restaurants (23%) were the only facility type to have an observable violation for H1. Consideration should be given for the low sample sizes across all of the segments when viewing the results. Only 65 of the 582 (11%) of the facilities included in this study were determined to have observable opportunities for this data item. This is reflective of the infrequency the cooling process is utilized at food establishments and the even less chance inspectors have to observe the practice. Intervention strategies should be tailored towards facilities that utilize cooling practices and involve creating opportunities for inspectors to view the process in action. This includes the addition of facilities that had marked N/O (not observed) for this data item on the inspection data.

V. CONCLUSION

A. Risk Factors Trends

The first objective of this risk factor study was to identify foodborne illness risk factor trends in need of priority attention. The data analysis found that the components, or data items, of the five major risk factors significantly varied in the influence they had to the overall out-of-compliance rates. The breakdown by facility type found that the out-of-compliance (see Appendix B) generally followed the overall trends for the data items. Based on these findings, it was determined to be more beneficial to focus on the trends of the individual data item as opposed to the lower level parent risk factors or by facility type. However, analysis by facility type should be utilized during the development of intervention strategies due to rate variations being identified within data items.

Although the ideal goal of any food regulatory program is to have full compliance with respect to food safety codes, a realistic threshold is needed to help determine when intervention strategies can be shifted to the next trend in need of priority attention. Utilizing data trends from other risk factor studies was not particularly useful for this purpose because this study used an atypical data collection method. An "acceptable" out-of-compliance rate for prioritization purposes needed to come from within the scope of this study. An arbitrary rate of 10% was established for this purpose and was primarily based on the range of the top five out-of-compliance data items. Any future study should re-evaluate and change this threshold based on the current data trends.

Based on the aforementioned criteria, five data items, or food safety practices and behaviors, were identified as needing priority attention. The data items are grouped into the following priority levels based on their overall out-of-compliance rates. Intervention strategies will initially focus on the primary data items, followed by secondary and tertiary after the former is established and deemed effective. The goal is to reduce all rates below the 10% threshold through targeted invention strategies.

Primary Data Items

- Food Contact Surfaces Cleaned & Sanitized (E2) – 38% out-of-compliance

Secondary Data Items

- Adequate Handwashing Facilities (P3) – 19% out-of-compliance
- Food Separated & Protected (E1) – 17% out-of-compliance

Tertiary Data Items

- Proper Cold Holding (H2) – 13% out-of-compliance
- Proper Cooling (H1) – 12% out-of-compliance

B. Intervention Strategies

The second objective of this risk factor study was to develop intervention strategies to reduce the occurrence of risk factor identified as needing priority attention. The intent of the intervention strategies is to reduce out-of-compliance rates to acceptable levels, which was defined in the previous section. The initial interventions will focus on the risk factor data item Food Contact Surfaces Cleaned & Sanitized (E2), which was found to be double the rate of the second highest out-of-compliance risk factor.

There are multiple strategies that could be implemented to target Food Contact Surfaces Cleaned & Sanitized (E2), such as fact sheets, training, or extra field inspections. The interventions will be developed within the following framework, but the specifics will be driven by the deeper analysis of the targeted data. This is important as E2 is associated with several specific code violations that may warrant different approaches to efficiently reduce the occurrence of the data item.

- Code Violation Analysis – E2 is associated with 17 specific WI Food Code violations (see Appendix A). Out-of-compliance rates of each specific code section will prioritize and guide the development of intervention strategies.

- Facility Types – The overall intervention strategies will target all facility types since the data analysis indicated that E2 was the top out-of-compliance risk factor across all industry segments. However, certain facility types may warrant more attention if the code violation analysis finds significant deviations between the segments.

- Approach – Intervention strategies will utilize a preventative approach. Regardless of the strategies used, ensuring active managerial control within each food establishment will be a major focal point. This system of continuous monitoring and verification by the staff in charge is vital for ensuring consistent food safe practices by employees. Facility operators will also be consulted in intervention development, as their buy-in is seen as essential in creating effective strategies.

