

8-2015

THE EFFECTIVENESS OF EDUCATIONAL DISPLAYS RELATED TO FOODBORNE ILLNESS IN INFANTS

Krista M. Godfrey

University of Nebraska-Lincoln, kmariegodfrey@gmail.com

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THE EFFECTIVENESS OF EDUCATIONAL DISPLAYS RELATED TO
FOODBORNE ILLNESS IN INFANTS

by

Krista Godfrey

A THESIS

Presented to the Faculty of
The Graduate College at the University of Nebraska
In Partial Fulfillment of Requirements
For the Degree of Master of Science

Major: Nutrition and Health Sciences

Under the Supervision of Professor Julie Albrecht

Lincoln, Nebraska

August, 2015

THE EFFECTIVENESS OF EDUCATIONAL DISPLAYS RELATED TO FOODBORNE ILLNESS IN INFANTS

Krista Godfrey, M.S.

University of Nebraska, 2015

Advisor: Julie Albrecht

Infants under one year of age are at high risk and have the highest incidence of foodborne illnesses. The majority of infants receive infant formula before the age of one. Powdered infant formula (PIF) is not sterile, and if not prepared or handled appropriately, may cause foodborne illness. Researchers suggest that the majority of mothers do not receive information regarding safe handling of infant formula, and many do not use recommended procedures when preparing formula. The study objective was to develop and evaluate four display concepts to educate parents on the FDA/CDC recommendation to dispose PIF after two hours at room temperature. Five focus groups were conducted (n=24) to evaluate display effectiveness. All participants had a child under one year. Quantitative data included a demographic survey, knowledge survey, display evaluation form, and rank order form. The knowledge survey was completed before and after viewing all the displays to evaluate the comprehension of the information and whether participants gained knowledge from the content. Descriptive statistics and t-test were conducted. Quantitative results indicate that parents of infants were not knowledgeable about the increased risk of foodborne illness with use of PIF; PIF is not sterile and contains germs (Salmonella and E. coli) that could cause illness; and prepared PIF must be disposed after 2 hours when held at room temperature. Qualitative data was collected

via focus group discussions focused on comprehension, acceptability, persuasiveness, and attractiveness of the displays. Data was transcribed and themes determined. Qualitative data elucidated key features of display effectiveness: title that captures attention; concise and easy to understand message; simple, large, dark font; graphics that appeal to parents, evoke emotion, and are racially diverse; simple and cohesive design with soft/warm colors. A final display was developed from the quantitative and qualitative results. Results suggest that parents of infants are not well informed of safe food handling of PIF and effective displays can be used to convey messages to parents on these topics.

Acknowledgements

I would like to express my gratitude to:

My family: my husband, Wyatt, for his support and encouragement throughout this project and my children for being the purpose behind all I do.

My research advisor, Dr. Julie Albrecht, for her guidance and many hours of work.

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Chapter 1: Literature Review

Infant Foodborne Illness

Many studies have shown infants to have a disproportionate disease burden.^{1,2,3} Children's immune systems are not fully developed, placing them at a higher risk for some foodborne illnesses. A child's lower weight means that it takes a smaller quantity of pathogens to make a child sick than it would a healthy adult.¹ Many of these pathogens result in diarrheal illness which can be very dangerous for infants.

Known bacterial causes of diarrheal illness in infants and children are campylobacteriosis, salmonellosis, and shigellosis.² In the United States salmonellosis is the pathogen that causes the most cases of foodborne illness, followed by campylobacteriosis.³ Infants under one year of age have the highest reported incidence of both salmonellosis and campylobacteriosis.^{1,3} The incidence of salmonellosis was eight times greater in infants than among other age groups, and infants are more likely to experience "severe illness or death due to salmonellae."⁴ In 2012, the Foodborne Disease Active Surveillance Network (FoodNet) reported 7,842 cases of laboratory confirmed bacterial infection from *Salmonella*, 1,938 cases affecting children under 5 years of age, and 6,812 cases of *Campylobacter*, 728 cases affecting children under 5 years of age³.

Redmond (2009) reported incidence of infection associated with the consumption of powdered infant formula milk has predominantly been associated with *Salmonella* spp. and *Cronobacter*.⁵ A study conducted by Rowe et al. (2004) presents a strong association between having a liquid diet (other than strictly breast milk) and sporadic infant salmonellosis.⁶ The same study suggested that 74%-100% of the risk for infant salmonellosis could be eliminated if infants drank breast milk and no formula or water.⁶

Cronobacter is regarded as an emerging opportunistic human pathogen which can cause life threatening bacterial infection in infants.⁷ It's incidence is low, but infections are likely unreported because and it is not included as a pathogen monitored by FoodNet, and only one state (Minnesota) requires confirmed cases to be reported. However, it is associated with significant morbidity and mortality, with mortality rates of 30-80%.⁷

A study done by Jason (2012) reported 13 cases of *Cronobacter* infection among infants in the United States in 2011.⁸ Ninety-nine percent of all infected infants were less than two months old (59% were full-term with no underlying conditions) and 90% had received either PIF or human milk fortifier (HMF).⁸ The conclusions of the study were that *Cronobacter* infections are extremely rare in infants not fed PIF or HMF, and healthy, term infants are also at risk.⁸ The exclusive use of breast milk and/or ready-to-feed formula for infants less than two months old should be encouraged.⁸

A number of studies have determined contamination rates of *Cronobacter* in powdered infant formula (PIF).^{9,10} In 2002, the United States Food and Drug Administration isolated *Cronobacter* from 23% of samples of PIFs.⁹ In the United Kingdom, Iversen & Forsythe (2004) isolated the bacteria from 2/82 samples of PIF.¹⁰

Currently, it is not technologically feasible to produce sterile powdered infant formula. Although PIF is pasteurized, it is then dried in a non-sterile environment and nonsterile components are often added after pasteurization.⁸ This is an important food safety concern because most infants receive formula at some point by six months of age.^{11, 12}

Furthermore, there is the risk of cross-contamination during preparation. Depending on storage and feeding practices, the potential for rapid growth in reconstituted formula is

amplified in what would otherwise likely be a very low level of contamination.

