

CHAPTER IV

RESULTS AND DISCUSSION

CHARACTERISTICS OF FSNEP PARTICIPANTS

Twenty-three program assistants from 24 FSNEP units across the state recruited 191 participants for the study (Table 1). Of the 191 participants, 13 were excluded from analysis because they did not meet study criteria, 8 participants did not complete the study, and 5 failed to correctly complete records. One hundred and sixty-five FSNEP clients constituted the final study sample. One hundred and forty-four were females (87.6%) and 21 (12.7%) were male. The mean age was 68 years with a range of 45 to 91 years. Fifty-eight percent of study participants were black and 36.4% were white. Sixty-seven percent of participants had a high school education or less. All of the participants had incomes of 150% or less of federal poverty guidelines with an average monthly income of \$595.34. Sixty-eight participants (41.2%) reported receiving food stamps and 26 participants (15.8%) reported receiving food commodities. Forty percent of participants were from towns under 10,000 and 20.6% of participants were from central cities over 50,000. Eight participants reported having children under the age of 19 living at home and 61 participants reported having other adults in the home. Twelve participants reported having cancer, 24 reported having gastritis, and 4 reported having an immune disorder such as AIDS or liver disease. Participants' demographic information data are shown in Table 2.

Over half of the participants (52.1%) reported having fair or poor vision and 57.5% reported having good or excellent hearing. On average participants prepared two meals a day. Ninety-six participants (58.2%) reported they do not have help in preparing daily meals. However 84 (50.9%) participants reported they always or most of the time rely on public transportation, a friend or family member when traveling to the grocery store. Fifty-three participants (32.1%) had received food safety instruction or training in the form of a home economics or food safety/sanitation class. Only 13 participants reported having been diagnosed with food poisoning by a physician. Participants' concerns about food safety issues are presented in Table 3. Approximately 50% reported being very concerned with food safety issues. Participants were most concerned with bacteria in food, followed by pesticide residues

Table 1. FSNEP units participating in the food safety study.

FSNEP Unit	Number	FSNEP Unit	Number
Accomac Co.	4	Hanover Co.	7
Amelia Co.	8	Henrico Co.	10
Appomattox Co.	6	Northampton Co.	13
Arlington	10	Pittsylvania Co.	20
Bedford Co.	12	Richmond Co.	4
Carroll Co.	6	Smith Co.	1
Chesapeake	10	Suffolk	10
Dickenson Co.	12	Surry Co.	10
Essex Co.	1	Virginia Beach	13
Fairfax Co.	9	Westmoreland Co.	1
Fauquier Co.	4	York Co.	8
Hampton	8	Washington Co.	4

Table 2. Demographic characteristics of FSNEP participants surveyed.

Variable	No. (%)
Gender	
Male	21 (12.7)
Female	144 (87.3)
No response	0 (0.0)
Age	
45-55 years	14 (8.5)
56-65 years	56 (34.0)
66-75 years	55 (33.3)
76-85 years	34 (20.6)
85+ years	6 (3.6)
No response	0 (0.0)
Race	
White (non-Hispanic)	60 (36.4)
Black (non-Hispanic)	96 (58.2)
American Indian/Alaskan Native	0 (0.0)
Hispanic	3 (1.8)
Asian/Pacific Islander	2 (1.2)
No response	4 (2.4)
Education	
<12 years	64 (38.8)
High School diploma	47 (28.5)
Some college or vocational training	23 (13.9)
B.S. or other advanced degree	8 (4.8)
No response	23 (23.9)
Total Monthly Income	
\$0-\$299	38 (23.0)
\$300-\$599	28 (16.9)
\$600-\$899	47 (28.5)
\$900-\$1199	26 (15.8)
\$1200-\$1500	11 (6.7)
No response	15 (9.1)
Residence	
Farm	5 (3.0)
Town under 10,000 rural non-farm	66 (40.0)
Town and cities 10,000 to 50,000	31 (18.8)
Suburbs of cities over 50,000	26 (15.8)
Central cities over 50,000	34 (20.6)
No response	3 (1.8)
Lesson Type	
Group	124 (75.2)
Individual	30 (18.2)
Both	4 (2.4)
No response	7 (4.2)
Chronic Diseases	
Cancer	12 (7.3)
Gastritis/ulcers	24 (14.5)
Immune disorders (i.e. AIDS, Liver Disease)	4 (2.4)

Table 3. FSNEP participants' concerns about food safety issues.

	Not at all No. (%)	Somewhat No. (%)	Moderately No. (%)	Very No. (%)	No Response No. (%)
Are you concerned about food safety?	4 (2.4)	28 (17.0)	43 (26.1)	81(49.1)	9 (5.5)
Bacteria/germs in food	4 (2.4)	22 (13.3)	32 (19.4)	88 (53.3)	19 (11.5)
Pesticides on food	9 (5.5)	29 (17.6)	32 (19.4)	74 (44.8)	21 (12.7)
Food preservatives	9 (5.5)	39 (23.6)	36 (21.8)	61 (37.0)	20 (12.1)

and food preservatives. During the study, 78.5% of participants received food safety lessons in a group setting, while 19% received individual lessons, 2.5% received lessons in both a group and individual setting.

The FSNEP clients surveyed were representative of other FSNEP clientele. However, FSNEP program assistants reported difficulty in recruiting participants because of the number of questionnaires used in the study. In addition, many FSNEP clients declined to participate in the study because they did not want to sign an informed consent form (Appendix F). A selection bias may have also occurred, as participants who believed they had higher food safety practices may have been more inclined to participate in the study than those who did not.

FSNEP PARTICIPANTS' FOOD SAFETY KNOWLEDGE AND PRACTICES

FSNEP participants' food safety knowledge and practices and observations data are presented in Tables 4-6. In general results indicated that the food safety knowledge and practices of FSNEP participants are consistent with other published studies (7,11-25). The mean food safety knowledge score of all participants at baseline was 7.19 out of 15 with a range of 0 to 15. The average food safety practices score at baseline was 3.0 out of 4 with a range of 2.14 to 4.00. One hundred and twenty-four participants (75.2%) knew food should be purchased before "sell-by" and "expiration" dates. Correspondingly, 81 participants (49.1%) reported they never buy food past "sell-by" or "expiration" date and 119 (72.1%) reported they never buy dented cans or torn packages of food. Many FSNEP participants have limited food resources and may be more inclined to buy food past the "sell-by" or "expiration" dates since these items are often sold at reduced prices. One hundred and three participants (62.4%) knew that refrigerated and frozen foods should be selected just prior to checkout when grocery shopping. However, only 78 participants (47.3%) reported they never select frozen and refrigerated foods first when grocery shopping. Eighty-six participants (53.1%) knew that when buying cold food at a grocery store they should return home within thirty minutes. One hundred and twelve participants (67.9%) reported they always or most of the time go directly home after food shopping. These findings are similar to the findings of Jay et al. (41).

Food storage practices indicated that fifty-four participants (32.7%) knew that ground meat could be safely stored in the refrigerator for only 24 hours. However, 59 participants (35.8%) thought it was acceptable to leave ground meat in the refrigerator for two days. Lack of

Table 4. FSNEP participants' food safety knowledge at baseline.

