A Comparison Study of the Occurrence of Risk Factors in Retail Food Establishments Observed Nationwide and in Virginia

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Abstract

This study compared the five Centers for Disease Control (CDC) foodborne illness risk factors found in Virginia high-risk retail food establishments during the Virginia Department of Agriculture and Consumer Services (VDACS) inspections (2012 – 2013) to the number and type of these risk factors documented nationally by the U. S. Food and Drug Administration (FDA) in 2009. Nationally, the highest-occurring risk factor was improper holding/time and temperature, while in Virginia the highest occurring risk factor was contaminated equipment/protection from contamination. The study also revealed large differences in occurrence rates for the improper holding/time and temperature risk factor in Virginia in comparison to national rates. Comparison of risk factor observations of VDACS regions and the Virginia average revealed significant differences for two risk factors: food from unsafe sources and improper holding/time and temperature.

Recommendations include further research to determine the reasons for differences in the rates of specific risk factor violations as well as additional research to examine whether Virginia-trained inspectors are appropriately standardized. Finally, the study recommends that regulators continue to update and reinforce the guidance that they provide to retail food establishment operators about the use of retail risk factors to actively manage their establishment’s food safety system.

Keywords: FDA, food inspections, food service, retail food establishments, risk factors, time and temperature, Virginia Department of Agriculture and Consumer Services (VDACS)
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Background

The Centers for Disease Control and Prevention (CDC) Surveillance Report for 1988 – 1992 identified the most significant contributing factors to foodborne illness (Centers for Disease and Prevention [CDC], 1996; U. S. Food and Drug Administration [FDA], 2009) as: Food from Unsafe Sources, Poor Personal Hygiene, Inadequate Cooking, Improper Holding/Time and Temperature, and Contaminated Equipment/Protection from Contamination. In 1996, the National Performance Review Report determined that foodborne illness caused by harmful bacteria and other pathogenic microorganisms in various food industry sectors (e.g., meat, poultry, seafood, dairy products) and a host of other foods was a significant public health problem in the U.S. (FDA, 2009). As a result, the Food and Drug Administration (FDA) conducted a study in 1998 to serve as a baseline for evaluation of future efforts to help improve food preparation practices and food employee behaviors in institutional food service establishments, restaurants, and retail food stores.

In 2009, the Virginia Department of Agriculture and Consumer Services (VDACS) began to better align its risk identification process with the CDC Surveillance Report by increasing focus on violations of the five CDC risk factors. For example, inspection report requirements were updated to reflect FDA risk categories and definitions. As a result, the data from the new inspection reports began to capture ordinal data about foodborne illness risk factor occurrences in retail establishments. VDACS also integrated risk factors into the evaluation of other food safety-related factors including:
food service processes, labeling, vulnerability to intentional contamination, employee training, and enforcement in the field.

**Problem Statement**

The differences between national and Virginia rates of the five risk factors found in high risk retail food establishments is unknown.

**Research Questions**

1. What are the differences between the rates of occurrence of CDC risk factors in Virginia and those documented in the 2009 national survey by the FDA?
2. What are the differences among the CDC risk factors in the three VDACS regions (Northern Virginia, Southwest, and Tidewater) as compared with the Virginia average?

**Methodology**

The protocol used to identify observable occurrences in the national survey was also used for this study. High-risk retail establishments in the VDACS database from September 1, 2012 to August 31, 2013 that were similar to the establishments used in the 2009 national survey completed by the FDA were identified, including retail food stores such as delis, meat departments, seafood departments, and produce departments. Seven hundred and seventy-four (774) inspections met the criteria. A random number simulator was used to select 390 reports (50%) that were reviewed for this study. The data was examined, sorted, and analyzed to determine the number and types of risk factor violations documented in selected retail establishments located in all three regions of Virginia (Northern Virginia, Southwest, and Tidewater). The data was then analyzed for the prevalence and distribution of risk factor violations in Virginia
during the 2012-2013 time frame and compared to the trends found at the national level by the FDA; in addition, trends among the three VDACS regions were compared to trends statewide.

Results

The national study revealed that improper holding/time and temperature occurred at a rate of 50.8% and this study found that the rate in Virginia was 37% (see Table 1). The contaminated equipment/protection from contamination risk factor occurred at a rate of 67.9% in Virginia and at 18.8% in the national study. The poor personal hygiene risk factor occurred at a rate of 20.5% in the national study compared to a rate of 8.4% in Virginia.