Redmond conducted a study in 2009 that established baseline contamination levels of bottles used for feeding infants PIF.⁵ Parents were asked to provide clean, 'ready-to-reuse' bottles for sampling. All bottles were sampled in four sites (inner screw cap, bottle interior, bottle outer rim and teat interior). Eighty-one percent of 'clean' bottles had at least one sampled site that had unsatisfactory levels of organic soiling. The inside of the screw cap was the site most likely to have microbial contamination. Results showed that a large proportion (55-62%) of sampled inner surface screw caps and outer rim of bottles had unsatisfactory soiling. All parents reported that they washed the bottles and components before disinfection. However, 45% of parents failed to report adequate cleaning methods; five percent reported that they did not use detergent, 31% did not use hot water, 19% did not rinse items after washing. Eighty percent of bottles and components that were only hand washed or washed in the dishwasher had unsatisfactory levels of organic debris, compared to 18-23% that had been subject to disinfection methods. A significant difference was identified between microbial counts from disinfected and non-disinfected bottles and components. *Staphylococcus aureus* was detected from four percent of clean bottles but no *Enterobacteriaceae* were detected. Ninety-nine percent of the 'unclean' bottles collected immediately after feeding had at least one or more sites with unsatisfactory organic soiling levels. *Enterobacteriaceae* and *Staphylococcus aureus* were isolated from 12-15% of unclean bottles/components and contamination was most frequently detected from screw cap and teat interiors. The study concluded that there is a need for health professionals to provide parents and other

caregivers with information and advice about safe preparation and use of PIF from an early age.

In response to that conclusion, Redmond published another article explaining the three main routes by which microorganisms can enter infant formula: (1) through the raw material used for producing the formula; (2) through contamination of the formula or other dry ingredients post-pasteurization; and (3) through contamination of formula as it is reconstituted by the caregiver prior to feeding.¹³ Most studies have concluded that the domestic environment is an important source of foodborne infections and hygiene behavior and/or cleaning practices need to be improved to reduce levels of contamination. Food handling practices employed by consumers in the domestic kitchen influence the risk of pathogen survival and multiplication, as well as cross-contamination to other products. Effective cleaning and sterilization/disinfection of feeding bottles and components is important to prevent contamination of the formula as it is reconstituted by the caregiver prior to feeding.

Some bacteria found in powdered infant formula can grow slowly at refrigerator temperatures, especially temperatures higher than 41° F. Studies have found that large numbers (21-25%) of consumers' refrigerators exceed recommended temperatures.⁵ If infant formula needs to be prepared in advance, prepared formula should be stored in the back of the refrigerator and at less than 41° F for up to 24 hours.¹³ Thus, educational messages, both on infant feeding options and on safe preparation, storage, and handling of powdered infant formula, are necessary risk-management measures.⁴

Four safe-handling practices for all types of infant formula have been recommended to reduce infants' risk of being burned or infected with foodborne pathogens: (1) wash

hands with soap before preparing formula; (2) wash bottles and bottle nipples thoroughly between uses; (3) discard formula left at room temperature for greater than two hours; and (4) never heat formula bottles in a microwave oven.¹¹

The World Health Organization recommends caregivers use water no less than 158° F when reconstituting powder formula.¹⁴ However, the European Society of Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) Committee on Nutrition disagrees with the use of boiling water and of heating of reconstituted formula to temperatures close to the boiling point because of possible adverse effects on nutrients such as vitamins.¹⁵

Established guidelines for infant formula food safety are:

1. Wash hands with soap and water before preparing formula.^{16,17}
2. Wash bottles and nipples thoroughly between uses.^{16,17}
3. Committee recommends that powdered infant formula should be prepared fresh for each feed during the first 2 months of life, when risk from severe infection with *E. Sakazakii* is at its highest.¹⁵
4. Remnants of feed should be discarded and not used as part of the following feed.¹⁵
5. Discard formula left at room temperature for >2 hours.^{16,17,18}
6. Never heat formula bottles in a microwave.^{16,17}
7. Opened cans of concentrated or ready to feed infant formula must be covered, refrigerated, and used within 48 hours.¹⁸

Despite the necessity for food safety measures to be well known and understood among those caring for infants, researchers suggest that the majority of mothers do not receive information regarding safe handling and storing practices, and many mothers do not use acceptable handling procedures when preparing milk, especially formula.¹¹ Two prominent studies have been conducted which evaluated the food handling practices of caregivers of infants. The first study was conducted by Fein & Falci (1999) in 1993-1994.¹⁹ This study demonstrated that 33% of mothers mix formula with warm tap water;