Question	No. (%)
<p>At the grocery store, select refrigerated and frozen items:</p> <ul style="list-style-type: none"> - just prior to checkout (correct) - anytime while grocery shopping - first - before visiting the produce section - Don't know - No response 	<p>103 (62.4) 41 (24.8) 10 (6.1) 8 (4.8) 3 (1.8) 0 (0.0)</p>
<p>To ensure best quality and safety when buying food items:</p> <ul style="list-style-type: none"> - purchase food products before the "sell by" and "expiration" dates (correct) - Don't know - All of the above - select frozen and refrigerated items first - purchase cans of food that are badly dented - No response 	<p>124 (75.2) 16 (9.7) 10 (6.1) 8 (4.8) 6 (3.6) 1 (0.6)</p>
<p>When buying cold food at the grocery store and the trip home takes longer than ____, place the cold food in a cooler packed in ice for the trip.</p> <ul style="list-style-type: none"> - 30 minutes (correct) - 2 hours - Don't know - 3 hours - 4 hours - No response 	<p>86 (52.1) 47 (28.5) 22 (13.3) 7 (4.2) 0 (0.0) 3 (1.8)</p>
<p>To ensure food safety and food quality, what temperature should the inside of your refrigerator be?</p> <ul style="list-style-type: none"> - Below 32^oF - 32^oF to 40^oF (correct) - 41^oF to 50^oF - Over 50^oF - Don't know - No Response 	<p>31 (18.8) 63 (38.2) 16 (9.7) 4 (2.4) 50 (30.3) 1 (0.6)</p>
<p>What is the recommended time of refrigerator storage for ground meats?</p> <ul style="list-style-type: none"> - 2 days - 24 hours (correct) - 3 days - Don't know - More than 3 days - No response 	<p>59 (35.8) 54 (32.7) 27 (16.4) 19 (11.5) 6 (3.6) 0 (0.0)</p>

Table 4. FSNEP participants' food safety knowledge at baseline.

Question	No. (%)
The recommended time for washing your hands before preparing food, or after handling raw meat is: - 20 seconds (correct) - 5 seconds - 10 seconds - Don't know - Any amount of time is acceptable - No response	42 (25.5) 39 (23.6) 37 (22.4) 27 (16.4) 20 (12.1) 0 (0.0)
Frozen food should not be thawed: - at room temperature (correct) - under cold running water - as part of the cooking process - in the refrigerator - Don't know - No response	83 (50.3) 24 (14.5) 24 (14.5) 22 (13.3) 12 (7.3) 0 (0.0)
To decrease the risk of food poisoning, fresh fruits and vegetables should be: - All of the above (correct) - Rinsed under cold running water before eating - Free of slime, mold and off-colors - Stored in a separate area in the refrigerator away from raw meat and poultry - Don't know - No response	75 (45.5) 44 (26.7) 24 (14.5) 17 (10.3) 5 (3.0) 0 (0.0)
Doneness of meat, poultry, and vegetable dishes can best be determined by: - Meat thermometer (correct) - Color - Texture - Smell - Don't know - No response	59 (35.8) 58 (35.2) 22 (13.3) 13 (7.9) 10 (6.1) 3 (1.8)
Potentially unsafe foods should be kept out of the temperature Danger Zone of: - Don't know - 40 ^o F to 140 ^o F (correct) - 140 ^o F to 212 ^o F - 10 ^o F to 40 ^o F - 212 ^o F or above - No Response	70 (42.4) 53 (32.1) 20 (12.1) 18 (10.9) 2 (1.2) 2 (1.2)
Potentially unsafe foods should not be held at room temperature longer than: - 2 hours (correct) - Don't know - 4 hours - 6 hours - Any amount of time is acceptable - No Response	101 (61.2) 29 (17.6) 22 (13.3) 7 (4.2) 5 (3.0) 1 (0.6)

Table 4. FSNEP participants' food safety knowledge at baseline.

Question	No. (%)
Leftovers should be stored: <ul style="list-style-type: none"> - in shallow containers and placed in the refrigerator immediately (correct) - in large containers held at room temperature and cooled later - in large containers and placed in the refrigerator immediately - Don't know - All of the above - No response 	<ul style="list-style-type: none"> 85 (51.5) 28 (17.0) 26 (15.8) 13 (7.9) 12 (7.3) 1 (0.6)
Leftovers can be safely stored for: <ul style="list-style-type: none"> - 2 to 3 days (correct) - 4 to 5 days - Don't know - 6 to 7 days - more than 7 days - No response 	<ul style="list-style-type: none"> 104 (63.0) 26 (26.0) 20 (12.1) 11 (6.7) 3 (1.8) 1 (0.6)
Leftovers should be reheated to an internal temperature of: <ul style="list-style-type: none"> - Don't know - 165^oF (correct) - 100^oF - 145^oF - 125^oF - No response 	<ul style="list-style-type: none"> 68 (41.21) 26 (15.76) 25 (15.15) 24 (14.56) 21 (12.73) 1 (0.61)
Which of the following practices are adequate for cleaning cutting boards, utensils, and counter tops after contact with raw meat or poultry: <ul style="list-style-type: none"> - Wash with hot soapy water, rinse, sanitize with a bleach solution, and air-dry (correct) - Rinse with warm water - All of the above - Wipe with a kitchen sponge - Don't know - No response 	<ul style="list-style-type: none"> 105 (63.6) 22 (13.3) 20 (12.1) 12 (7.3) 5 (3.0) 1 (0.6)

Table 5. FSNEP participants' food safety practices at baseline.

Food Safety Practice	Never No. (%)	Some- times No. (%)	Most of the time No. (%)	Always / Almost Always No. (%)	No response No. (%)
When food shopping, how often do you select refrigerated and frozen foods first?	78 (47.3)	40 (24.2)	30 (18.2)	6 (3.6)	11 (6.7)
How often do you buy foods past the “sell by” or “expiration” date?	81 (49.1)	62 (37.6)	6 (3.6)	6 (3.6)	10 (6.1)
How often do you buy or (use) badly dented cans or torn packages of food?	119 (72.1)	29 (17.6)	4 (2.4)	4 (2.4)	9 (5.5)
How often do you go directly home after food shopping?	6 (3.6)	34 (20.6)	51 (30.9)	61 (37.0)	13 (7.9)
How often do you store ground meats in the refrigerator for longer than 1 day?	45 (27.3)	84 (50.9)	15 (9.1)	10 (6.1)	11 (6.7)
How often do you check the internal temperature inside your refrigerator?	86 (52.1)	39 (23.6)	15 (9.1)	16 (9.7)	9 (5.5)
How often do you wash fresh fruits and vegetables before eating?	9 (5.5)	18 (10.9)	42 (25.5)	83 (50.3)	13 (7.9)
How often do you use a thermometer to check internal temperatures of cooked meat, poultry, and vegetable dishes?	118 (71.5)	24 (14.5)	7 (4.2)	8 (4.8)	8 (4.8)
How often do you cool cooked food to room temperature prior to refrigerating?	21 (12.7)	61 (37.0)	39 (23.6)	35 (21.2)	9 (5.5)
How often do you separate large quantities of leftovers (for example, meatloaf, meat-vegetable soup, fried chicken, etc.) into smaller containers before refrigerating?	23 (13.9)	66 (40.0)	32 (19.4)	34 (20.6)	10 (6.1)
How often do you store leftovers (for example, meatloaf, meat- vegetable soup, fried chicken, etc.) for longer than 3 days?	56 (33.9)	83 (50.3)	13 (7.9)	2 (1.2)	11 (6.7)
How often do you reheat leftovers (for example, meatloaf, meat-vegetable soup, fried chicken, etc.)?	10 (6.1)	68 (41.2)	40 (24.2)	37 (22.4)	10 (6.1)
How often do you wash and sanitize cutting boards, utensils, and the kitchen counter after cutting raw meat or poultry?	10 (6.1)	22 (13.3)	33 (20.0)	92 (55.8)	8 (4.8)
How often do you let meat and dairy foods sit out of refrigerator for more than 2 hours?	130 (78.8)	21 (12.7)	12 (7.3)	1 (0.6)	1 (0.6)
How often do you thaw frozen food at room temperature?	80 (48.5)	43 (26.1)	27 (16.4)	14 (8.5)	1 (0.6)
How often do you wash your hands in warm soapy water before preparing food?	0 (0.0)	1 (0.6)	2 (1.2)	1.7 (70.9)	45 (27.3)

Table 6. Observations of food safety practices of FSNEP participants at baseline .

