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## Improved Knowledge and Adoption of Recommended Food Safety Practices by Food Recovery Agency Personnel and Volunteers Participating in the Serving Food Safely Program

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## Improved Knowledge and Adoption of Recommended Food Safety Practices by Food Recovery Agency Personnel and Volunteers Participating in the Serving Food Safely Program

### Abstract

The tri-state study reported here tested the effectiveness of a curriculum developed and presented in workshops by Extension and research faculty to increase knowledge and promote safe food handling practices of staff and volunteers of food recovery agencies providing rescued and surplus food to vulnerable populations. Results indicated that knowledge and adoption of recommended food safety practices increased for both staff and volunteers following participation in the workshops. The improvement in food safety knowledge and adoption of recommended food safety practices support the continued use of the food safety curriculum in the three states and possibly other areas in the United States.

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## Introduction

Food recovery agencies, including community outreach programs, food pantries, and food banks, help feed the hungry with donations from restaurants, supermarkets, schools, prisons, hospitals, food processors, hotels, and community events. Included are those agencies that prepare and serve donated food to program recipients on site and those that provide perishable and non-perishable foods for preparation by recipients at home. Both permanent employees and volunteers work in food recovery agencies.

Because many of the recipients of food recovery agencies include individuals who are at greater risk of and more severely affected by foodborne illness, such as children, the elderly, and the immunocompromised (Shewmake & Dillon, 1998; USDA, 2000; Alaimo, Olson, & Frongillo, 2001), it is essential that food recovery agency personnel practice recommended food safety guidelines. A shortage of workers trained in safe food-handling procedures and an overall high turnover rate among employees have been identified as barriers to safe food handling practices (Kendall, Smith, Thilmany, Hine, Melcher, & Paul, 2001).

The purpose of the study reported here was to test the effectiveness of a curriculum designed and presented by land-grant university research and extension faculty in Louisiana, Mississippi, and Arkansas to increase knowledge and promote safe food handling practices by staff and volunteers of food recovery agencies.

## Methods

### Participants

A list of food recovery agencies in urban and rural areas of the Lower Mississippi Delta region of Louisiana (32 agencies), Mississippi (40 agencies), and Arkansas (6 agencies) was compiled from lists obtained from food banks in each state. Urban areas included large metropolitan cities, New Orleans and Baton Rouge, Louisiana; Jackson, Mississippi; and Little Rock, Arkansas, and rural areas included smaller towns and communities in the three states. A letter inviting participation in the free workshops and postage-paid response cards were mailed to the 78 identified agencies.

### Curriculum

The Serving Food Safely food safety curriculum designed for food recovery agency personnel and volunteers was developed and presented by land-grant university research and Extension faculty in Louisiana, Mississippi, and Arkansas. Curriculum topics addressed the leading factors associated with foodborne disease in the United States, including failure to: (a) hold and cool foods appropriately, (b) practice proper personal hygiene, (c) prevent cross-contamination, (d) cook to proper internal temperatures, and (e) procure food from safe sources (Olsen, MacKinnon, Goulding, Bean, & Slutsker, 2000). The curriculum contained 10 lessons, a video, and an exhibit. Each lesson included a lesson plan with participatory activities, a fact sheet, and a computer-generated presentation. The curriculum training was presented in a single session workshop of no more than 3 hours in length.

### Research Design

Changes in food safety knowledge were measured using 20-point pre- and post-tests at the beginning and immediately after participating in the curriculum. In addition, a 10-point food safety practices survey, administered immediately after the workshop, estimated the participants' current practices and intention to follow recommended food safety practices they were not already practicing. A follow-up food safety practices questionnaire, mailed to Louisiana and Mississippi participants 3 to 4 months after participating in the program estimated the participants' maintenance of their baseline food safety practices. The baseline food safety practices survey statements were phrased "plan to follow," and the follow-up food safety practices survey statements were phrased "currently following."

An expert panel of nutrition and food science faculty and food service managers from Louisiana, Mississippi, and Arkansas participated in developing the instruments. The instruments were

administered to 29 nutrition paraprofessionals presumed to have reading levels similar to the intended audience, and their reactions were used to ensure that the material was informative and clear.

The study protocol and instruments were approved by the three university institutional review boards. Participants completed consent forms at each workshop.

## Statistical Methods

Data were analyzed using the Statistical Package for the Social Sciences (SPSS version 14.0). Descriptive statistics and summative evaluations were reported. Independent-sample t-tests were performed to examine potential differences in subject characteristics and food safety knowledge and behaviors between groups. Pre-test differences were controlled for using analysis of covariance (ANCOVA) with pre-test scores considered the covariate. Change in food safety knowledge and practices as a result of participating in the curriculum were examined using repeated measures analysis of variance (ANOVA). Last, the relationship between expressed intention to adopt recommended food safety practices and adoption of those practices 3 to 4 months post-intervention was examined using the Pearson's r correlation coefficient. Significance was set at  $p < 0.05$ .

