Executive Summary

The Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA) contracted with RTI International and its subcontractor North Carolina State University (NCSU) to conduct meal preparation experiments to evaluate consumer food handling behaviors in a test kitchen. The research team is conducting five separate iterations of meal preparation experiments to address a specific consumer behavior and to determine the effectiveness of a behavior change intervention. The meal preparation experiments are part of a larger 5-year annual study that also includes focus groups (two iterations) and web surveys (two iterations). This report describes the results of the fourth iteration of the meal preparation experiment.

RTI and NCSU conducted the study in a test kitchen facility located in Raleigh, North Carolina (Wake County), with three identical test kitchens. For this study, we explored the impact of including food safety instructions in recipes on participants' food safety practices. Participants were randomized to one of three conditions: the control group, recipes without food safety instructions; Treatment 1 (T1), recipes with food safety instructions; or Treatment 2 (T2), recipes with food safety instructions and a celebrity endorsement. A total of 200 people participated in the study (66 control, 66 T1, 68 T2). Food safety information was formatted using the Partnership for Food Safety Education's Safe Recipe Style Guide[1] and included instructions on washing hands at the beginning of cooking and after touching uncooked ground beef, using a food thermometer to check for doneness, cleaning and sanitizing surfaces and utensils after touching uncooked ground beef, and washing the apple and carrot by rubbing under cold water. For the outcomes of interest, we conducted statistical testing for the difference between the control vs. T1, control vs. T2, and T1 vs. T2.

In each test kitchen, eight cameras recorded participants' actions at various locations throughout the kitchen and recorded the meal preparation from beginning to end. Participants in the control and treatment groups were observed while grilling bratwurst and hamburgers (inoculated with harmless traceable nonpathogenic *E. coli* strain DH5-Alpha) and preparing a ready-to-eat (RTE) salad (bagged lettuce, carrots, and apples) to determine whether they used a food thermometer, adhered to recommended handwashing practices, safely prepared the RTE salad, and safely handled and stored uncooked ground beef from a chub. Following meal preparation and participants' cleaning and/or sanitizing of the kitchen, the study team collected microbiological samples from surfaces and lettuce from the prepared RTE salad and analyzed the samples for prevalence and level of DH5-Alpha. Participants participated in a post-observation interview to collect information on their usual food preparation practices.

ES.1 Key Findings

The key findings from the study are summarized below.

Food Thermometer Use

▪ Thermometer use was significantly higher in the two treatment groups (95% for T1 and 96% for T2) when compared with the control group (55%) for determining doneness of bratwurst.

▪ Thermometer use was significantly higher in the two treatment groups (95% for T1 and 99% for T2) when compared with the control group (58%) for determining

doneness of hamburgers.

▪ Among participants in all groups, most participants who used a thermometer checked the doneness of the two hamburgers and all five bratwurst.

▪ Among participants using a thermometer, most participants failed to insert the thermometer in the proper location when checking the doneness of the hamburgers and bratwurst.

▪ Comparing thermometer use among control group participants for Years 1 through 4 of the study, thermometer use varied by the type of product cooked. Thermometer use was significantly higher for hamburgers (58%) compared with turkey burgers (34%).

Handwashing

▪ Handwashing attempts before meal preparation were significantly higher in the two treatment groups (62% for T1 and 65% for T2) when compared with the control group (44%).

▪ There was not a statistically significant difference in the rate of handwashing attempts between the three groups for events requiring handwashing during meal preparation.

▪ As in Years 1 through 3, few handwashing attempts included all steps necessary to be considered an adequate handwashing event as defined by the Centers for Disease Control and Prevention's recommended steps, and the most documented reason for not successfully washing hands was failing to rub hands with soap for at least 20 seconds.

▪ For handwashing before meal preparation, the rate of attempting handwashing (44%) was significantly lower compared with rates observed for study Year 2 (74%) and Year 3 (71%) among control group participants.

2 We speculate that the lower rate for Year 4 may be because participants used the hand sanitizer station upon arrival, which was not present in prior years, as a COVID-19 precaution. Other reasons are possible, such as differences in the characteristics of the study sample and social distancing measures during the participant introduction to the test kitchen, which led them to touch meal preparation surfaces (e.g., drawers/cabinets),

thus commencing meal preparation before washing their hands. Additional analysis is needed to understand why the rates are different.