Food Safety Practice	YES No. (%)	NO No. (%)	NOT OBSERVED No. (%)
Kitchen counters are clean	54 (84.4)	10 (15.6)	0 (0)
Cleaning agents and other chemicals stored separate from food	48 (75.0)	9 (14.1)	7 (10.9)
Sufficient food storage space (i.e. refrigerator, freezer, cabinets)	51 (79.7)	11 (17.2)	2 (3.1)
Presence of animals in the kitchen	10 (15.6)	51 (79.7)	3 (4.7)
Presence or signs of roaches, mice, rats, etc. in kitchen	14 (21.9)	47 (73.4)	3 (4.7)
Animals petted or touched during meal preparation	5 (7.81)	54 (84.4)	5 (7.8)
Hands washed prior to food preparation	42 (65.6)	4 (6.3)	18 (28.1)
Frozen food thawed at room temperature	27 (42.2)	22 (34.4)	15 (23.4)
Fresh fruits and vegetables rinsed before use	37 (57.8)	6 (9.4)	21 (32.8)
Food cooked to proper temperatures	28 (43.8)	3 (4.7)	33 (51.6)
Food cooled appropriately	30 (46.9)	5 (7.8)	29 (45.3)
Food stored in appropriate covered containers	42 (65.6)	8 (12.5)	14 (21.9)
Leftovers reheated	30 (46.2)	6 (9.4)	28 (43.8)
Presence of moldy and spoiled foods	13 (20.3)	40 (62.5)	11 (17.2)
Utensils, cookware, and kitchen counters cleaned and sanitized	37 (57.8)	8 (12.5)	19 (70.3)

knowledge of proper storage time for ground meats was apparent in participants' self-reported practices. Only, forty-five participants (27.3%) reported they never store ground meats in the refrigerator for longer than 24 hours. Eighty-four participants (50.9%) reported they would sometimes store ground meats in the refrigerator longer than 24 hours.

One hundred and seventeen participants 117 (97.5%) reported they always washed hands in warm soapy water before preparing food. However, only 42 participants (25.5%) knew the correct recommended time for handwashing. Although participants reported washing their hands frequently, they may not understand the importance of using proper handwashing procedures. These findings are similar to an American Dietetic Association survey (13) in which 88% of survey respondents washed their hands, but 10% failed to use proper handwashing techniques.

One hundred and five participants (64.0%) knew cutting board, utensils, and counter tops should be cleaned, rinsed, sanitized with bleach solution and air-dried, while 92 participants (58.6%) always washed and sanitized cutting boards utensils, and kitchen counter after cutting raw meat and poultry. These results are similar to findings of Altekruze et al. (12) who found that respondents 65 years or older were more likely to wash their hands and cutting boards after handling raw poultry.

Results indicate that FSNEP participants lack knowledge and adequate practices for checking refrigerator temperatures and using meat thermometers to test the internal temperature of meat, poultry, and vegetable dishes. Only, sixty-three participants (38.4%) knew proper refrigerator temperatures and eighty-six participants (52.1%) reported they never check the internal temperature of their refrigerator. This finding is similar to Jay et al. (41) who found that a majority of participants did not know the proper refrigerator temperature setting. In addition, only 59 participants (36.4%) knew doneness of meat was best determined by a meat thermometer. Correspondingly, 118 participants (71.5%) reported they never use a thermometer to check the internal temperatures of cooked meat, poultry, and vegetable dishes. This finding is similar to the ADA study (13) that found only 12% of survey respondents used a meat thermometer to check doneness of meats. Seventy-five participants (45.5%) knew that fresh fruits and vegetables should be rinsed under cold running water, and be free of slime, mold and off-colors, and be stored in the refrigerator separate from raw meat and poultry. Correspondingly, 83 participants (54.6%) reported that they always wash fruits and vegetables before eating.

Half of the participant's (83) knew frozen foods should not be thawed at room temperature and 80 (48.8%) never thawed food at room temperature. One hundred and one participants (61.6%) knew that potentially unsafe foods should not be held at room temperature for longer than two hours. Correspondingly, one hundred and thirty participants (79.3%) reported they never let meat and dairy foods sit out for more than two hours. However, only 54 participants (32.5%) were knowledgeable of the temperature danger zone of 40-140°F. FSNEP participants also appear to lack knowledge and adequate practices for proper handling of leftovers. Eighty-five participants (51.8%) knew leftovers should be stored in shallow containers and placed in the refrigerator immediately. However, only 34 participants (20.6%) reported that they always separate large quantities of leftovers into smaller containers before refrigerating. These findings are consistent with findings of other published studies (11,15,45). In addition to improper cooling of leftovers, only 21 participants (12.7%) reported never cooling food to room temperature prior to refrigerating. These results are similar to the findings of Jay et al. (41) and Jones and Weimer (20). One hundred and four participants (63.4%) knew leftovers could be safely stored for two to three days. However, only 56 participants (33.9%) reported they never store leftovers longer than 3 days. In addition, only 26 participants (15.85%) knew leftovers should be reheated to an internal temperature of 165°F and only 37 participants (22.4%) reported that they always reheat leftovers.

FSNEP program assistants conducted observations of 64 participants' food safety practices (Table 6). Fifty-four participants (84.4%) had clean kitchen counters, and 48 participants (75.0%) had cleaning agents stored separately from food. This finding is similar to findings of Daniels who found that 28% of households improperly stored chemicals (17). Thirty-seven participants (57.8%) rinsed fruits and vegetables before eating, 28 participants (43.8%) cooked foods to proper internal temperatures, and 30 participants (46.9%) cooled food appropriately. Forty-two participants (65.6%) stored foods in appropriate covered containers, 30 participants (46.2%) reheated leftovers, and 37 participants (57.8%) sanitized utensils. Fifty-one participants (79.7%) had sufficient storage spaces, and 42 participants (65.6%) washed hands prior to food preparation. This is in contrast of findings of Daniels (17) who reported that 57% of households observed neglected handwashing. Ten households (15.63%) had animals present in the kitchen, while flies, roaches, and mice were found in 14 (21.9%) of the households. In addition, 27 participants (42.2%) thawed foods at room temperature. This

finding is similar to Daniels (17) who reported that 31% of consumers fail to use proper thawing techniques. FSNEP participants observed had refrigerator temperatures set with acceptable limits. The average refrigerator temperature was 39.9°F.

