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Older Adults' Perceptions of Nutrition as Protective Against Detrimental Effects of Environmental Pollution

Abstract

The aging process makes older adults vulnerable to the detrimental health effects of environmental contaminants. Our study assessed older adults' perceptions regarding diet as protective against environmental contaminants, levels of concern about exposure to environmental contaminants, and interest in learning about protective food-related strategies. A needs assessment to collect such information had not been conducted among older adults. Health fair survey results showed that respondents perceived diet as beneficial against contaminants, were concerned about health implications of exposure, and were interested in learning how to protect health through diet-related strategies. Results suggest that a nutrition-focused curriculum addressing how dietary strategies can help protect against environmental contaminants is needed for Extension professionals.

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Introduction

The natural process of aging brings changes in the metabolism and daily activities of older adults that increase their vulnerability to the detrimental health effects of environmental contaminants or pollution (Geller & Zenick, 2005). Metabolic changes include decreased abilities of the liver to detoxify contaminants and the kidneys to excrete them (Geller & Zenick, 2005). The Centers for Disease Control and Prevention (2013b) predicts that the rapidly growing older adult population will increase to 89 million by 2050. Taken together, these circumstances create a public health concern. The negative health consequences associated with pollution threaten the independence of older adults by promoting frailty and, consequently, increase the incidence of institutionalization and health care costs.

Environmental contaminants are present everywhere in our daily lives, including in food, air, soil, and water. They contribute to an increased risk for debilitating chronic diseases. Researchers have found that environmental contaminants may cause chronic diseases through oxidative stress and inflammation (Petriello et al., 2014). A number of metabolic changes associated with aging, including diminished liver and renal function, promote the bioaccumulation of contaminants in the body. This accumulation can cause physiological

and systemic dysfunctions that can lead to the development of various diseases due to their potential to affect almost every system of the body (Crinnion, 2000; Khansari, Shakiba, & Mahmoudi, 2009). In addition to undergoing metabolic changes, older adults have had greater exposure to environmental contaminants because they have lived longer than younger people, and they have greater exposure to indoor pollutants because they spend more time indoors due to their decreased ability to carry out certain daily activities (Geller & Zenick, 2005).

The U.S. Environmental Protection Agency (EPA) has recognized the increased susceptibility of older adults to environmental contaminants and the need to protect their health from these hazards. In 2004, the EPA launched the Aging Initiative (U.S. Environmental Protection Agency [EPA], 2005) and established a strategic plan for studying how aging increases susceptibility to environmental contaminants (U.S. EPA, 2009). The plan includes an educational component that involves teaching seniors dietary changes they can make to reduce their exposure to environmental contaminants.

The Cooperative Extension System is an appropriate resource for communicating this important health message to older adults. However, before an effective curriculum can be developed, an assessment of older adults' interest in learning about the role of diet in protecting against environmental contaminants is necessary. Therefore, the purpose of the study reported here was to assess older adults' perceptions regarding the role of diet in protecting against the harmful effects of environmental contaminants, their levels of concern about being exposed to environmental contaminants, and their interest in learning more about the use of food-related strategies to decrease exposure to contaminants. To our knowledge, a needs assessment for collecting information such as this had not been conducted among older adults.

Methods

Procedures and questionnaires were approved by University of Kentucky's institutional review board. We used a nonrandom convenience sample consisting of adults aged 50 years or older attending a health fair occurring in an urban setting and targeting older adults. Forty-eight participants independently completed a four-page survey at the health fair. The survey included standard demographics items; the Behavioral Risk Factor Surveillance System (BRFSS) fruit and vegetable intake questions, modified from a telephone interview format to a self-administered survey format; other food intake-related questions; dietary knowledge questions; and questions pertaining to environmental concerns and interest in learning about the use of food-related strategies to decrease exposure to environmental contaminants. The 10 self-reported food intake categories were combined into three levels: low consumption (≤ 1 time/week), medium consumption (2–4 times/week), and high consumption (≥ 5 times/week). We calculated means, frequencies, and standard deviations, and we compared categorical variables using chi-square analysis.

Results

The average age of participants was 70.3 ± 9.8 years; the sample was 86% female and 86% White. Education levels varied, with 67% of participants reporting having a 4-year degree or higher ($p \leq .0001$). Table 1 shows demographic data of participants.

Table 1.

Demographics of Participants in Survey of
Older Adult Health Fair Attendees ($n = 48$)

Variable	Value
Age (years)	70.3 ± 9.8
Sex	
Female	85.7%*
Male	14.3%
Race/ethnicity	
White	86.0%*
Black	11.6%
Other	2.4%
Education level	
No degree	26.2%
2-yr/technical degree	7.1%
Bachelor's degree or higher	66.7%*

* $p \leq .05$

Participant self-reported 30-day food intake levels are shown in Table 2. Over half of survey respondents reported high consumption for the categories of fruit, dark green vegetables, and other vegetables ($p \leq .05$). Walnut and seed consumption was low or medium ($p = ns$) for most respondents. At least 57% of participants reported low consumption of legumes and foods in the high-fat meats, grilled meats, whole milk, and high-fat cheese categories ($p \leq .0001$).