2 For Year 1, data were not available by when handwashing took place (i.e., before the start of or during meal preparation).

Handling, Preparation, and Storage of Chub/Ground Beef

- Most participants placed the chub on a cutting board or plate to prepare the hamburgers or dumped the ground beef into a bowl without letting the ground beef or chub packaging touch a surface. Some participants (15 to 20% depending on study group) prepared the ground beef directly on the counter, which is not recommended.
- Immediately after handling the chub, 31% of control group participants, 53% of T1 participants, and 46% of T2 participants attempted cleaning/sanitizing the surface used to prepare the uncooked ground beef from the chub; the difference between the control group and T1 was statistically significant, but not between the control group and T2.
- Most participants stored the uncooked ground beef from the chub in the refrigerator (instead of placing in freezer). Few participants labeled the package.

Cross-contamination and Microbiological Analysis

- Across all participants, the surface most often contaminated was the sink basin (28% of participants). The rate of contamination for the spice containers was 12%. Rates of contamination were relatively low for the cupboard handle (8%) and the counter area where the chub was opened (3%).
- Among participants handwashing the plate or cutting board used to prepare the hamburgers from the chub, 32% of participants did not thoroughly wash the plate/cutting board (i.e., it was contaminated with the surrogate).
- Across all participants, the prevalence for contamination on the salad lettuce was 17%.
- For the sink basin, the prevalence rate for contamination was higher for the control group (32%) compared with T1 (17%). Prevalence rates for the other surfaces and the salad lettuce were not significantly different between the control group and the

two treatment groups.

Washing Produce

▪ Rates of properly washing the carrot for the RTE salad were higher in the treatment groups (84% for T1 and 75% for T2) than the control group (71%); however, the differences were not statistically significant.

▪ Rates of properly washing the apple for the RTE salad were higher in the treatment groups (83% for T1 and 79% for T2) than the control group (72%); however, the differences were not statistically significant.

▪ For both the carrot and apple, about 40% of control group participants did not attempt washing, whereas nearly all T1 and T2 participants attempted washing, although some failed to rub it with their hands, so the attempt was unsuccessful.

▪ Most participants in all three groups did not wash the bagged lettuce as recommended.

ES.2 Implications for OPACE Outreach Efforts

The key implications for OPACE outreach efforts based on the study results are summarized below:

▪ ***Inclusion of food safety instructions positively affected some food safety practices.*** The study results suggest that the food safety instructions included in the recipes positively affected using the thermometer, attempting handwashing before meal preparation, and attempting cleaning/sanitizing immediately after handling the chub but did not affect attempting handwashing during meal preparation and properly washing the carrot and apple. Lower rates of cross-contamination were also found for certain kitchen surfaces. In the post-observation interviews with treatment group participants, many participants reported using recipes when cooking at home, and most reported that they noticed the food safety instructions in the recipes provided for the meal preparation experiment.

▪ ***The addition of a celebrity chef endorsement for food safety instructions in recipes did not influence food safety practices.*** Recognition of the celebrity chef (Kenji Lopez-Alt) featured in T2 was low (15%), which likely led to the lack of statistically significant differences between T1 and T2 for the behaviors of interest. Although most T2 participants said they trust celebrity chefs in general, only about a

third agreed they would follow food safety instructions because a celebrity chef endorsed them. These findings suggest that the addition of a celebrity chef endorsement for food safety instructions in recipes may not influence consumers' food safety behaviors and that inclusion of food safety instructions alone may be sufficient to motivate behavior change.

▪ ***Providing consumers with information on food safety practices at the point of use (i.e., during meal preparation) may help facilitate behavior change.*** Prompting consumers with food safety instructions at the time of meal preparation and as part of the recipe positions a consumer to adhere to food safety instructions as part of the process, even if it is not something they normally do. The Partnership for Food Safety Education's Food Safety Style Guide could also be used as a reference point for media organizations when developing news segments about food safety and include examples on how to handle food safely to help prevent foodborne illness.