The food safety practices observed by Program Assistants were consistent with the self-reported practices of participants. However, having an interviewer observe participants' food safety practices may have added bias to the results. In addition, most participants in the study were taught in group settings and no opportunity existed for food safety practices to be observed.

EFFECT OF FOOD SAFETY EDUCATION ON FSNEP PARTICIPANTS' FOOD SAFETY KNOWLEDGE AND PRACTICES

FSNEP participants were randomly assigned to a treatment group. Eighty-one participants were assigned to Group 1, which received only the *Healthy Futures Series*. Eighty-four participants were assigned to Group 2, which received the *Healthy Futures Series*, and an instructional video titled *From Store to Fork: Safe Food Guidelines for Older Adults*. Analysis was conducted to determine if the two treatment groups differed on demographic variables at baseline (Table 7). There was no significant difference ($p < 0.05$) between the two groups for any of the variables measured, except that more participants in group two reported having cancer ($p < 0.05$), which was most likely a type one error. Therefore, it was concluded that the two groups did not differ in demographics and on other food safety variables collected at baseline. Pre-test scores for food safety knowledge, practices, and observation scores between the two groups also did not differ significantly at baseline (independent samples t-test).

Treatment Group 1 had significant ($p < 0.05$) gains in food safety knowledge, practices, and observation scores from baseline (Table 8). Knowledge pretest scores increased from a mean score of 6.97 to 11.32 with a gain score of 4.35 (paired samples t-test). Practices pre-test scores increased from 2.95 to 3.40 with a gain score of 0.45 (paired samples t-test). Group 1 observation scores also increased from 9.24 to 11.28 with a gain score of 2.03 (paired samples t-test).

Treatment Group 2 also had significant ($p < 0.05$) gains in food safety knowledge, practices, and observation scores from baseline (Table 8). Knowledge pre-test scores increased from 7.12 to 10.42 with a gain score 3.30 (paired samples t-test). Practices pre-test

Table 7. FSNEP participants' demographic variables by treatment group.

Variable	Food Safety Lesson (Group 1) No.	Food Safety Lesson and Instructional Video (Group 2) No.
Gender		
Male	11	10
Female	70	74
Age	67.8±9.4	68.9±9.7
Race		
White (non-Hispanic)	30	30
Black (non-Hispanic)	48	48
American Indian/Alaskan Native	0	0
Hispanic	0	3
Asian/Pacific Islander	0	2
Education		
<12 years	29	35
High School diploma	27	20
Some college or vocational training	12	11
B.S. or other advanced degree	3	5
Total Monthly Income	\$553.14±\$378.93	\$636.43±\$397.98
Residence		
Farm	2	3
Town under 10,000 rural non-farm	30	36
Town and cities 10,000 to 50,000	15	16
Suburbs of cities over 50,000	15	11
Central cities over 50,000	18	16
Food Stamps	33	35
Commodities	12	14
Chronic Diseases		
Cancer	1	11*
Gastritis/ulcers	9	15
Immune disorders (i.e. AIDS, Liver Disease)	1	3
Food Poisoning		
Yes	4	9
No	76	66
Food Safety Instruction		
Yes	27	26
No	53	48
Lesson Type		
Group	58	66
Individual	17	13
Help With Meal Preparation		
Never	49	47
Most of the time	21	23
Always	8	6

* p<0.05.

Table 7. FSNEP participants' demographic variables by treatment group.

Variable	Food Safety Lesson (Group 1) No.	Food Safety Lesson and Instructional Video (Group 2) No.
Rely On Public Transportation, Friend Or Family Member For Getting To The Grocery Store		
Never	35	35
Most of the time	23	27
Always	19	15
Hearing		
Poor	7	5
Fair	21	27
Good	40	34
Excellent	11	10
Vision		
Poor	6	7
Fair	41	32
Good	27	35
Excellent	6	2

Table 8. Food safety knowledge and practice scores for FSNEP participants.

	Pre-test		Post- test		Gain	
	Mean	SD	Mean	SD	Mean	SD
Group 1						
Knowledge Scores	6.9733	3.2465	11.3200*	3.0232	4.3467	3.7972
Average Practice Score	2.9463	0.3455	3.4046*	0.3336	0.4541	0.4291
Observations Score	9.2414	3.3770	11.2759*	3.2282	2.0345	3.7653
Group 2						
Knowledge Scores	7.1184	3.2943	10.4211*	3.6415	3.3026	3.8851
Average Practice Score	3.0446	0.3583	3.3130*	0.3604	0.2684	0.4967
Observations Score	9.5000	3.5224	11.0714*	2.8406	1.5714	3.6659

*p<0.05.

scores also increased from 3.04 to 3.31 with a gain score of 0.27 (paired samples t-test). Observation scores for Group 2 increased 1.57 from 9.50 to 11.07 (paired samples t-test).

Both treatment groups made improvements in all areas on the food safety knowledge and practices questionnaires (Tables 9-12). However, for some food safety knowledge concepts only small improvements were noted. For example, after receiving their respective food safety lessons, only 43.2% of Group 1 participants and 41.7% of Group 2 participants knew leftovers should be reheated to an internal temperature of 165° F. In addition, only 54.3% of Group 1 participants and 50.0% of Group 2 participants knew ground meat should be stored for less than 24 hours. Furthermore, only 45.2% of Group 2 participants knew that hands should be washed for twenty seconds, and only 46.4% knew how to properly handle fresh fruits and vegetables.

Food safety practices for participants in both groups also improved from baseline. However, participants made small improvements when monitoring the internal temperatures of refrigerators, using a meat thermometer, and re-heating leftovers. Average practices scores for participants in Group 1 for checking internal temperature of refrigerator improved from 1.70 to 2.35. Participants in Group 2 improved from an average score of 1.71 to 2.19. Average practices scores for participants in Group 1 for using a meat thermometer improved from 1.34 to 2.04 and for participants in Group 2 increased from 1.66 to 1.89. Average practices scores for participants in Group 1 for re-heating leftovers increased from 2.66 to 2.92 and for participants in Group 2 increased from 2.64 to 2.71. Although improvements were made, the frequency of engaging in these food safety practices appear to be inadequate.

Only small changes in observations scores from baseline were noted (Tables 13, 14). This may be due to the small sample size of observed food safety practices. Only 64 participants were observed at baseline and 57 participants were observed after the intervention. In addition, many participants had no opportunity to observe all practices on the checklist. Therefore N values for some items on the checklist were low.

Both lessons were effective in increasing participants' food safety knowledge and practices. Participants who received only the *Healthy Futures Series* (Group 1) made higher gains in food safety knowledge and practices. Group 1 mean gain scores were significantly ($p < 0.05$) higher than Group 2 for practices (independent samples t-test). Mean gain scores for food safety knowledge for group one were also higher than participants in Group 2 (4.3467 vs. 3.3026), but were not significant (independent samples t-test). Gain scores for food safety

Table 9. Frequency of correct responses on the food safety knowledge questionnaire for FSNEP participants receiving the Healthy Futures food safety lesson (Group 1).