38% of mothers do not sterilize bottles and nipples, 39% of mothers heat bottles in the microwave (more than 50% of the time); and 35% of mothers add food to the bottle.¹⁹ Additionally they explained that only 21% of mothers of two-month-old infants, increasing to 35% of mothers of seven-month-old infants, received instruction from a health care professional about formula preparation.¹⁹ Fein and Falci (1999) stated that receiving instruction from a health care professional on formula use had a positive effect on the practice of diluting formula, mixing with warm tap water, and heating in a microwave for mothers of two-month-old infants.¹⁹ Other results suggest that providing information through health professionals is effective; mothers who reported that they had received instruction on formula preparation were more likely to follow recommended procedures when their infants were young.¹⁹

Research by Labiner-Wolfe (2008) showed that the majority of formula-feeding mothers did not receive instruction on formula preparation (77%) or storage (73%) from a health professional.¹¹ Despite slightly lower rates of some unsafe-handling practices in 2005-2007, mothers were less likely than in 1993-1994 to have received instruction on formula preparation from a health care professional. Thirty percent of the mothers did not read the package directions on what to do with leftover formula; six percent did not always discard formula left standing for greater than two hours.¹¹ Most mothers did not boil tap (70%) or bottled (83%) water to reconstituted formula; 35% heated formula bottles in a microwave. Over 50% of the mothers, of even young infants, did not always wash their hands with soap before preparing formula, and one-third did not always adequately wash bottle nipples between uses, thereby increasing their infant's risk of being exposed to a foodborne pathogen and suffering an illness. Additionally, 38% of the

mothers thought it was unlikely that either ready-to-feed or powdered formula contained microorganism; the data on mothers' beliefs about germs (microorganisms) in formula suggest that consumers are not aware that there are different risks associated with powdered infant formula compared to ready-to-feed and liquid concentrates, which are commercially sterile. No consistent subset of maternal characteristics was shown to be associated with unsafe practices.

The previous studies reveal that many mothers do not follow safe practices when preparing infant formula. Additional research is needed to understand why more mothers do not follow safe formula-handling recommendations.

The Social Marketing Framework and Health Belief Model are the methodologies that have been used to begin planning intervention for the necessary behavior change of improper food handling and storing practices of infant formula and breast milk. Social marketing is defined as a communication strategy to inform and influence individual behavioral changes to enhance a social situation. It is most effective when it motivates people to change. Social marketing is used to target people who have a reason to care and who are ready for change. The Health Belief Model attempts to explain and predict health-related behavior from certain belief patterns.²⁰ This model emphasizes understanding the population of interest, particularly their perceived susceptibility and seriousness of the health problem and the benefits, barriers, and cues to taking action.

Research by Trepka (2006) gives information about the population of interest regarding the perceived susceptibility and seriousness of foodborne illness infants and the barriers to safe preparation and handling of PIF.²¹ The study was conducted to determine beliefs and barriers to good food safety practices among clients of a Special

Supplemental Nutrition Program for Women, Infants, and Children (WIC Program). Five focus groups were conducted with 32 women demographically similar to clinic participants. The results showed that participants did not perceive foodborne illness as a major problem or believe that foodborne illness usually resulted from poor food handling practices at home. In addition, participants were unaware of the risk to pregnant women and infants. Leaving perishable foods and baby bottles outside refrigerator for longer than two hours was reported to be a problem. This explains that there is a need to increase the perceived susceptibility and seriousness of the risk of foodborne illness among this population. Mothers reported that their child's health was the most important cue to action for safe food handling practices.

In an effort to present the information to the necessary population in an effective way, research concerned with the effectiveness of educational materials, in particular displays, needs to be investigated. Displays are widely used in nutrition education, but little research on what makes a display effective or how to measure the effectiveness of a display has been investigated.

Display Development

Research in psychology and communication demonstrates a strong advantage for visual displays in comparison with typical written or spoken language in many circumstances.²² Graphic displays improve comprehension and enhance messages.²² The use of displays as a component of nutritional education messages complements other forms of delivery and increases the impact of a message. Utilization of visual aids in the classroom has been associated with positive effects on cognitive processes such as

attention, organization of new information, recall, comprehension, effective note taking, problem-solving, and overall academic performance.²³

The immediate benefits of visual displays as a learning enhancement have been demonstrated by a number of researchers. A study conducted by Brockhoven (2004) evaluated the effectiveness of three methods of presenting educational material: traditional lecture, demonstration, and visual display.²³ Results show that demonstration and visual display methods were rated by the participants to be more interesting and helpful, the visual display being slightly more helpful than the demonstration, and the visual display enhanced the learning objectives with the highest recall and retention of information. Participants in the visual display group had the highest scores on both a test following the class and a test five weeks later. The visual display used in this experiment was a PowerPoint™ presentation with colorful graphics and mobile images.

Colapinto & Malaviarachi (2009) conducted a study to determine consumer understanding and retention of nutrition information presented at grocery stores via two approaches: interactive display events and brochure distribution.²⁴ Seventeen stores participated (11 held interactive display events with public health staff, six distributed brochures). Two hundred and one participants received a three-month follow-up telephone call. Participants at interactive display events were six times more likely to identify serving size of fruit and vegetables and 23 times more likely to identify recommended number of servings of fruit and vegetables correctly. However, follow-up, three months later, there was no significant difference between event type and ability to answer correctly. Interactive displays increase immediately knowledge but failed to increase long term retention. This suggests that consistent presence of the message is

needed to reinforce initial understanding and retention. Increased exposure and availability increased the likelihood that an individual will learn a message.

Another study conducted by Strobel (1999) evaluated the comprehension of breastfeeding education of persons receiving a class and those reading a display.²⁵ Participants completed a post-test after receiving each form of education. The mean score of participants who received breastfeeding education by a class was 93% whereas the mean score of participants who received education by display was 83%. The difference was significant ($p=0.01$), but it was small. Overall, most subjects of either educational method achieved all possible points on individual questions. Results indicate that immediate comprehension was still good for subjects receiving breastfeeding education by poster display. This supports the usability of these particular educational materials for the population and can be used with confidence in their effectiveness.

