



Food safety education for people with diabetes and pregnant women: A positive deviance approach



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ABSTRACT

Few education programs target audiences at high-risk for foodborne illness, especially people with diabetes and pregnant women. The objective of this study is to develop a food safety education program for each using a positive deviance approach. The positive deviance focus group is a novel educational intervention that allows participants to discuss their food handling behaviors and decide to try recommended positive practices modeled by people like themselves. To fit within the educational programs offered by the collaborating institutions, three sessions were given, discussing safe handling topics: 'Cook and Chill,' 'Clean and Separate,' and 'Choose Safe Food.' People with diabetes (32) and pregnant women (29) participated in the study. Focus groups were audiotaped and transcribed. Participants became involved and inspired by vivid discussions and were inspired to change their behaviors to the recommended food handling practices modeled by their peers. Safe food handling practices were reinforced by take-home tasks focused on using refrigerator and cooking thermometers and using separate cutting boards. Participants were unaware of details associated with safe handling recommendations, such as the recommended temperature for cooking specific items or the temperature of the refrigerator. Results of this study indicate that positive deviance discussion module could be a promising alternative to traditional methods of food safety education.

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1. Introduction

Foodborne illness is an important public health issue in the United States. Data collected by the Centers for Disease Control and Prevention's (CDC) reveal a total of 19,056 cases of culture-confirmed bacterial and laboratory-confirmed parasitic infection, 4200 hospitalizations, and 80 deaths among 48 million residents of 10 states, 15% of the US population (Humes, Jones, & Ramirez, 2011). Some groups are at higher risk for foodborne illness than others. Smith J. L. reported that down-regulation of the cellular immune system induced by hormonal changes during pregnancy increase the risk of pregnant women experiencing foodborne illness (Smith, 1999). Such changes increase the chance of infection from certain foodborne pathogens, like *Listeria monocytogenes*, *Toxoplasma gondii*, *Brucella* species, *Salmonella* species and *Campylobacter jejuni* (Szekeres-Bartho, 1990). Pregnant women are considered 17 times more likely than the healthy general population to contract

listeriosis from *L. monocytogenes* (Silver, 1998; Poulsen & Czuprynski, 2013). Certain organisms, including *L. monocytogenes*, *T. gondii*, *Salmonella typhi* and *C. jejuni*, can have adverse consequences for the fetus if they cross placenta (Smith, 1999; Lamont et al., 2011; Poulsen & Czuprynski, 2013). While *Escherichia coli* O157:H7 and *Vibrio cholerae* have not been found to cross the placental barrier; they can infect the mother and cause severe consequences for the mother and her fetus (Smith, 1999). Infection can result in miscarriage, stillbirth, premature labor or severe complications for the baby.

Diabetes can also increase the risk of foodborne infection (Shah & Hux, 2003). During a *Salmonella* enteritidis outbreak in which raw eggs were used in a hospital-prepared mayonnaise, patients with diabetes who required insulin or oral hypoglycaemics were at increased risk (Telzak, Greenberg, Budnick, Singh, & Blum, 1991). According to previous research (Calvet & Yoshikawa, 2001) campylobacteriosis is four times more common and salmonellosis three times more common in persons with diabetes than in the general population. Goulet and Marchetti (Goulet & Marchetti, 1996) report that persons with diabetes are 25 times more likely to have listeriosis. The increased risk of infection with *Salmonella* enteritidis

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among diabetics is likely due to decreased gastric acid production and decreased bowel motility. The stomach, through the effect of gastric acidity due to hydrochloric acid, functions as a barrier to ingested bacteria (Giannella, Broitman, & Zamcheck, 1973). At the time of this paper, current literature does not estimate the increased risk of an *E. coli* infection among pregnant women or people with diabetes.

High-risk individuals are generally unaware of their increased vulnerability to foodborne illness. A multi-state survey results showed that less than 20% of the pregnant women have knowledge about *Listeria*, which is a crucial pathogen during pregnancy (Ogunmodede et al., 2005). Other studies report that women are unaware of the danger of eating higher risk foods during pregnancy (Athearn et al., 2004; Cates, Carter-Young, Conley, & O'Brien, 2004; Trepka, Murunga, Cherry, Huffman, & Dixon, 2006). Furthermore, a qualitative study of health care professionals suggests that women are not being educated about this issue during pregnancy (Morales, Kendall, Medeiros, Hillers, & Schroeder, 2004). Few studies address awareness of the increased risk of foodborne illness among people with diabetes. Educational programs for this condition focus on food choice and seldom or never include a discussion of food safety (Institute, 2011).