- Monitoring – A monitoring system will be developed in conjunction with the intervention strategies in order to evaluate short-term effectiveness. This allows for a fluid approach that can evolve based on intervention effectiveness, changing trends, and operator feedback.

The same general framework will be used for the secondary and tertiary data items after the Food Contact Surfaces Cleaned & Sanitized intervention strategies are successfully implemented.

C. Future Studies

The third objective of this foodborne illness risk factor study was to establish a baseline that can be used to measure risk factor trends and implemented intervention strategies over time. The RCPHD intends to repeat this study at least once every 60 months and use it to evaluate and guide the regulatory food program. Since 5 years is a long time window to measure trends, conducting periodic data and analysis updates between full risk factor studies will be explored. This would help ensure implemented interventions are successfully addressing the targeted risk factors and identify others that may be significantly trending in an undesired direction.

Future risk factor studies should attempt to follow the same methodology as this study. However, it is recommend that the following observations and recommendations be considered for future studies:

- Facility Types – The Hospital segment had a small sample size (n=4), creating uncertainty in trend analysis. It is recommended that future studies group Schools and Hospitals into one category of Institutional Establishments.

- Out-of-Compliance Rates – The 10% threshold utilized in this study should be adjusted based on the most current data.

- Data Collection – Periodic training for inspection staff is recommended to ensure the IN/OUT/NA/NO convention is being consistently and properly marked.

- Additional Data – Including inspection data not directly associated with the five risk factors is recommended in future studies. These items are important as they are seen as supporting or enabling components of the five risk factors.

APPENDIX A

Risk Factor Reference Sheets

Risk Factor: Poor personal hygiene		
Data Item	**WI Food Code Section**	
P1 – Proper Handwashing	2-301.11	2-301.15 (A)
	2-301.12	2-301.15 (B)
	2-301.14	2-301.16
P2 – Prevention From Contamination From Hands	3-301.11 (B)	3-301.11 (D)
	3-301.11 (C)	3-801.11(D)
P3 – Adequate Handwashing Facilities	5-203.11	6-301.14
	5-204.11	5-202.12 (A)
	5-205.11	5-202.12 (B)
	6-301.11	5-202.12 (C)
	6-301.12	5-202.12 (D)
	6-301.13	8-301.11
P4 – Good Employee Hygienic Practices	2-401.11 (A)	3-301.12
	2-401.11 (B)	
P5 – Ill Employees Restricted	2-401.12	

Risk Factor: Improper food holding/time and temperature		
Data Item	**WI Food Code Section**	
H1 – Proper Cooling	3-501.14	
H2 – Proper Cold Holding	3-501.16(A)(2) AND (B)	
H3 – Proper Hot Holding	3-501.16(A)(1)	
H4 – Time As A Public Health Control	3-501-19 (A)	3-501-19 (C) (3)
	3-501-19 (B) (1), (3) AND (4)	3-501-19 (D) (1), (2) AND (5)
	3-501-19 (B) (2)	3-501-19 (D) (3)
	3-501-19 (C) (1), (4) AND (5)	3-501-19 (D) (4)
	3-501-19 (C) (2)	3-501-19 (E)
H5 – Proper Date Marking	3-501.17	3-501.18 (A)
	3-501.18 (B)	

Risk Factor: Inadequate cooking		
Data Item	**WI Food Code Section**	
C1 – Proper Cooking	3-401.11 (A)	3-401.14 (A)
	3-401.11 (B) (1)	3-401.14 (B)
	3-401.11 (B) (2)	3-401.14 (C)
	3-401.11 (C)	3-401.14 (D)
	3-401.11 (D)	3-401.14 (E)
	3-401.12	
C2 – Proper Reheating for Hot Holding	3-403.11	

Risk Factor: Contaminated equipment/protection from contamination		
Data Item	**WI Food Code Section**	
E1 – Food Separated & Protected	3-302.11 (A) (1)	3-302.11 (A) (6)
	3-302.11 (A) (2)	3-304.11
	3-302.11 (A) (4)	3-304.15 (A)
	3-302.11 (A) (5)	3-306.13 (A)
E2 – Food Contact Surfaces Cleaned & Sanitized	4-501.111	4-602.11 (E)
	4-501.112	4-602.12 (A)
	4-501.113	4-602.12 (B)
	4-501.114	4-701.10
	4-501.115	4-702.11
	4-601.11 (A)	4-703.11 (A)
	4-602.11 (A)	4-703.11 (B)
	4-602.11 (C)	4-703.11 (C)
	4-602.11 (D)	
E3 – Proper Disposition of Food	3-306.14	3-701.11 (A)