Knowledge concept	Pre-test No. (%)	Post-test No. (%)
At the grocery store, select refrigerated and frozen foods just prior to checkout.	50 (61.7) n=81	68 (84.0) n=76
Food should be purchased before "sell-by" and "expiration" dates to ensure best quality and safety.	59 (72.8) n=80	68 (84.0) n=76
When buying cold food at the grocery stores you should return home within 30 minutes or pack items in a cooler.	40 (49.4) n=79	62 (76.5) n=75
Internal refrigerator temperature should be 32 to 40° F	35 (43.2) n=81	58 (71.6) n=75
Ground meat can be safely refrigerated for 24 hours or less.	26 (32.1) n=81	44 (54.3) n=75
Hands should be washed for 20 seconds before preparing food, or after handling raw meat.	16 (19.8) n=81	48 (59.3) n=75
Frozen food should not be thawed at room temperature.	43 (53.1) n=81	53 (65.4) n=75
Fresh fruits and vegetables should be rinsed under cold running water before eating, free of slime, mold and off-colors, stored in a separate area of the refrigerator away from raw meat and poultry.	40 (49.4) n=81	49 (60.5) n=74
Doneness of meat, poultry, and vegetable dishes can best be determined by a meat thermometer.	27 (33.3) n=79	54 (66.4) n=74
Potentially unsafe food should be kept out of the temperature Danger Zone of 40 to 140° F	22(27.2) n=80	58 (71.6) n=74
Potentially unsafe food should not be held at room temperature for longer than 2 hours.	52 (64.2) n=80	69 (85.2) n=73
Leftovers should be stored in shallow containers and placed in the refrigerator immediately.	41 (50.6) n=80	65 (80.2) n=74
Leftovers can be safely stored for 2 to 3 days.	48 (59.3) n=81	57 (70.4) n=73
Leftovers should be reheated to an internal temperature of 165° F.	15 (18.5) n=81	35 (43.2) n=75
Cutting boards, utensils and counter tops should be washed with hot soapy water, rinsed, sanitized with a bleach solution and air-dry after contact with raw meat or poultry.	52 (64.2) n=81	57 (70.4) n=72

Table 10. Frequency of correct responses on the food safety knowledge questionnaire for FSNEP participants receiving the Healthy Futures food safety lesson and the instructional video (Group 2).

Knowledge concept	Pre-test No. (%)	Post-test No. (%)
At the grocery store, select refrigerated and frozen foods just prior to checkout.	53 (63.1) n=84	61 (72.6) n=75
Food should be purchased before "sell-by" and "expiration" dates to ensure best quality and safety.	65 (77.4) n=84	66 (78.6) n=76
When buying cold food at the grocery stores you should return home within 30 minutes or pack items in a cooler	46 (54.8) n=83	58 (69.0) n=76
Internal refrigerator temperature should be 32 to 40°F	28 (33.3) n=83	50 (59.5) n= 75
Ground meat can be safely refrigerated for 24 hours or less	28 (33.3) n=81	42 (50.0) n=75
Hands should be washed for 20 seconds before preparing food, or after handling raw meat.	26 (31.0) n=84	38 (45.2) n=76
Frozen food should not be thawed at room temperature.	40 (47.6) n=84	56 (66.7) n=76
Fresh fruits and vegetables should be rinsed under cold running water before eating, free of slime, mold, and off-colors, stored in separate area of the refrigerator away from raw meat and poultry.	35 (41.7) n=84	39 (46.4) n=76
Doneness of meat, poultry, and vegetable dishes are best determined by a meat thermometer.	32 (38.1) n=83	49 (58.3) n=76
Potentially unsafe foods should be kept out of the temperature Danger Zone of 40 to 140 °F.	31 (36.9) n=83	52 (61.9) n=76
Potentially unsafe food should not be held at room temperature for longer than 2 hours.	49 (58.3) n=84	57 (67.9) n=76
Leftovers should be stored in shallow containers and placed in the refrigerator immediately.	44 (52.4) n=84	60 (71.4) n=76
Leftovers can be safely stored for 2 to 3 days.	56 (66.7) n=83	63 (75.0) n=76
Leftovers should be reheated to an internal temperature of 165° F.	11 (13.1) n=83	35 (41.7) n=76
Cutting boards, utensils and counter tops should be washed with hot soapy water, rinsed, sanitized with a bleach solution and air-dried after contact with raw meat or poultry.	53 (63.1) n=83	57 (67.9) n=76

Table 11. Aggregate scores of food safety practices for FSNEP participants receiving the Healthy Futures food safety lesson (Group 1).

Practices Concept		Mean ^a	N	Std. Deviation
^b When food shopping how often do you select frozen foods first?	PRE	3.3289	76	0.8228
	POST	3.6053	76	0.8653
^b How often do you buy foods past the "sell-by" or "expiration" dates?	PRE	3.4342	76	0.5963
	POST	3.8026	76	0.4904
^b How often do you buy or (use) badly dented cans or torn packages of food?	PRE	3.6234	77	0.6497
	POST	3.8312	77	0.4974
How often do you go directly home after food shopping?	PRE	2.9737	76	0.9518
	POST	3.4211	76	0.8044
^b How often do you store ground meats in the refrigerator for longer than 1 day?	PRE	3.0400	75	0.8127
	POST	3.3200	75	0.9467
How often do you check the internal temperature inside your refrigerator?	PRE	1.7013	77	0.9468
	POST	2.3506	77	0.9565
How often do you wash fresh fruits and vegetables before eating?	PRE	3.2329	73	0.9055
	POST	3.7397	73	0.5008
How often do you use a thermometer to check internal temperatures of cooked meat, poultry, and vegetable dishes?	PRE	1.3421	76	0.6842
	POST	2.0395	76	1.0385
^b How often do you cool cooked food to room temperature prior to refrigerating?	PRE	2.4667	75	0.9633
	POST	3.1733	75	1.0184
How often do you separate large quantities of leftovers into smaller containers before refrigerating?	PRE	2.3378	74	1.0241
	POST	3.0811	74	1.0567
^b How often do you store leftovers for longer than 3 days?	PRE	3.2329	73	0.6566
	POST	3.6164	73	0.6998
How often do you reheat leftovers?	PRE	2.6622	74	0.9691
	POST	2.9189	74	1.0171
How often do you wash and sanitize cutting boards, utensils, and the kitchen counter after cutting raw meat or poultry?	PRE	3.2267	75	1.0077
	POST	3.7067	75	0.7310
^b How often do you let meat and dairy foods sit out of refrigerator for more than 2 hours?	PRE	3.6301	73	0.7170
	POST	3.9863	73	0.1170
^b How often do you thaw frozen food at room temperature?	PRE	3.0548	73	1.0259
	POST	3.8630	73	0.5087
How often do you wash your hands in warm soapy water before preparing food?	PRE	4.0000	50	0.0000
	POST	4.0000	50	0.0000

^aMean practices scores.

^bMeasurement scales for these items were reversed.

1-Never

2-Sometimes

3-Most of the time

4-Always or almost always

Table 12. Aggregate scores of food safety practices for FSNEP participants receiving the Healthy Futures food safety lesson and instructional video (Group 2).