Table 2.

Older Adult Health Fair Attendees' Self-Reported 30-Day Food Intakes ($n = 48$)

Food type	Low	Medium	High	<i>p</i>
	consumption (<1 time/week)	consumption ($2-4$ times/week)	consumption (>5 times/week)	
Juice	46.7%	17.8%	35.5%	.06
Fruit	6.7%	29.8%	63.5%	.0001*
Legumes	57.4%	23.5%	19.1%	.001*
Dark green vegetables	10.6%	36.2%	53.2%	.001*
Orange vegetables	34.1%	48.9%	17.0%	.03*
Other vegetables	6.4%	36.2%	57.4%	.0001*
Whole wheat	37.5%	16.7%	45.8%	.04*

Walnuts	51.2%	24.4%	24.4%	.08
Seeds	28.3%	43.4%	28.3%	.45
High-fat meats	57.4%	36.2%	6.4%	.0001*
Grilled meats	64.4%	26.7%	8.9%	.0001*
Whole milk	82.6%	13.1%	4.3%	.0001*
High-fat cheese	62.5%	14.6%	22.9%	.0001*

* $p \leq .05$

The majority of participants, 74%, agreed that a healthful diet could be protective against the negative health effects of pollution ($p \leq .0001$) (Table 3). However, only 45% indicated that they make certain dietary choices because of the potential of contaminants being present in food (Table 3). Approximately 70% of survey participants agreed that inadequate nutrition increases potential risk for sickness, and 81% felt that a healthful diet is an important factor even when living in an area with a high degree of pollution (Table 3).

Table 3.

Older Adult Health Fair Attendees' Attitudes and Dietary Behaviors Related to Perception of Diet as Protective Against Environmental Contaminants or Pollution ($n = 48$)

Survey item	Agree/strongly		Disagree/strongly		<i>p</i>
	agree	Neutral	disagree		
People may get sick because they don't eat the right foods to protect themselves from pollution.	69.5%	28.3%	2.2%		.0001*
A healthy diet can be protective against the negative health effects of pollution.	73.9%	15.3%	10.8%		.0001*
Eating a healthy diet will NOT make a difference in my health if I live near pollution.	11.9%	7.1%	81.0%		.0001*
I limit how much fish I eat because fish might contain toxic chemicals.	34.9%	18.6%	46.5%		.11
I eat a normal diet and do not spend time worrying about contaminants in my	33.3%	21.4%	45.3%		.23

food.

$*p \leq .05$

Participants had limited knowledge of phytochemicals (Table 4). Over half (53.8%) stated that they had never heard of phytochemicals. Among participants familiar with phytochemicals, 55% believed that they are beneficial to health ($p \leq .01$), but only 37% indicated that they ate certain foods because they contained phytochemicals.

Table 4.

Knowledge of Phytochemicals Among Older Adult Health Fair Attendees with Awareness of Phytochemicals ($n = 48$)

Survey item	Yes	No	Not sure	<i>p</i>
Do you believe that phytochemicals can improve your health?	54.8%	3.3%	41.9%	.01*
Do you believe that phytochemicals can specifically help to prevent or better manage cancer, heart disease, or other chronic illnesses?	50.0%	6.7%	43.3%	.01*
Do you eat certain foods because they contain phytochemicals?	36.6%	26.7%	36.7%	.74

$*p \leq .05$

Participants' interest in learning about reducing exposure to environmental contaminants by implementing food-related strategies was high (Table 5). Participants rated their levels of interest in learning about health risks and ways to reduce those risks relative to four topics. Approximately 77% of participants were interested or very interested in learning more about strategies related to consumption of particular foods; 83% indicated interest in food additives and preservatives; 68% wanted to learn more about food storage containers; and 66% were interested in commonly used household items.

Table 5.

Older Adult Health Fair Attendees' Interest in Learning Ways to Reduce Exposure to Environmental Contaminants Found in Common Items ($n = 48$)

Topic area	Very interested	Interested	Somewhat interested	Not interested
Foods such as dairy products, grains, meat, fish, fruits, and vegetables	41.9%	34.9%	20.9%	2.3%
Food additives and preservatives	51.0%	32.6%	14.1%	2.3%
Food storage containers	41.9%	25.6%	25.5%	7.0%
Commonly used household	50.0%	15.8%	23.7%	10.5%