Risk Factor: Food obtained from unsafe sources		
Data Item	**WI Food Code Section**	
S1 – Approved Food Source	3-201.11 (A)	3-201.17 (A)
	3-201.11 (B)	3-201.17 (B) (1)
	3-201.11 (C)	3-201.17 (B) (2)
	3-201.11 (D)	3-201.17 (B) (3)
	3-201.11 (E)	3-201.17 (B) (4)
	3-201.11 (F)	3-201.17 (B) (5)
	3-201.11 (G)	3-201.17 (B) (6)
	3-201.11 (H)	3-201.17 (B) (7)
	3-201.12	3-201.17 (B) (8)
	3-201.13	3-201.17 (B) (9)
	3-202.13	3-201.17 (C)
	3-202.14	3-201.17 (D)
	3-202.110 (A)	3-202.110 (A)
	3-202.110 (B)	3-202.110 (B)
	5-101.13	3-202.13
	3-201.14	3-202.14
	3-201.15	5-101.13
	3-201.16	3-202.110 (A)
S2 – Food Received at Proper Temperature	3-202.11 (A)	3-202.11 (D)
	3-202.11 (C)	3-202.11 (E)
	3-202.11 (F)	
S3 – Food in Good Condition & Safe	3-101.11	3-202.15
S4 – Required Records Available	3-202.18	3-203.12 (A)
	3-203.12 (B)	3-203.12 (C)
	3-402.11	3-402.12 (A)
	3-402.12 (C)	

APPENDIX B

Full Data Tables

Risk Factor Out of Compliance Data by Facility Type

	Retail Food Stores			Full Restaurants			Fast Food Restaurants			Schools			Hospitals			ALL FACILITIES		
Risk Factor	**Out**	**Total In/Out**	**Rate**	**Out**	**Total In/Out**	**Rate**	**Out**	**Total In/Out**	**Rate**	**Out**	**Total In/Out**	**Rate**	**Out**	**Total In/Out**	**Rate**	**OUT**	**TOTAL IN/OUT**	**RATE**
Poor Personal Hygiene	22	125	**17.6%**	93	312	**29.8%**	16	80	**20.0%**	3	61	**4.9%**	2	4	**50.0%**	136	582	**23.4%**
Improper Holding / Time & Temperature	27	118	**22.9%**	81	301	**26.9%**	8	80	**10.0%**	6	61	**9.8%**	0	4	**0.0%**	122	564	**21.6%**
Contaminated Equipment / Protection	52	125	**41.6%**	168	312	**53.8%**	31	80	**38.8%**	10	61	**16.4%**	2	4	**50.0%**	263	582	**45.2%**
Inadequate Cooking	0	59	**0.0%**	1	186	**0.5%**	1	61	**1.6%**	0	39	**0.0%**	0	4	**0.0%**	2	349	**0.6%**
Food Obtained From Unsafe Sources	2	125	**1.6%**	1	312	**0.3%**	0	80	**0.0%**	0	61	**0.0%**	0	4	**0.0%**	3	582	**0.5%**