This study was aimed to address the gap of high-risk population food safety education, and to evaluate a food safety educational program which uses a positive deviance approach. Positive deviance is based on the observation that in every community there are certain individuals whose uncommon practices enable them to find better solutions to problems than others despite having access to the same resources. This approach has been successfully used to solve problems in the field of nutrition, like childhood malnutrition (Zeitlin, Ghassemi, & Mansour, 1993) and poor infant health (Guldan et al., 1993). At the time of this writing, positive deviance has not been used in food safety education.

2. Methods and materials

2.1. Participants

2.1.1. People with diabetes

The authors recruited participants from the University of California Davis Health Center Health Management and Education diabetes classes in Sacramento. The study was announced in classes and study flyers and a blank contact information forms were left with participants. The interested parties could contact the author by phone or email. All participants were required to be 18 years old or older, have Type I or II diabetes, act as the primary meal preparer in their family, and cook meals at least three times a week. Classes were scheduled based upon participant's availability. After four months of recruitment (from January 2014 to May 2014), 32 people with diabetes were recruited (30 completed all three sessions and the post-survey). Participants were separated into six groups of four to eight people each.

2.2. Pregnant women

Participants from Sutter Health Davis were recruited from their monthly two to two and half hour 'centering program meeting', and they were grouped by their due date months, for example, the participants, whose due dates were in May, were grouped together. The author announced the study in their centering program meetings, and handed out the consent forms and pre-surveys to those who indicated that they would like to participate in the study. Participants from Women Infants and Children (WIC) were recruited through flyers in the office lobby. Inclusion criteria stated that participants must prepare meals at least three times per week,

and act as the primary meal preparer in the family. Discussions with participants from Sutter Health Davis took place in a conference room in the Sutter Health Davis hospital, and with participants from WIC took place in a conference room in UC Davis Food Science department. Participants were advised that they could discontinue participating in the study at any time. In return for participation, participants were given a \$30 gift card. The study was approved through the Institutional Review Board, University of California, Davis.

3. Procedure

At the first meeting all participants completed a survey, which measured their safe food handling knowledge, and perceived risk of contracting foodborne illness. The pre-survey included four self-efficacy questions that were adapted from previous work (Byrd-Bredbenner et al., 2007); two self-risk assessment questions developed by the authors; and eleven food safety knowledge questions that were adapted from an educational program delivered in California (Blackburn, Bruhn, Miller, Ganthavorn, & Ober, 2014). At the conclusion of the food safety intervention, participants completed a post-survey which consisted of three program evaluation questions and the same self-risk assessment and food safety knowledge questions in the pre-survey.

To fit within the education programs cooperated by the medical institutions, three PD group sessions were led by the authors. Due to the nature of the programs for the two audiences, each PD session with the diabetes group lasted one and one-half hours; while the pregnant women sessions were 1 h. Topics for each session were 'Cook and Chill', 'Clean and Separate' and 'Choose Safe Food'. Topics were selected based on the educational programs offered by the Partnership for Food Safety (www.fightbac.org). Previous research (Anderson, Verrill, & Sahyoun, 2011; Kosa, Cates, Bradley, Chambers, & Godwin, 2015; Nesbitt et al., 2014) also showed that consumers especially need information around those topics. In each session the author provided an introduction, answered questions and conducted a structured discussion using a written guide (Table 2) based on the Positive Deviance approach (Zeitlin et al., 1993). Participants were invited to discuss their food handling practices related to the topic. If a respondent was practicing the recommended behavior, the group would analyze the strategy leading to this behavior. The discussion would then lead to a consensus that others would try the behavior before the next session. Finally the entire group was assigned a take home task that reinforced the concepts discussed. A co-moderator took notes and operated the tape recorder. After the first session, the participants were provided a cooking thermometer (model IRT220, Component

Table 1
Demographic information of study participants.

	Diabetics n = 30% (n)	Pregnancy n = 29% (n)
Gender		
Male	43 (13)	0
Female	57 (17)	100 (29)
Age group		
20–29	0	55 (16)
30–39	0	45 (13)
40–49	13 (4)	0
50–59	27 (8)	0
60–69	47 (14)	0
70–79	13 (4)	0
Ethnicity		
Caucasian	73 (22)	69 (20)
Hispanic	13 (4)	28 (8)
Asian	10 (3)	3 (1)
African-American	3 (1)	0

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