Practices Concept		Mean ^a	N	Std. Deviation
^b When food shopping how often do you select frozen and refrigerated foods first?	PRE	3.1159	69	0.9782
	POST	3.3913	69	0.9270
^b How often do you buy or (use) food past the "sell-by" or "expiration" dates?	PRE	3.4143	70	0.8426
	POST	3.6857	70	0.7526
^b How often do you buy or use badly dented cans or torn packages of food?	PRE	3.7571	70	0.6004
	POST	3.9429	70	0.2338
How often do you go directly home after food shopping?	PRE	3.1515	66	0.8085
	POST	3.4697	66	0.7690
^b How often do you store ground meats in the refrigerator for longer than 1 day?	PRE	3.1471	68	0.7778
	POST	3.2353	68	0.8485
How often do you check the internal temperature inside your refrigerator?	PRE	1.7101	69	0.9717
	POST	2.1884	69	1.0329
How often do you wash fresh fruits and vegetables before eating?	PRE	3.3239	71	0.9223
	POST	3.5352	71	0.9386
How often do you use a thermometer to check internal temperatures of cooked meat, poultry, and vegetable dishes?	PRE	1.3662	71	0.8149
	POST	1.8873	71	0.9644
^b How often do you cool cooked food to room temperature prior to refrigerating?	PRE	2.3521	71	1.0014
	POST	2.9296	71	1.0866
How often do you separate large quantities of leftovers into smaller containers before refrigerating?	PRE	2.6429	70	0.9485
	POST	3.1571	70	0.9576
^b How often do you store leftovers for longer than 3 days?	PRE	3.2429	70	0.6689
	POST	3.3714	70	0.9505
How often do you reheat leftovers?	PRE	2.6429	70	0.8347
	POST	2.7143	70	0.9501
How often do you wash and sanitize cutting boards, utensils, and the kitchen counter after cutting raw eat or poultry?	PRE	3.3429	70	0.9150
	POST	3.7714	70	0.6179
^b How often do you let meat and dairy foods sit out of the refrigerator for more than 2 hours?	PRE	3.7662	77	0.5355
	POST	4.0000	77	0.0000
^b How often do you thaw frozen food at room temperature?	PRE	3.2857	77	0.9439
	POST	3.7792	77	0.6412
How often do you wash your hands in warm soapy water before preparing food?	PRE	3.9130	46	0.3544
	POST	4.0000	46	0.0000

^aMean practices scores.

^b Measurement scales for these items were reversed.

1-Never

2-Sometimes

3-Most of the time

4-Always or almost always

Table 13. Observed food safety practices of FSNEP participants receiving the Healthy Futures food safety lesson (Group 1).

Food Safety Practice	Pre-test No.^a (%)	Post-test No.^a (%)
Kitchen counters are clean	27 (84.38) n=32	28 (90.32) n=31
Cleaning agents and other chemicals stored separate from food	25 (86.20) n=29	22 (81.48) n=27
Sufficient food storage space (i.e. refrigerator, freezer, cabinets)	25 (83.33) n=30	26 (92.86) n=28
Presence of animals in the kitchen	6 (19.35) n=31	7 (23.33) n=30
Presence or signs of roaches, mice, rats, etc. in kitchen	10 (33.33) n=30	6 (20.0) n=30
Animals petted or touched during meal preparation	3 (10.0) n=30	3 (11.54) n=26
Hands washed prior to food preparation	20 (90.90) n=22	22 (91.67) n=24
Frozen food thawed at room temperature	8 (34.78) n=23	4 (14.81) n=27
Fresh fruits and vegetables rinsed before use	18 (81.81) n=22	22 (95.65) n=23
Food cooked to proper temperatures	12 (85.71) n=14	12 (66.67) n=18
Food cooled appropriately	15 (83.33) n=18	21 (84.0) n=25
Food stored in appropriate covered containers	19 (76.0) n=25	26 (96.29) n=27
Leftovers reheated	15 (75.0) n=20	16 (72.73) n=22
Presence of moldy and spoiled foods	7 (26.92) n=26	3 (10.34) n=29
Utensils, cookware, and kitchen counters cleaned and sanitized	15 (68.18) n=22	26 (89.66) n=29

^a Number of participants engaging in listed behaviors.

Table 14. Observed food safety practices of FSNEP participants receiving the Healthy Futures food safety lesson and instructional video (Group 2).

Food Safety Practice	Pre-test No. ^a (%)	Post-test No. ^a (%)
Kitchen counters are clean	27 (84.38) n=32	25 (96.15) n=26
Cleaning agents and other chemicals stored separate from food	23 (82.14) n=28	23 (100) n=23
Sufficient food storage space (i.e. refrigerator, freezer, cabinets)	26 (81.25) n=32	24 (88.89) n=27
Presence of animals in the kitchen	24 (13.33) n=30	2 (7.41) n=27
Presence or signs of roaches, mice, rats, etc. in kitchen	4 (13.33) n=30	3 (11.1) n=27
Animals petted or touched during meal preparation	3 (10) n=30	3 (11.1) n=27
Hands washed prior to food preparation	22 (91.67) n=24	23 (100) n=23
Frozen food thawed at room temperature	12 (46.2) n=26	2 (7.69) n=26
Fresh fruits and vegetables rinsed before use	19 (90.48) n=21	17 (89.47) n=19
Food cooked to proper temperatures	16 (94.12) n=17	8 (61.54) n=13
Food cooled appropriately	15 (88.24) n=17	17 (89.47) n=19
Food stored in appropriate covered containers	23 (92.0) n=25	22 (88.0) n=25
Leftovers reheated	15 (93.75) n=16	9 (81.82) n=11
Presence of moldy and spoiled foods	6 (22.22) n=27	2 (8.33) n=24
Utensils, cookware, and kitchen counters cleaned and sanitized	22 (95.7) n=23	23 (100) n=23

^a Number of participants engaging in listed behaviors.

observations for Group 1 were also higher than scores for Group 2 (0.45 vs. 0.27), but were not significant (independent samples t-test). Cross tabulation of gain scores and Chi-square statistics were used to determine if there was a difference for each treatment group for each individual items on the knowledge questionnaire. This analysis indicated that only two items on the knowledge questionnaires differed significantly between the two groups (Table 15). Group 1 participants were significantly more likely to change from answering the handwashing and temperature danger zone questions incorrectly at baseline to a correct response after the intervention. Although, only these two items were significant there was a trend that Group 1 participants were more likely to answer knowledge questions correctly after receiving the food safety lesson. Cross-tabulations and Chi square statistics of gains scores for each item on the observations questionnaire by treatment group could not be conducted because too few observations were made for the analysis to be reliable. In addition, there were no significant differences in mean gain scores between the two treatment groups for individual items on the food safety practices questionnaire (independent samples t-test). However, there was a trend for mean food safety practice gain scores for each item for treatment Group 1 to be higher than mean gain scores for Group 2 (Table 16). The only exception was the handwashing question, which asked participants how often they washed their hands. In this case, group two participants did have higher mean gains in the frequency of washing their hands than participants in Group 1. However, this was attributed to the fact that all of Group 1 participants reported they always washed their hands at baseline and after the lesson. Therefore, the Group 1 gain score was zero because there was no room for improvement on this item.

Surprisingly, participants in Group 1 had more gains in food safety knowledge and practices. Theoretically, since both groups received the *Healthy Futures Series* one would expect the treatment group that received both the *Healthy Futures Series* and the instructional video would have higher gains in food safety knowledge and practices. These results indicate that instructional videos may not be an effective medium to deliver food safety information to an older adult audience. Some FSNEP Program Assistants reported that seniors tend to prefer lessons that have more personal interaction, the video may not be appropriate for all senior FSNEP audiences and instructional videos tend to work better in an individual setting. This is consistent with the finding that participants who received food safety lessons on an individual basis had significantly ($p < 0.05$) higher gains for food safety practices (0.58 vs 0.30). Mean gains

Table 15. Cross tabulations of right to wrong, no change, and wrong to right scoring for food safety knowledge questions.