Data Item Out of Compliance by Facility Type

		Retail			Full Restaurant			Fast Food			Hospitals			Schools			ALL FACILITIES		
Risk Factor	**DATA ITEM**	**OUT**	**TOTAL IN/OUT**	**RATE**	**OUT**	**TOTAL IN/OUT**	**RATE**	**OUT**	**TOTAL IN/OUT**	**RATE**	**OUT**	**TOTAL IN/OUT**	**RATE**	**OUT**	**TOTAL IN/OUT**	**RATE**	**OUT**	**TOTAL IN/OUT**	**RATE**
Inadequate	**C1**	0	52	**0.0%**	1	177	**0.6%**	1	54	**1.9%**	0	4	**0.0%**	0	33	**0.0%**	2	320	**0.6%**
Cooking	**C2**	0	32	**0.0%**	0	71	**0.0%**	0	37	**0.0%**	0	1	**0.0%**	0	19	**0.0%**	0	160	**0.0%**
Contaminted	**E1**	16	124	**12.9%**	76	312	**24.4%**	5	80	**6.3%**	1	4	**25.0%**	0	60	**0.0%**	98	580	**16.9%**
Equipment /	**E2**	43	124	**34.7%**	139	312	**44.6%**	26	80	**32.5%**	2	4	**50.0%**	10	61	**16.4%**	220	581	**37.9%**
Protection From	**E3**	1	125	**0.8%**	0	312	**0.0%**	0	80	**0.0%**	0	4	**0.0%**	0	61	**0.0%**	1	582	**0.2%**
	H1	0	14	**0.0%**	8	35	**22.9%**	0	14	**0.0%**	0	0	**0.0%**	0	2	**0.0%**	8	65	**12.3%**
Improper	**H2**	14	116	**12.1%**	50	299	**16.7%**	3	80	**3.8%**	0	4	**0.0%**	3	60	**5.0%**	70	559	**12.5%**
Holding / Time	**H3**	8	63	**12.7%**	15	162	**9.3%**	1	72	**1.4%**	0	4	**0.0%**	2	47	**4.3%**	26	348	**7.5%**
& Temperature	**H4**	0	23	**0.0%**	1	16	**6.3%**	2	36	**5.6%**	0	0	**0.0%**	0	3	**0.0%**	3	78	**3.8%**
	H5	8	108	**7.4%**	34	288	**11.8%**	3	79	**3.8%**	0	4	**0.0%**	1	60	**1.7%**	46	539	**8.5%**
	P1	6	109	**5.5%**	20	286	**7.0%**	3	80	**3.8%**	0	4	**0.0%**	0	57	**0.0%**	29	536	**5.4%**
Poor Personal	**P2**	1	120	**0.8%**	9	293	**3.1%**	0	80	**0.0%**	0	4	**0.0%**	0	61	**0.0%**	10	558	**1.8%**
Hygiene	**P3**	20	125	**16.0%**	73	312	**23.4%**	15	80	**18.8%**	2	4	**50.0%**	3	61	**4.9%**	113	582	**19.4%**
	P4	0	99	**0.0%**	14	299	**4.7%**	2	59	**3.4%**	1	4	**25.0%**	0	61	**0.0%**	17	522	**3.3%**
	P5	0	121	**0.0%**	0	310	**0.0%**	0	80	**0.0%**	0	4	**0.0%**	0	61	**0.0%**	0	576	**0.0%**
Food Obtained	**S1**	0	125	**0.0%**	0	312	**0.0%**	0	80	**0.0%**	0	4	**0.0%**	0	61	**0.0%**	0	582	**0.0%**
From Unsafe	**S2**	0	13	**0.0%**	0	18	**0.0%**	0	4	**0.0%**	0	1	**0.0%**	0	15	**0.0%**	0	51	**0.0%**
Sources	**S3**	2	125	**1.6%**	1	312	**0.3%**	0	80	**0.0%**	0	4	**0.0%**	0	61	**0.0%**	3	582	**0.5%**
	S4	0	11	**0.0%**	0	12	0.0%	0	2	**0.0%**	0	0	**0.0%**	0	2	**0.0%**	0	27	**0.0%**

APPENDIX C

References

FDA Voluntary National Retail Food Regulatory Program Standards
https://www.fda.gov/food/voluntary-national-retail-food-regulatory-program-standards/voluntary-national-retail-food-regulatory-program-standards-november-2019

FDA's Study on the Occurrence of Foodborne Illness Risk Factors in Selected Retail and Foodservice Facility Types (2013-2024), Protocol for the Data Collection
https://www.fda.gov/media/98224/download

FDA Food Code
https://www.fda.gov/food/retail-food-protection/fda-food-code

Wisconsin Food Code
https://docs.legis.wisconsin.gov/code/admin_code/atcp/055/75_

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