## Results

One hundred ninety subjects from Louisiana ( $n=103$ ; 54%), Mississippi ( $n = 58$ ; 31%), and Arkansas ( $n = 29$ ; 15%) completed the food safety training program. Most were staff (75%) as compared to volunteers, and most worked in urban locales (58%) as compared to rural areas. At baseline, there were no differences between the staff and volunteers or between the rural and urban participants in food safety knowledge scores ( $t[188] = 0.58$ ,  $p = 0.56$  and  $t[188] = 0.01$ ,  $p = 0.99$  respectively). However, among the three states, there were differences in pre-test scores ( $F[2, 187] = 6.50$ ,  $p = 0.00$ ). Test scores for Louisiana participants were significantly lower than those for Mississippi ( $p = 0.01$ ) and approached a significant difference with Arkansas subjects ( $p = 0.07$ ).

Because of this dissimilarity among states, a one-way ANCOVA was conducted to examine food safety knowledge at post-test, after controlling for the variance in food safety knowledge scores at pre-test (covariate). The results of the analysis confirmed the pre-test food safety knowledge scores as the study covariate for the post-test assessment ( $F[1, 186] = 90.5$ ,  $p = 0.00$ ). There was no significant difference between the states in food safety knowledge at post-test ( $F[2, 186] = 1.19$ ,  $p = 0.31$ ). The unadjusted and adjusted means and standard deviations for food safety knowledge at both the pre-test and post-test for the state groups are presented in Table 1.

**Table 1.**  
Food Safety Knowledge Scores Between Groups ( $n=190$ )

Groups	Pre-Test	Post-Test (unadjusted)	Post-Test (adjusted)
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
<b>State of Residence</b>			
Louisiana ( $n=103$ )	16.0 $\pm$ 2.8 <sup>y</sup>	18.8 $\pm$ 2.1	19.0 $\pm$ 0.2**
Mississippi ( $n = 58$ )	17.5 $\pm$ 2.4 <sup>z</sup>	19.1 $\pm$ 1.7	18.7 $\pm$ 0.2**
Arkansas ( $n = 29$ )	17.3 $\pm$ 3.2 <sup>y,z</sup>	19.5 $\pm$ 0.8	19.3 $\pm$ 0.3**
<b>Employment Status</b>			
Staff ( $n = 143$ )	16.7 $\pm$ 2.7	19.0 $\pm$ 1.8**	
Volunteer ( $n = 47$ )	16.5 $\pm$ 3.1	18.9 $\pm$ 2.2**	
<b>Area of Residence</b>			
Urban ( $n = 111$ )	16.7 $\pm$ 2.8	19.0 $\pm$ 1.7**	
Rural ( $n = 79$ )	16.7 $\pm$ 2.8	18.9 $\pm$ 2.1**	
		18.8 $\pm$ 2.1**	
Total group ( $n = 190$ )	16.7 $\pm$ 2.8	19.0 $\pm$ 1.9**	
Note: Score reflects food safety knowledge from a list of 20 questions. <sup>y,z</sup> Pre-test scores were significantly lower for Louisiana participants when compared to participants from Mississippi ( $p = 0.00$ ) and approached significance when compared to Arkansas participants ( $p = 0.06$ ). ** Post-test scores were significantly greater than pre-test scores ( $p < 0.01$ ).			

Seventy-two of 161 participants from Louisiana and Mississippi completed and returned the food safety practices follow-up questionnaires. The Arkansas workshop schedule did not coincide with Louisiana and Mississippi, which precluded the inclusion of the follow-up results from Arkansas. As found in the total group, pre-test scores for food safety knowledge were significantly lower in Louisiana participants when compared to those from Mississippi ( $p = 0.00$ ). In the follow-up group, pre-test and post-test mean and standard deviation scores for food safety knowledge were similar to the larger group ( $16.2 \pm 2.7$  and  $18.1 \pm 2.1$  for Louisiana and Mississippi respectively), and post-test ( $19.0 \pm 2.0$  and  $18.9 \pm 1.95$ ;  $19.4 \pm 0.23$  and  $18.3 \pm 0.29$  for Louisiana and Mississippi unadjusted and adjusted scores respectively). Pre-and post-test safety knowledge scores did not differ between staff and volunteers or between urban and rural participants.

At the conclusion of the workshop, there were no differences reported in food safety practices between Louisiana and Mississippi participants, staff and volunteers, or urban and rural residents (Table 2). When assessed in the follow-up group 3 to 4 months after participating in the workshop, self-reported food safety practices had improved in both states ( $F[1, 70] = 47.66, p = 0.00$ ), staff and volunteers ( $F[1, 70] = 25.83, p = 0.00$ ), and urban and rural subjects ( $F[1, 70] = 43.80, p = 0.00$ ).