Arrigoni (1997) points out that learners can gain information from posters in less time than by other methods.²⁶ Posters are becoming popular in WIC settings for a variety of reasons:²⁶

- a. Posters don't require constant attention.
- b. Clients are willing to participate in poster education.
- c. Poster displays can be exchanged between counties, making more resources available for less cost and time.
- d. Clients can receive valuable information in a short period of time.
- e. Poster displays often have "take with you" handouts and pamphlets reiterating the information in the poster or giving additional information.
- f. Poster displays are "do-it-yourself," therefore people who are more interested or have a greater need for the info can spend more time with the particular display, and those with less interest or need can spend less time.
- g. WIC clients are finding poster education, rather than classroom instruction, fits their lifestyle (90% preferred poster display over classroom nutrition education, 100% said "it takes less time").

Ward and Hawthorne (1994) conducted a study to test whether patients read health promotion posters in waiting rooms.²⁷ They found the majority of patients reported that they read the posters in the waiting room; the longer they waited in the waiting room, the more likely they were to remember the subject of the poster; and more than half of patients requested more information on the topics. This study illustrates that posters can help raise awareness and interest in an issue, that length of exposure to the display may influence participant retention, and that the location of the display may influence its reception and impact.

Educational displays have been used successfully to disseminate information to the public. Recently, displays were used as a part of a North Carolina community-based BEAUTY and Health pilot project.²⁸ Displays were used to reinforce targeted health messages toward women given by beauty salon stylists over a seven-week period. After one year, 81% of customers had read the display in the salons and 55% made changes in their health habits because of conversations with the stylists and the displays.²⁸

Displays increase awareness of nutrition information, as was demonstrated through a 5-A-Day Roadside Market project in Ohio.²⁹ Extension agents found that laminated posters, along with fact sheets, increased awareness of the 5-A-Day concept among their customers.²⁹

Nutrition and food safety educational displays can also increase awareness of the need for changing behavior. A study done by Concannon et al. (2009) showed that educational displays encouraged making specific behavior change.³⁰ Displays regarding food safety recommendations were distributed to agencies that pick up and distribute

food to families from a local food bank. These providers found the display information extremely valuable for the at-risk communities they serve.

In another study by Sherbondy and Schuster (2008), nutrition education displays and handouts were distributed to teachers to display in their classroom to promote behavior change.³¹ Forty-seven percent of teachers indicated that they plan to increase nutrition education and 73% plan to change personal health behaviors. The displays supported school staff in making healthy lifestyle choices and were incorporated into the school wellness policies.

Although displays have been shown to be an effective way of communicating educational messages, it is important to consider a number of factors that contribute or influence their effectiveness. The development of the message and how it is delivered impacts the effectiveness of the display. A study done by Wilson (2007) identifies the following important strategies when creating persuasive messages: draw firm conclusions in the message, use two-sided arguments that refute opposing views, use fear messages when possible.³² “Strong fear messages are generally more effective than weak or moderate ones, so long as the receivers are convinced that the threat is severe, and that an effective response can be followed to reduce or eliminate the threat.”³²

Trepka’s (2006) research with WIC participants found that that their child’s health was the most important motivator to good food safety practices and that women may be most receptive to food safety education during their first pregnancy.²¹ Regarding food safety education materials, participants stated that messages should be repetitive, clear and simple and use catchy, real-life images.

Contento et al. (1995) suggests nutrition education programs should be planned with the following characteristics in mind:^{33, 34}

- a. Nutrition education programs should be theory based
- b. Motivate behavior change and provide skills to maintain behavior change
- c. Clearly identify goals, objectives and outcomes
- d. Communicate the consequences of not making the recommended change
- e. Give choices of positive options
- f. Gear the content and the method to the target audience
- g. Use mass media to promote the message
- h. Give the same message through different media and over a period of time if possible

A list of other recommendations for effective displays include:

- a. The need for the display should be documented.³⁵
- b. Adults learn best when they are motivated. The motivation to learn is influenced by the learner's personality, the nature of the subject of skill to be learned, and the perceptions of the value and difficulty of learning it.³⁶
- c. Educational posters are used to present information and communicate ideas.³⁷
- d. Drawing attention to the main concept and keeping the attention of learners is the goal of this type of visual aid.³⁸
- e. To educate with posters, attention must be captured. The first part of the poster that viewers read must capture their attention because the average viewer will decide in 11 seconds whether to read the poster or move on.³⁸
- f. Place the most important information in the top center because that is what viewers will read first.³⁸
- g. Each poster should have one main message.^{38, 39}
- h. Choose a message that should be easily demonstrated or illustrated, and outline the key points;³⁵ bullet point.³⁹
- i. Keep messages brief so that viewers can digest the main messages in just a few seconds.^{35,40}
- j. Educational posters need to be readable, legible, well organized, and succinct.³⁸
- k. The size and color of the display board itself, as well as the letter type and size, and organization of the material on the poster are all important details.^{37,38}
- l. Use lettering that can be read at least five feet away, open space in the design, elements of different size and proportion, use of color to add visual interest and clarity, and simple and bold illustrations and photographs.^{37,38}