Table 1

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>National</th>
<th>Virginia</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food from Unsafe Sources</td>
<td>4.30%</td>
<td>12.05%</td>
<td>+7.75%</td>
</tr>
<tr>
<td>Improper Holding/Time and Temperature</td>
<td>50.80%</td>
<td>37.09%</td>
<td>-13.71%</td>
</tr>
<tr>
<td>Improper Cooking</td>
<td>9.40%</td>
<td>0.76%</td>
<td>-8.64%</td>
</tr>
<tr>
<td>Contaminated Equipment/Protection from Contamination</td>
<td>18.80%</td>
<td>67.90%</td>
<td>+49.1%</td>
</tr>
<tr>
<td>Personal Hygiene</td>
<td>20.50%</td>
<td>8.46%</td>
<td>-12.04%</td>
</tr>
</tbody>
</table>

A comparison of risk factors in the three Virginia regions revealed both differences and similarities (see Table 2). Risk factors for inadequate cooking and poor personal hygiene showed a low occurrence rate of less than 10% in each region. Contaminated equipment/protection from contamination ranged from 65% to 69% in
Virginia regions, which was a rate close to the Virginia average of 67.9%. Improper holding/time and temperature occurred at a rate of 52% in the Tidewater region and 31% for both Northern Virginia and Southwest regions, compared with the Virginia average of 37%. The food from unsafe sources risk factor differed among the three Virginia regions, with Tidewater at 21.4%, Southwest at 3.7%, and Northern Virginia at 11.7% which is close to the Virginia average of 12%.

Table 2

_Difference Among Virginia Regions Compared With Virginia Average_

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Virginia Average</th>
<th>Northern Virginia</th>
<th>Southwest</th>
<th>Tidewater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food from Unsafe Sources</td>
<td>12.05%</td>
<td>11.71%</td>
<td>3.70%</td>
<td>21.40%</td>
</tr>
<tr>
<td>Improper holding Time/Temperature</td>
<td>37.09%</td>
<td>31.20%</td>
<td>31.80%</td>
<td>52%</td>
</tr>
<tr>
<td>Improper Cooking</td>
<td>0.76%</td>
<td>0%</td>
<td>0%</td>
<td>2.30%</td>
</tr>
<tr>
<td>Contaminated Equipment/Protection</td>
<td>67.90%</td>
<td>65.60%</td>
<td>68.80%</td>
<td>69.80%</td>
</tr>
<tr>
<td>from Contamination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Hygiene</td>
<td>8.46%</td>
<td>7.03%</td>
<td>8.80%</td>
<td>9.50%</td>
</tr>
</tbody>
</table>

**Conclusion**

Virginia rates reflect similarities with observations of the national study in that improper holding/time and temperature was one of the highest-occurring risk factors regionally. However, the risk factor protection from contaminated equipment/protection from contamination occurred at the highest rate in Virginia and at an even greater rate than the frequency observed at the national level.

The observed occurrence rate for improper holding time and temperature in Virginia was 20% higher than the data observed nationally. Protection from
contamination was overall one of the highest-occurring risk factors out of all five of the risk factors in Virginia. The inadequate cooking temperature and food from unsafe sources risk factors occurred at a significantly lower rate both nationally and in Virginia.

Observed risk factor violations were consistent among VDACS regions in all risk factor categories except food from unsafe sources and improper holding/time and temperature. The greatest variation among VDACS regions was the rate that the risk factor food from unsafe sources was reported as a violation. In the Southwest region, inspectors documented observations of the food from unsafe sources violation approximately 6% less often than the Virginia average, while inspectors working in the Tidewater Region documented this risk factor approximately 9% more often than the Virginia average. The sole outlier in the documentation of improper holding/time and temperature involved inspectors in the Tidewater Region, who documented this violation at a rate nearly 15% more often than the Virginia average.

A possible limitation of this study is the difference between the identification of observable occurrences and method of inspection performed by FDA during the national study and Virginia inspectors.

**Recommendations**

Further research needs to be completed to determine the cause of notable risk factor differences (improper holding/time and temperature, contaminated equipment/protection from contamination) in Virginia as compared with the national study. This research should include determining whether Virginia-trained inspectors are standardized to perform retail food establishment inspections based on the current Food
Code requirements and associated FDA guidance related to the identification and categorization of risk factor violations.

Further research also needs to be performed to determine the cause of VDACS regional variance from the state's average observed violation rates for the food from unsafe sources and improper holding/time and temperature risk factors.

VDACS should develop approaches to ensure that foodservice and retail food store operators responsible for active managerial control of retail food establishments are systematically reminded about risk factors present in their businesses, and are provided information about updated requirements and establishment-specific guidance for application of these requirements. FDA risk-based inspection protocols and method of inspection should be studied to see if elements can be incorporated into routine inspection methods performed by Virginia inspectors.

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References