**Table 2.**  
Self-Reported Food Safety Practices Scores Between Groups (n=72)

<b>Group</b>	<b>Food Safety Practices Post-Workshop Score</b>	<b>Food Safety Practices 3-4 Months Post- Workshop Score</b>
	<b>Mean <math>\pm</math> SD</b>	<b>Mean <math>\pm</math> SD</b>
<b>State of Residence</b>		
Louisiana (n = 43)	6.3 $\pm$ 3.2	8.5 $\pm$ 1.5**
Mississippi (n = 29)	5.6 $\pm$ 3.7	9.1 $\pm$ 1.5**
<b>Employment Status</b>		
Staff (n = 56)	5.8 $\pm$ 3.5	8.8 $\pm$ 1.6**
Volunteer (n = 16)	6.8 $\pm$ 2.7	8.9 $\pm$ 1.5**
<b>Area of Residence</b>		
Urban (n = 31)	6.0 $\pm$ 3.4	8.9 $\pm$ 1.4**
Rural (n = 41)	6.0 $\pm$ 3.4	8.7 $\pm$ 1.7**
Total group (n = 72)	6.0 $\pm$ 3.4	8.8 $\pm$ 1.5**
Note: Score reflects the number of food safety practices currently performed from a list of 10 recommended practices. ** Self-reported food safety practices three to four months after participating in the intervention were significantly greater than practices reported at the completion of the workshop ( $p < 0.01$ ).		

After reporting their current use of recommended practices, most participants stated that they intended to adopt the remaining practices (n = 62; 86%). Four individuals from Louisiana and three from Mississippi reported that they were already performing or intended to adopt only nine practices (9.7%). Of these seven individuals, five were staff, and four worked in urban areas. Two staff members from an urban area reported that they intended to adopt only eight practices (2.8%), and one staff member from a rural area reported the intention to adopt only five practices (1.4%). The intention to adopt new food safety practices expressed in the survey immediately after participating in the intervention workshop had a strong positive relationship with gain in reported practices described in the follow-up survey ( $r = 0.89, p = 0.00$ ).

## Discussion

Participation in the Serving Food Safely workshop resulted in increased food safety knowledge and greater self-reported use of recommended food safety practices. The curriculum was equally effective in increasing food safety knowledge among participants in all three states and similarly improved knowledge of staff and volunteers and urban and rural participants. This gain in food safety knowledge has been similarly reported by other investigators (Pettitt & Goldmon, 2000; Meer & Misner, 2000; Rennie, 1995; Soneff, McGeachy, Davison, McCargar, & Therien, 1994; United States Department of Agriculture, 2002).

Results from the baseline food safety practices survey administered immediately after participation in the food safety workshop were positive in that the majority of food recovery agency personnel and volunteers reported they were already using or planning to use proper food safety practices. Most participants reported properly washing fruits and vegetables, cleaning and sanitizing cooking utensils after each use, and washing their hands before preparing food and after handling raw meat and poultry. Practices most often reported as those to adopt included using calibrated food thermometers to check food temperatures regularly, dividing large quantities of hot food into smaller containers to cool more quickly, and storing raw meat in the refrigerator below cooked or ready-to-eat foods.

The intentions of the Louisiana and Mississippi food recovery agency workshop participants expressed in the survey immediately after participating in the intervention workshop were strong predictors of behavior 3 to 4 months later. There was a significant increase in self-reported practices of food safety recommendations after 3 to 4 months for participants living in either state, for staff or volunteers, and for those living in either rural or urban areas. This finding is supported by prior research that also found intention to be a significant predictor of behavior (Dedobbelleer, Champagne, & Potvin, 1994; Villarrubia, 2002).

Several studies demonstrate increased food safety practices by food service personnel following food safety education. Soneff et al. (1994) reported that food safety education led to increased adoption of safe food handling practices as evidenced by an adult care facility audit. Studies by Cotterchio, Gunn, Coffill, Tormey, and Barry (1998) and Mathias, Sizto, Hazlewood, and Cocksedge (1995) reported improved food safety practices in restaurants based on restaurant inspection scores. A study by Meer and Misner (2000) showed that food safety knowledge scores had a small, positive effect on food safety practices scores in Expanded Food and Nutrition Education Program participants.

A limitation of this study was the use of self-reported data without observing employees' practices. Redmond and Griffith (2003) found that food safety knowledge, attitudes, intentions, and self-reported practices did not correspond to observed behaviors, suggesting that observational studies provide a more accurate indication of the food safety practices used in food preparation. A study by Clayton, Griffith, Price, and Peters (2002) reported that food safety training does not necessarily guarantee that the workers carry out the safe food handling behaviors. An evaluation of school food service employees' food handling practices and food safety knowledge and attitudes by Henroid and Sneed (2004) found that the employees' food safety knowledge was high but observation of their food handling behaviors showed that safe food handling practices were not practiced.