- m. All capital letters are especially difficult for people with lower literacy skills to read.³⁹
- n. Titles may be in all capitals and should be not more than 6 words.³⁷
- o. Place periods at the end of each sentence.³⁹
- p. Highlights may be done with boldface, italics, shadow, larger print, or color.³⁸
- q. People tend to learn more when their senses are involved.³⁶
- r. Adding pictures to written and spoken language increases patient retention, comprehension, recall, and adherence, and can be especially helpful to patients with low literacy skills.⁴¹
- s. Graphics must relate to the subject at hand;³⁹ or any photograph must be pertinent to the information presented.³⁷
- t. Keep the visual cues sharp, concise, and uncluttered as possible.³⁹
- u. Open space is important for a less cluttered look.³⁷
- v. All text and graphics should be arranged in a manner that the viewer is lead through the display.³⁷
- w. Health care educators should be sensitive to the culture of the intended audience in creating or selecting pictures for use in health education materials.⁴¹

Additionally, Cates et al. (2004) collected data from numerous focus groups found that information about risk of foodborne illness was most effective if delivered by health care providers.⁴² The article also notes that other researchers have concluded that food safety education is most likely to be effective if the educational materials are targeted toward at-risk populations and behaviors.⁴² These findings suggest that who presents the information and if the message is tailored to the necessary population are influencing factors in a display's effectiveness.

Little research has been done regarding how to measure the effectiveness of educational displays. Some of the initial research on display effectiveness was done by Vincente (1992).⁴³ He evaluated the validity of memory recall as a measure of display effectiveness. The general conclusion that emerges on using memory recall as a measure of display effectiveness is that memory-recall performance is correlated with domain expertise. Vincent measured *coherence* by evaluating if subjects could reconstruct the

figure in the diagram and *correspondence* by the accuracy of their memory. His findings supported that memory recall can be a sensitive measure of display effectiveness.⁴³

However, The University of Wisconsin Extension (2008) offered recommendations on how to test whether a display will have an impact.⁴⁴ They suggests inviting the target audience to a focus group of about ten to twelve people. Make certain that the attendees are representative of the target population. Learn whether the audience understands the ideas being communicated; whether the language is on their level; and whether they are convinced. Use six to ten questions to get at the following aspects of interest: comprehension, acceptability, persuasiveness, attractiveness. These same concepts can be used to measure the effectiveness of the final display produced from the focus group feedback.

The Center for Disease Control (CDC) published a guide in 2014 for developing educational material.⁴⁵ The guidelines to develop effective communication products include:

- a. Identify intended audience(s)
- b. Conduct audience research
- c. Identify behavioral objective(s) and key messages

Core items

- d. Main message
 - i. One main message at top, beginning or front
 - ii. Emphasize main message with visual cues (ie boldface, color, shapes, lines, arrows, font type/size/alignment/spacing)
 - iii. At least one visual that conveys or supports the main message
 - iv. One or more calls to action for the primary audience
- e. Language
 - i. Both main message and call to action in active voice
 - ii. Always use words the primary audience uses
- f. Information Design
 - i. Use bulleted or numbered lists

- ii. Most important info in the first paragraph
 - iii. Unfamiliar terms are explained
 - iv. Organize material in chunks with headings
- g. State of Science
 - i. (Information is current and credible)

Behavioral Recommendations (may not apply to all material)

- h. Material includes one or more behavioral recommendations for the primary audience (tells how to protect or promote their health)
- i. Material explains why behavioral recommendation(s) is important to the primary audience
- j. Do the behavioral recommendations include specific directions about how to perform the behavior?

Numbers (may not apply to all materials)

- k. Material always use numbers the primary audience uses
- l. Material always explains what the numbers mean

Risk (may not apply to all materials)

- m. Material explains the nature of the risk
- n. Material addresses both the risks and benefits of the recommended behaviors
- o. Material that uses numeric probability to describe risk, should also explain probability with words or a visual.

Hand et al. (2015) recently validated an assessment tool to measure the effectiveness of nutrition education handouts.⁴⁶ Review of literature revealed the best practice-recommendations for quality indicators that should be included in effective nutrition and health education handouts (21 constructs) could be classified into the following categories:

- a. Content
 - i. Current, accurate, and consistent with current guidelines
 - ii. Promotes relevant health issues for target audience
 - iii. Clear purpose
- b. Behavior focus
 - i. One or two main themes
 - ii. Specific example of desired behavior

- c. Cultural sensitivity
 - i. Culturally appropriate content for target audience
 - ii. Culturally appropriate images for target audience
- d. Written word
 - i. Simple, common words
 - ii. Positive messages
 - iii. Active voice, second person (you/your), conversational tone
 - iv. Repetition of key words and/or new concepts
- e. Organization/readability
 - i. Logical order, most important message first
 - ii. Short paragraphs
 - iii. Space around headings and text
 - iv. Blocks of text are left justified
 - v. Bullets, numbers and tables
 - vi. Several informative headings/subheadings
 - vii. Easy to read font
 - viii. Important text is bolded or underlined if necessary
 - ix. Purposeful and relevant
 - x. 5th grade reading level

The Developing and Assessing Nutrition Education Handouts (DANEH) is used to determine if each category is present or absent.

Displays have been shown to enhance messages by improving comprehension, and are, therefore, a useful method of delivering nutrition information. Factors that contribute to their effectiveness include their content, extent of exposure, presentation (who), delivery (how), and location. Pretesting the comprehension, acceptability, persuasiveness, and attractiveness of a display with targeted focus groups will help measure its prospective impact. However, further research needs to be carried out on how to measure the effectiveness of displays.

Purposed Research

This study focuses on the evaluation of educational displays for infant feeding.