Food Safety Knowledge Concept	Pre to post	Treatment		Total
		Group 1	Group 2	
At the grocery store, select refrigerated and frozen foods just prior to checkout. $X^2=0.249$	Right to Wrong ^a	1	6	7
	No change	53	50	103
	Wrong to Right	22	19	41
	Total	76	75	151
Food should be purchased before "sell-by" and "expiration" dates to ensure best quality and safety. $X^2=0.002$	Right to Wrong ^a	2	6	8
	No change	58	55	113
	Wrong to Right	15	15	30
	Total	75	76	151
When buying cold food at the grocery store you should return home within 30 minutes or pack items in a cooler. $X^2=0.574$	Right to Wrong ^a	2	5	7
	No change	48	53	94
	Wrong to Right	26	22	48
	Total	74	75	149
Internal refrigerator temperature should be 32 to 40° F. $X^2=2.332$	Right to Wrong	8	5	13
	No change	32	40	72
	Wrong to Right	35	28	63
	Total	75	73	148
Ground meat can be safely refrigerated for 24 hours or less. $X^2=1.333$	Right to Wrong	5	9	14
	No change	44	40	84
	Wrong to Right	26	26	52
	Total	75	75	150
Hands should be washed for 20 seconds before preparing food, or after handling raw meat. $X^2=6.536$	Right to Wrong	6	9	15
	No change	31	44	75
	Wrong to Right	38*	23	61
	Total	75	76	151
Frozen food should not be thawed at room temperature. $X^2=3.223$	Right to Wrong	7	8	15
	No change	48	38	86
	Wrong to Right	20	30	50
	Total	75	76	151
Fresh fruits and vegetables should be rinsed under cold running water before eating, free of slime, mold and off-colors, stored in a separate area of the refrigerator away from raw meat and poultry. $X^2=0.716$	Right to Wrong	8	9	17
	No change	45	50	95
	Wrong to Right	21	17	38
	Total	74	76	150
Doneness of meat, poultry, and vegetable dishes can best determined by a meat thermometer. $X^2=1.709$	Right to Wrong	5	8	13
	No change	32	38	70
	Wrong to Right	35	29	64
	Total	72	75	147

^a Right to Wrong and No Change were combined for analysis.

*p<0.05.

Table 15. Cross tabulations of right to wrong, no change, and wrong to right scoring for food safety knowledge questions.

Food Safety Knowledge Concept	Pre to Post	Treatment		Total
		Group 1	Group 2	
Potentially unsafe food should be kept out of the temperature Danger Zone of 40 to 140°F. X ² =6.066	Right to Wrong ^a	2	4	6
	No change	31	45	76
	Wrong to Right	40*	26	66
	Total	73	75	148
Potentially unsafe food should not be held at room temperature for longer than 2 hours. X ² =1.125	Right to Wrong ^a	1	5	6
	No change	48	52	100
	Wrong to Right	24	19	43
	Total	73	76	149
Leftovers should be stored in shallow containers and placed in the refrigerator immediately. X ² =1.083	Right to Wrong ^a	2	3	5
	No change	43	50	93
	Wrong to Right	28	23	51
	Total	73	76	149
Leftovers can be safely stored for 2 to 3 days. X ² =0.442	Right to Wrong ^a	4	4	8
	No change	49	54	103
	Wrong to Right	20	17	37
	Total	73	75	148
Leftovers should be reheated an internal temperature of 165°F. X ² =0.453	Right to Wrong ^a	2	4	6
	No change	46	42	88
	Wrong to Right	24	29	53
	Total	72	75	147
Cutting boards, utensils and counter tops should be washed with hot soapy water, rinsed, sanitized with a bleach solution and air-dried after contact with raw meat or poultry. X ² =1.297	Right to Wrong ^a	5	4	9
	No change	49	58	107
	Wrong to Right	18	13	31
	Total	72	75	147

^a Right to Wrong and No Change were combined for analysis.

*p<0.05.

Table 16. Aggregate gain scores for food safety practices.

Practices Concept	Group^a	N	Mean Gain Scores	Std. Deviation
When food shopping how often do you select frozen foods first?	1	76	0.2763	1.0145
	2	69	0.2754	1.0694
How often do you buy foods past the "sell-by" or "expiration" dates?	1	76	0.3684	0.6291
	2	70	0.2714	0.9769
How often do you buy or (use) badly dented cans or torn packages of food?	1	77	0.2078	0.7134
	2	70	0.1857	0.6437
How often do you go directly home after food shopping?	1	76	0.4474	0.9852
	2	66	0.3182	1.0252
How often do you store ground meats in the refrigerator for longer than 1 day?	1	75	0.2800	1.0598
	2	68	0.0882	1.0035
How often do you check the internal temperature inside your refrigerator?	1	77	0.6494	1.0484
	2	69	0.4783	1.2903
How often do you wash fresh fruits and vegetables before eating?	1	73	0.5068	0.8680
	2	71	0.2113	1.1201
How often do you use a thermometer to check internal temperatures of cooked meat, poultry, and vegetable dishes?	1	76	0.6974	1.1078
	2	71	0.5211	1.2172
How often do you cool cooked food to room temperature prior to refrigerating?	1	75	0.7067	1.0752
	2	71	0.5775	1.0094
How often do you separate large quantities of leftovers into smaller containers before refrigerating?	1	74	0.7432	1.3351
	2	70	0.5143	1.1260
How often do you store leftovers for longer than 3 days?	1	73	0.3836	0.7751
	2	70	0.1286	1.1023
How often do you reheat leftovers?	1	74	0.2568	1.0606
	2	70	0.0714	1.2197
How often do you wash and sanitize cutting boards, utensils, and the kitchen counter after cutting raw meat or poultry?	1	75	0.4800	1.0700
	2	70	0.4286	0.8439
How often do you let meat and dairy foods sit out of refrigerator for more than 2 hours?	1	73	0.3562	0.7143
	2	77	0.2338	0.5355
How often do you thaw frozen food at room temperature?	1	73	0.8082	1.0496
	2	77	0.4935	0.9545
How often do you wash your hands in warm soapy water before preparing food?	1	50	0.0000	0.0000
	2	46	0.0870	0.3544

^a Group 1-Healthy Futures food safety lesson.

Group 2-Healthy Futures food safety lesson and instructional video.

scores for knowledge (4.86 vs. 3.55) and observations (2.75 vs. 1.30) were also higher, but were not significant. FSNEP participants reported that they enjoyed the video, with a mean rank of 5.49 on a scale of 1 to 6. Participants also reported that the length of the video was adequate. Participants commented they liked the video and the information it provided. Some Program Assistants reported, they did not use the instructional video at the end of the lesson as instructed and this could have influenced the results. Also, data for the study assessing food safety knowledge and practices was collected after the first time the Program Assistants used the video as a teaching tool; whereas, Program Assistants are more experienced with teaching the *Healthy Futures Series*. A limitation of this study is that various teaching methods used by the Program Assistants were not assessed. In addition, Program Assistants reported that many FSNEP participants had difficulty understanding some of the questions on the survey instruments. Also, the questionnaires used in this study could not be assessed for reliability. However, observation scores were significantly ($p < 0.05$) correlated with the self-reported practices of FSNEP participants and this finding adds validity to the Food Safety Practices Questionnaire (Pearson's Correlation). Another limitation of the study is that the video was not piloted tested with an older adult audience before used in the study. Also having the program assistants teach both lessons may have added some bias to the results. All of these factors may have attributed to the findings of this study. Therefore, more research is needed to determine if videos are an effective way to convey food safety information to older adults.