items such as antimicrobial
soap, bedding, cosmetics, and
cell phones

Discussion

The strategic plan of the EPA's Aging Initiative includes an education component related to communicating health risks caused by environmental contaminants as well as strategies for minimizing risk among older adults (U.S. EPA, 2009). Health professionals and Extension educators use public health interventions to convey important health information to community members. The results of the study described here serve as preliminary data for developing an appropriate curriculum for use by Extension educators. In general, the older adults sampled perceived diet to be an important factor in safeguarding their health from the negative effects of pollution. Additionally, the majority of participants were interested in learning how to reduce their exposure to environmental contaminants using food-related strategies. Furthermore, most participants acknowledged the important role of food in protecting against the negative health effects of pollution, and respondents felt that diet was an important factor in protecting health even if they lived near a pollution source. These are important findings as it is critical to determine the interest a target audience has in a particular topic before developing a nutrition education curriculum (Higgins & Barkley, 2004) and because of the common misconception that educators and health professionals have about educating older adults. Specifically, it is often thought that older adults are set in their ways, unwilling to make lifestyle changes, or unable to adapt to changing conditions (Kaempfer, Wellman, & Himburg, 2002). However, a number of community interventions that have targeted older adults have demonstrated a positive reception by older adults toward nutrition education interventions as well as the effectiveness of such interventions at increasing knowledge and positive dietary behavior changes, specifically those associated with fruit and vegetable intake (Lara et al., 2014; McClelland, Jayaratne, & Bird, 2013). The study reported here also showed that survey participants wanted to learn about using food-related strategies to reduce their exposure to environmental contaminants. Also identified was the need to educate older adults about the health benefits of phytochemicals as less than half had heard of phytochemicals. Among those who had, many were unaware that phytochemicals could improve health and help prevent or better manage various chronic diseases.

Surprisingly, our survey results indicated that this particular sample of older adults consume a relatively healthful diet. In contrast, BRFSS data showed that only 24% of Kentuckians aged 65 or older reported consuming five or more servings of fruits and vegetables per day (Centers for Disease Control and Prevention, 2009), and in 2013, 24% reported consuming vegetables less than one time per day, and 38% reported consuming fruit less than one time per day (Centers for Disease Control and Prevention, 2013a). Our sample of survey respondents did, however, report low to medium consumption of walnuts and seeds, a situation that could be associated with dental or disease-related dietary restrictions. Even though most of the older adults in the study reported eating a healthful diet, an Extension curriculum focusing on the link between nutrition and protection from environmental contaminants should promote the consumption of a variety of fruits and vegetables to coincide with the importance of phytochemicals. A special focus on legumes may be needed because our study demonstrated low consumption of these beneficial vegetables among participants. Legumes are rich in phytonutrients and also relieve constipation that is commonly experienced by older adults. An emphasis on the consumption of lean meats and low-fat dairy products also may be important because consumption of these foods is a key strategy for reducing exposure to contaminants stored in the fat tissue of animals (Yaktine, Harrison, & Lawrence, 2006).

Implementing certain dietary strategies is just one mechanism for reducing exposure to environmental contaminants, of course. However, focusing on this approach in educational materials has the additional benefit of conveying a positive message consistent with the *Dietary Guidelines for Americans* (U.S. Department of Health and Human Services & U.S. Department of Agriculture, 2015)—specifically, eat more plant-based foods—offered without a disease-centric focus. The message empowers people to take action to protect their health from a situation, exposure to environmental contaminants. On receiving this message instead of a more disease-centric one, a person does not react by feeling the shame and personal responsibility that can be associated with developing a disease. Feelings of shame, as observed among some obese individuals, can have a negative impact on the effectiveness of a health message (Earnshaw, Quinn, & Park, 2012; Robinson & Coveleski, 2016). Therefore, an environmental contaminant–focused nutrition education program emphasizing the *Dietary Guidelines for Americans* would provide the dietary strategies nationally recognized and recommended for protecting health against chronic diseases, but that information would be delivered in an exposure-centric rather than disease-centric context.

Exposure to environmental contaminants can negatively affect the trajectory of healthful aging at any point along the life span, including in the later stages of life (Stein, Schettler, Rohrer, & Valenti, 2008). An individual does not have to live near a hazardous waste site to experience the detrimental health effects of pollution because people are exposed to environmental contaminants in their immediate surroundings. Diet was identified in the EPA strategic plan as a key component in the pollution exposure pathway and is a good intervening point with respect to the development of prevention strategies that are actionable at individual and community levels. A nutrition education program highlighting particular dietary strategies for reducing exposure to and protecting against the detrimental effects of environmental contaminants is an appropriate method for reaching older adults with this environmental health message. The interest in such a curriculum among older adults is promising as our study showed that older adults perceived diet as a factor that can protect their health from environmental contaminants and that they were concerned about the health implications of being exposed to pollution.

Furthermore, participants were interested in learning more about food-related strategies to protect their health. These results represent a first step toward documenting the need to develop a diet-related curriculum for use by Extension professionals to fill this educational gap. Due to the small size and homogenous nature of the sample, further needs assessments among more diverse populations of older adults are warranted. Development of such a curriculum, however, would support the EPA's Aging Initiative strategy of disseminating this type of information through public health interventions to reach people across the life span, including older adults.

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