The objectives of this project were to:

1. Develop four displays
2. Test the four displays using focus groups
3. Measure key components (attractiveness, acceptability, persuasiveness, and comprehension) of the displays
4. Measure participant knowledge pre and post viewing the displays

The hypothesis is that the educational display will be effective in increasing knowledge among the target audience.

Chapter 2: Materials and Methods

IRB Approval- Prior to conducting the study, approval was obtained from the University of Nebraska-Lincoln Institutional Review Board for the use of human subjects (Appendix A).

Display Development

Initial Displays- 7 display concepts were developed based on Federal Drug Administration (FDA) and CDC food safety recommendations for infant formula feeding with the help of students and staff from the University of Nebraska-Lincoln College of Education and Human Sciences Instructional Design Center (Appendix B).

Focus Group Script Development

A focus group script was developed to evaluate the display concepts based on recommendations from Krueger et al. (2002) (Appendix D) to use less than ten open ended questions, avoid dichotomous questions or questions that ask why, and select questions that are clear, precise and brief.⁴⁷ The focus group script focused on the aesthetics (color, font, graphics) and appeal (attractiveness) of the display. Probing, open ended questions were designed to collect information on key components (comprehension, acceptability, persuasiveness, and attractiveness) of the displays.

Informed Consent Development

An informed consent form was developed with information about the research study including the title of the project, purpose of research, procedures, risks, benefits,

confidentiality and compensation (Appendix A). The informed consent form was distributed to participants prior to beginning the focus group and their signature was collected as a form of consent.

Demographic Survey Development

A demographic survey was developed to obtain information about participants regarding gender, ethnicity, education level, employment status, if they are expecting a child or have currently have an infant, number and age of children, what method they use or plan to use to feed their child and where they receive their information about infant food safety (Appendix E).

Knowledge Survey Development

Knowledge Survey was developed to assess caregiver's knowledge of information related to food safety for infants under one year of age (Appendix F). This survey consisted of 13 questions which were either multiple choice or true/false questions. All questions related to food safety for infants under one year of age.

The same survey was administered prior to the start of the focus group and again after the focus group discussion was completed.

Development of Display Evaluation and Ranking Forms

A Display Evaluation Form (Appendix G) was developed to assess the understanding and comprehension of the display, if the display was informative and persuasive, and if behavior change is intended as a result of the information. There was a

question that related to readability to assess if any words presented in the display were unclear. The form also gathered information about the attractiveness, color scheme, font, graphics and overall acceptability. A Likert scale was used to rate the components assessed (Appendix G).

A Ranking Form was developed to rank order the four displays after all the displays were individually evaluated (Appendix H).

Expert Evaluation

A panel of 6 experts in nutrition education from Nebraska and Iowa evaluated the following documents for content validity and readability: Focus Group Script, Demographic Survey, Knowledge Survey, Display Evaluation Form, Display Ranking Form, and the seven initial display concepts. Changes were made to the documents in response to the feedback received.

Revised Displays- Four displays were selected for use in the focus groups. Limiting the number of displays to four made it possible to keep focus groups to a reasonable length of time, yet provided a range of ways to present the infant formula food safety message to caregivers of infants (Appendix C).

Recruitment

Recruitment flyers explaining the purpose of the research, time and place of the focus group, and incentive for participating (Appendix I) were handed out to individuals that met criteria for participation. Staff at local childcare centers, Women, Infant and Children (WIC) program, pregnancy center, city mission, and community center were

contacted and asked to hand out the flyers. Recruitment flyers were also advertised on social websites which parents of young children might access. The recruitment flyer was posted on Craigslist and Facebook walls of people other than those involved in the research to prevent bias among the participants. Focus group sessions were scheduled for a college campus, crisis pregnancy center, city mission, community center, state university extension site, and office building.

Focus Groups

Participants read and signed the informed consent form (Appendix A) before the start of the focus group discussion. Questions from the participants concerning the research were answered prior to conducting the focus group. Participants were reminded that their names would remain confidential and would not be linked to any information in the focus group discussion or to any of the surveys completed. After signing the informed consent form, participants were asked to complete the demographic survey and knowledge questionnaire.

Prior to beginning the focus group discussion, participants were asked where they receive their infant food safety information as an ice breaker.

Display concepts were shown one at a time. The order was consistent for all focus groups. After viewing each display, participants were given a Display Evaluation Form (Appendix G) to complete. After the participant completed the Display Evaluation Form, questions were asked from the focus group script to obtain qualitative data from participants about the display. This procedure continued until all four displays were evaluated qualitatively.

Next the participants were asked to complete the Ranking Form (Appendix H) in which they ranked the displays from best (4) to worst (1). After this task was completed, the participants completed the Knowledge Survey (Appendix F). Participants were thanked for providing valuable data and received a \$20 gift card.

The focus group sessions were taped for later transcription and an assistant provided written notes of the focus group session. Three independent reviewers evaluated the transcripts for common themes and synthesis of the qualitative data.^{47, 48}

Data Analysis

The demographic data and the knowledge survey data were entered into an Excel spreadsheet and transferred to the SAS program and descriptive statistics were conducted. Additionally, the data from the knowledge surveys were scored and entered into SPSS and descriptive statistics were conducted. A paired t-test was used to calculate if there was significance between the difference in scores before and after viewing the displays. Knowledge survey results were analyzed using the SAS.