## Conclusions

The improvement in food safety knowledge of food recovery agency personnel and volunteers, and their stated willingness to adopt recommended food safety practices support the continued use of the food safety curriculum in the Lower Mississippi Delta region, and possibly in other areas of the United States. In part, the program's success may have been due to the appeal of the curriculum to the participants. Participants appeared to respond positively to the visual aids, hands-on activities, and games included in the curriculum. While the results of the study are promising, further research needs to examine the effect of the program using more direct, observational methods.

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## References

- Alaimo, K., Olson, C. M., & Frongillo, E. (2001). Food insufficiency and American school-aged children's cognitive, academic and psychosocial development. *Pediatrics*, 108, 44-53.
- Clayton, D. A., Griffith, C. J., Price, P., & Peters, A.C. (2002). Food handlers' beliefs and self-reported practices. *International Journal of Environmental Health Research*, 12(1), 25-39.
- Cotterchio, M., Gunn, J., Coffill, T., Tormey, P., & Barry, M. A. (1998). Effect of a manager training program on sanitary conditions in restaurants. *Public Health Reports*, 113, 353-356.
- Dedobbelleer, N., Champagne, F., & Potvin, L. (1994). Predicting child restraint device use: A comparison of two models. *Journal of Applied Social Psychology*, 24, 1837-1847.
- Henroid, D., & Sneed, J. (2004). Readiness to implement hazard analysis and critical control point (HACCP) systems in Iowa schools. *Journal of the American Dietetic Association*, 104, 180-185.
- Kendall, P. S., Smith, K., Thilmany, D., Hine, S., Melcher, L., & Paul, L. (2001). Value of and satisfaction with food safety training in the intermountain West. *Food Service Research International*, 13, 1-16.
- Mathias, R. G., Sizto, R., Hazlewood, A., & Cocksedge, W. (1995). The effects of inspection

frequency and food handler education on restaurant inspection violations. *Canadian Journal of Public Health*, 86 (1), 46-50.

Meer, R. R., & Misner, S. L. (2000). Food safety knowledge and behavior of expanded food and nutrition education program participants in Arizona. *Journal of Food Protection*, 63(12), 1725-1731.

Olsen, S. J., MacKinnon, L. C., Goulding, J. S., Bean, N. H., & Slutsker, L. (2000). Surveillance for Foodborne Disease Outbreaks-United States 1993-1997. *Morbidity and Mortality Weekly Reports*, 49:1-62. Retrieved August 15, 2006 from:  
<http://www.cdc.gov/mmwr/preview/mmwrhtml/ss4901a1.htm>

Pettitt, A., & Goldmon, S. (2000). A model food safety education program for North Carolina food service operators. *The Forum for Family and Consumer Issues*, 5(2), 14 pars. Retrieved August 30, 2006 from: [http://www.ces.ncsu.edu/depts/fcs/pub/2000/showcase\\_nc\\_200.html](http://www.ces.ncsu.edu/depts/fcs/pub/2000/showcase_nc_200.html).

Redmond, E. C., & Griffith, C. J. (2003). Consumer food handling in the home: A review of food safety studies. *Journal of Food Protection*, 66(1), 130-161.

Rennie, D. M. (1995). Health education models and food hygiene education. *Journal of the Royal Society for Health*, 115(2), 75-79.

Shewmake, R. A., & Dilon, B. (1998). Food poisoning: Causes, remedies, and prevention. *Postgraduate Medicine*, 103 (6), 125-129, 134, 136.

Soneff, R., McGeachy, F., Davison, K., McCargar, L., & Therien, G. (1994). Effectiveness of two training methods to improve the quality of foodservice in small facilities for adult care. *Journal of the American Dietetic Association*, 94(8), 869-873.

United State Department of Agriculture, Food Safety and Inspection Service. (2002). Pathogen education: hazard analysis and critical control point (PR/HACCP) rule and evaluation final report: changes in consumer knowledge, behavior, and confidence since the 1996 PR/HACCP final rule. *Final Report: 12/05/01*. Retrieved August 6, 2006 from:  
[http://www.fsis.usda.gov/oa/research/behavior\\_haccp.htm](http://www.fsis.usda.gov/oa/research/behavior_haccp.htm)

United States Department of Agriculture Food Recovery Committee Council 1 Conference for Food Protection. (2000). *Comprehensive Guidelines for Food Recovery Programs: 2000*. Retrieved August 30, 2006 from: <http://www.foodprotect.org/pdf/foodRecovery.pdf>.

Villarrubia A. (2002). Understanding parents' decisions about serving vegetables to their children. Unpublished masters' thesis, Louisiana State University, Baton Rouge.

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