RELATIONSHIP BETWEEN DEMOGRAPHIC VARIABLES AND FOOD SAFETY KNOWLEDGE AND PRACTICES

There was a significant ($p < 0.05$) positive correlation between participants age and average scores on the food safety practices pre-test (Pearson correlation) and observation of food safety practice scores at baseline (Pearson correlation). On average, as age increased pre-test scores on practices and observation scores increased. However, only 1.93% of the variance in practices pre-test scores and 10.96% of the variance in observation scores could be explained by age. There was a significant ($p < 0.01$) positive correlation between education level and average scores on the practices pre-test (Spearman's rank correlation). On average, participants with higher levels of education scored higher on the food safety practices pre-test. However, only 4.20% of variance in average pre-test scores could be explained by education level. There was a

significant ($p < 0.01$) negative correlation between education level and average practices gain scores (Spearman's rank correlation). On average as education levels increased gains in food safety practices decreased. This indicates that the program may be more beneficial to those participants with lower levels of education. However, only 4.24% of variance in average practices gain scores could be explained by education level. There was a significant ($p < 0.05$) positive correlation between education level and observation scores at baseline (Spearman's rank correlation). Participants with higher levels of education had better observed food safety practices. However, only 7.90% of variance in observation scores at baseline could be explained by education level.

There was a significant ($p < 0.05$) positive correlation between participants' place of residence and observation scores at baseline (Spearman's rank correlation). On average participants who live in more urban areas had higher food safety observation scores at baseline. However, only 8.64% of variance could be explained by place of residence. There was a significant ($p < 0.05$) negative correlation between place of residence and observation gain scores (Spearman's rank correlation). On average participants who lived in urban areas had lower gains in observations of food safety practices. However, only 6.00% of variance in observation gain scores could be explained by place of residence. These results indicate that food safety practices may vary by residential area due to cultural differences. There was a significant ($p < 0.01$) negative correlation between the number of children living in the home and observation scores at baseline (Pearson's correlation). As the number of children living in the home increased observation scores decreased. However, only 8.82% of variance in observation pre scores could be explained by number of children living in the home. This finding is in contrast to Daniels (16) who reported that households with young children were more likely to have higher observed food safety practices.

There was a significant ($p < 0.05$) positive correlation between the number of meals prepared in the home and knowledge pre-test scores (Pearson's correlation). On average as the number of meals prepared in the home increased so did knowledge pre-test scores. However, the number of meals prepared in the home could explain only 3.06% of the variance in knowledge pre-test scores. There was a significant ($p < 0.05$) positive correlation between the number of meals prepared in the home and average practices pre-test scores (Pearson's correlation). Only 2.37% of variance in average practices pre-test scores could be explained by the number of meals

prepared in the home. There was a significant ($p < 0.05$) positive correlation between hearing and knowledge pre-test scores (Spearman's rank correlation). On average as participant ranking of hearing increased so do scores on knowledge pre-test. Only, 1.96% of variance in knowledge pre-test scores could be explained by hearing.

There was a significant ($p < 0.05$) negative correlation between relying on public transportation, a friend or family member for getting to the grocery store and knowledge pre-test scores (Spearman's rank correlation). As the frequency of relying a public transportation, a friend or family member for getting to the grocery store increased knowledge pre-test scores decreased. Only 3.46% of variance in knowledge pre-test scores could be explained by relying on public transportation, a friend or family member for getting help to the grocery store. There was a significant ($p < 0.05$) negative correlation between having help with meal preparation and knowledge pre-test scores (Spearman's rank correlation). As help in meal preparation increases knowledge pre-test scores decreases. Help with meal preparation could explain only 2.00% of variance in knowledge pre-test scores. There was a significant ($p < 0.01$) negative correlation between help with meal preparation and average practices pre-test scores. (Spearman's rank correlation). Help with meal preparation could explain only 3.88% of variance in practices pre-test scores. These findings indicate that participants who have help in meal preparation have lower food safety knowledge and practices.

There was a significant ($p < 0.05$) positive correlation between concern for food safety and knowledge pre-test scores (Spearman's rank correlation). As concern for food safety increases so do knowledge pre-test scores. However, only 2.16% of variance in scores explained by concern for food safety. There was a significant ($p < 0.05$) positive correlation between concern for food safety and observation gain scores (Spearman's rank correlation). Participants' concern for food safety explains 7.08% of the variance in the food safety observation gain scores. These results indicate that participants who are more concerned with food safety are more likely to be knowledgeable of and observed using safe food handling principles.

There was a significant ($p < 0.01$) positive correlation between knowledge pre-test scores and participants concern for bacteria in foods (Spearman's rank correlation). Participants' concern for bacteria explains 5.43% of variance in food safety knowledge pre-test scores. There was also a significant positive ($p < 0.01$) correlation between concern for bacteria in foods and average practices pre-test scores (Spearman's rank correlation). Participants' concern for

bacteria in foods explains 5.66% of variance in average food safety practices pre-test scores. In addition, there was a significant ($p < 0.01$) positive correlation between participants' concern for bacteria in foods and food safety observation scores at baseline (Spearman's rank correlation). Participants' concern for bacteria in food explains 10.43% of variance in food safety observation scores at baseline. The findings indicate that on average as participants' concern for bacteria in foods increases so do food safety knowledge and practices.

There was a significant ($p < 0.05$) positive correlation between participants' concern for pesticides in foods and knowledge pre-test scores (Spearman's rank correlation). However, only 3.53% of variance in knowledge pre-test scores could be explained by participants' concern for pesticides in food. There was a significant ($p < 0.01$) positive correlation between participants' concern for pesticides in food and average practices pre-test (Spearman's rank correlation). However only, 4.41% of variance in average food safety practices scores could be explained by participants concern for pesticides in food. There was also a significant ($p < 0.05$) positive correlation between participants' concern for pesticides in food and observation pre scores (Spearman's rank correlation). However, only 6.25% of variance in observation scores at baseline could be explained by participants' concern for pesticides in food.

Participant who did not have gastritis had significantly higher ($p < 0.05$) mean practices pre-test scores and higher gains in observations (independent samples t-test). Also, participants who had not received prior food safety lessons had significantly higher ($p < 0.05$) gains in food safety knowledge. This indicates that those participants who had not received prior food safety lessons were more likely to improve their scores on the food safety practices questionnaire after receiving food safety instruction. Participants who had received prior food safety training may not have been as receptive to hearing new food safety information.

Participants who had not had a foodborne illness had significantly ($p < 0.05$) higher food safety practices and observation scores at baseline. However, having a prior foodborne illness made significant ($p < 0.05$) gains in food safety practices and food safety observation scores. These findings indicate that participants who have had a foodborne illness in the past may be more receptive to food safety education and more inclined to change food safety practices.

There were no significant relationships between gender, race, income, number of other adults in the home, vision, and concern for preservatives and food safety knowledge, practices, and observations pre-test scores and gain scores. In addition, no relationship was found between

having cancer or an immune disorder and food safety knowledge and practices. Respective correlation coefficients and t-test are presented in Appendix G. Although some significant correlations between demographic variables and food safety knowledge and practices were found, demographics accounted for only small proportions of the variance in the scores. These findings indicate that demographics may not play a major factor in participants' food safety knowledge and practices.