Final Display Development

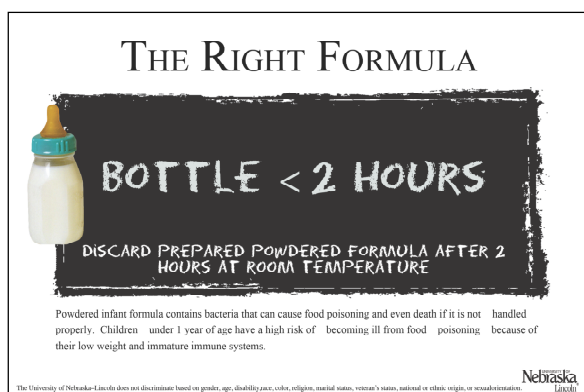
A final display was developed using the features compiled from the quantitative and qualitative results of the focus group. Graphic designer, Mary Masur, from the University of Nebraska-Lincoln instructional design center assisted with the development.

Chapter 3: Results

Display Development

Changes were made to Focus Group Script, Demographic Survey, Knowledge Survey, Display Evaluation Form based on the expert evaluation to make them easier to read and understand. The most prominent change made in response to the feedback from the expert panel was that the primary message on the displays was changed to focus on discarding prepared infant formula after 2 hours. This change was made to be in accordance with current recommendations by the FDA and CDC.^{16, 49} The recommendations to heat tap water to 149°F and discard prepared powdered formula after one hour was primarily for use in clinical settings, and although those recommendations could be used by the general public for more protection against food poisoning, at the time the CDC's recommendation for general use was to discard prepared powdered infant formula after 2 hours. Two messages on the display were perceived as confusing. The message to heat tap water to 149°F requires additional information for the recipient such as letting the water cool before mixing with formula to prevent damaging nutrient content of formula and water must cool before feeding to prevent burning baby's mouth.

Revised Posters-



Recruitment

Recruitment flyers were handed out to a total of over 150 individuals who met participation criteria at 18 different locations; 16% of individuals who received flyers participated. The first four focus groups averaged 3.25 participants. However, the final focus group had 13 participants. One focus group was organized to be held at the University of Nebraska Extension office in Omaha and despite distributing flyers to 32 parents of infants under 1 year of age through surrounding childcare centers, no one participated.

Focus Groups

Five focus groups were conducted with a total of 24 participants. Demographic data are presented in Table 1.

Table 1. Demographic Characteristics of Focus Group Participants		
Gender (n =24)	Female	65%
	Male	35%
Ethnicity (n = 24)	Caucasian	79%
	African American	8%
	Native American	4%
	Hispanic	4%
	Other	4%
Age (n = 23)	Mean Age	29.5
	Median Age	29
Education (n = 23)	Some High School	31%
	High School Graduate	4%
	Some College	26%
	College Graduate	13%
	Post-graduate	26%
Number of Children Under 5 years of age (n =24)	0	25%
	1	46%
	2	29%
Someone in Household Pregnant (n= 24)	Not Pregnant	25%
	Pregnant with 1st Child	21%
	Pregnant (has other children)	54%
Feeding Method (n = 24)	Formula Only	29%
	Breastfeed Only	42%
	Both	29%
Type of Formula (n = 13)	Powdered	100%
	Liquid	8%
	Ready-to-Feed	15%
Employment (n = 24)	Unemployed	29%
	Part-time	17%
	Full-time	54%
Work Experience (childcare) (n = 24)	Never	71%
	Previously	21%
	Currently	8%
Feeding Resources (n = 24)	Family	54%
	Friends	13%
	Books/Magazines	33%
	Internet	21%
	WIC	21%
	Doctor	54%
	Other	21%

Not all participants responded to the ice breaker question. The responses that were received indicate that participants receive their infant food safety information from the following sources (followed by the percentage of total responses):

- Family (31.5%)
- Local breastfeeding center (25%)
- Doctor (12.5%)
- Books (12.5%)
- Experience (12.5%)
- Friends (6%)

Display Evaluation

For each poster, participants completed a Display Evaluation Form. Quantitative and qualitative results for each poster follow (Tables 2-13).

Figure 1. “Bottle < 2 Hours” Display

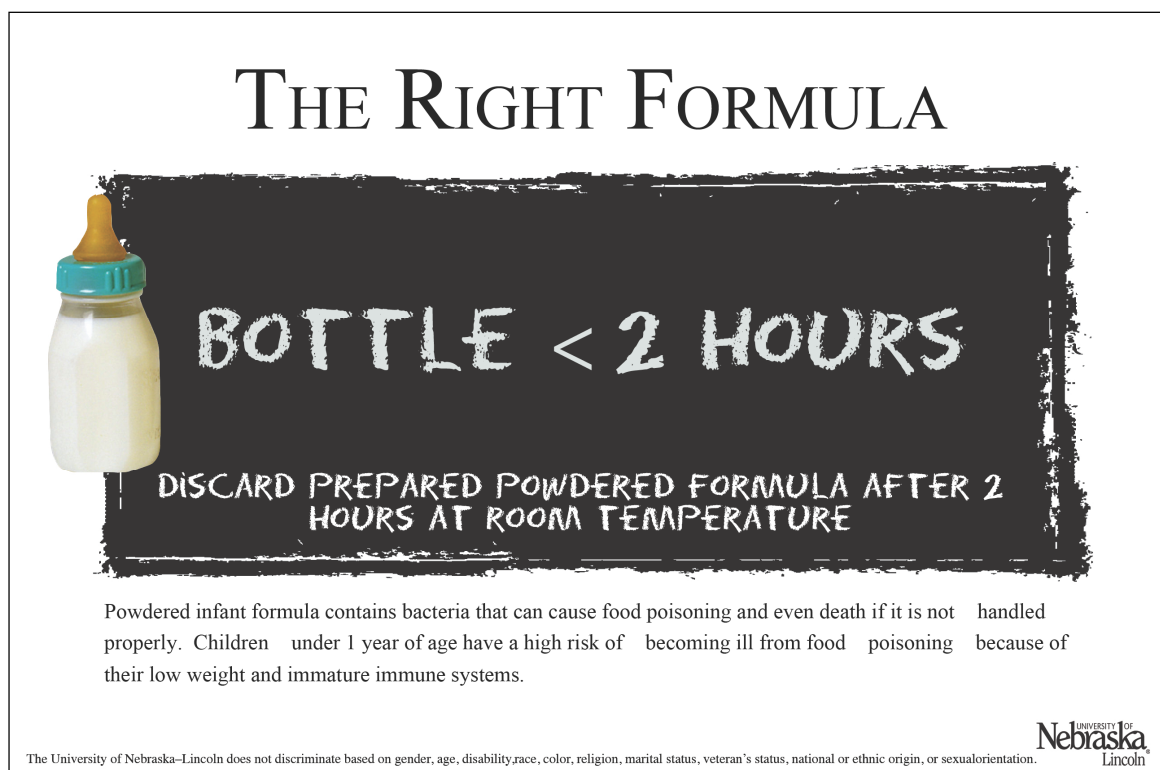


Table 2. Results of quantitative evaluation for “Bottle < 2 Hours”	
Rating scale: 1 = very poor, 2 = poor, 3 = ok, 4 = good, 5 = very good	
	Average score (n = 24)
Rate how easy this display is to understand?	4.12 ± 0.70
Rate the overall aesthetic appeal (attractiveness) of the display.	3.79 ± 0.59
Rate the color scheme of the display.	3.54 ± 0.78
Rate the text style of the display.	4.08 ± 0.83
Rate the pictures and figures of the display.	3.79 ± 0.78
Rate the overall persuasiveness of the display.	4.04 ± 0.75
Rate the overall acceptability of the display.	3.83 ± 0.69

Table 3. Summary of written comments for “Bottle < 2 Hours”	
List any words or concepts that you do not understand or feel are unclear.	<ul style="list-style-type: none"> • "Some people may not understand the symbol < or word choice/diction." • 'The Right Formula'- not sure that describes what the poster is about; it's a bit confusing • "'The Bottle <2 hours' part could be explained better in different words." • "The word bottle threw me off. What would be better I don't know- milk, formula, prepared bottle...not sure." • "Bottle < 2 hours is confusing until you read the message underneath"
What do you like most about the display?	<ul style="list-style-type: none"> • "I like the general concept of the 'Right Formula' and the chalkboard image." • "The Right Formula words & text" • "It's bold and makes me want to stop and read it." • "It's straight to the point and looks like it's trying to educate you." • "The main point is very clear even if only looked at for a second" • "It's easy to read and understand." • "The main message is simple." • "very helpful information" • "black & white = easy to read" • "the pic of bottle & how it says bottle < 2 hours"
What changes would you make to the display?	<ul style="list-style-type: none"> • "<" symbol looks strange- use 'less than'" • "The bottle seems a bit dated." • "add more color" • "Bullet the info under the picture. Listing it out is more eye catching, and people are more likely to read it." • "larger font for the information under black area" • "spacing of words below the image" • "Lot to read at the bottom, would be better if quicker to read if just walking or driving past."
Comments:	<ul style="list-style-type: none"> • I like that it only talks about formula so moms that don't breastfeed don't feel as though they are being judged.

Table 4: Themes from focus group discussion for “Bottle <2 Hours”			
	Code	Theme	Quote
Information	Title	Unclear	<ul style="list-style-type: none"> • "I think the wording is confusing," "have it state a bottle after 2 hours is no good." • "Adding the word discard or change it to use bottle within 2 hours." • ""Change the word bottle. That word threw me off...maybe formula or prepared bottle."
		Misleading	<ul style="list-style-type: none"> • "I didn't know what <2 hours meant until I read the information below." • ""The Right formula' doesn't explain what the formula is about. It's like this formula is better than another." • "Formula vs breastmilk is a touchy subject. I would think that you could read that and immediately get defensive and not read the rest of it even though that is not what it is about."
	Message	Stands out	<ul style="list-style-type: none"> • "I think the important part is that you get the point across and then you added some details about it because not everyone is going to stop and read the rest of it and then they get the major points."
		Clever	<ul style="list-style-type: none"> • "I like that it is a play on words." • "I think it's clever."
		Factual	<ul style="list-style-type: none"> • Could not be more convincing because "the information is correct and it's the facts." • "I have been around newborns and it is true that you need to use formula within 2 hours of making it."
	Vocabulary	not understood	<ul style="list-style-type: none"> • I teach high school and there are parents that I think would need even more of this information, but I don't think they would know the less than sign or the word choice or diction used." (ie "discard")
Text	Font	< not understood	<ul style="list-style-type: none"> • "Not everyone will know that that is less than." • "Depending on who you are trying to reach, I think just the < symbol could be very confusing." • "I don't know how many moms, especially moms who are uneducated or do not speak English, might not understand what that means."
		Contrast	<ul style="list-style-type: none"> • The message at the bottom that is smaller, it has good contrast
	Format	Size	<ul style="list-style-type: none"> • "It's big and easy to read."
		Bullet list is more readable	<ul style="list-style-type: none"> • "I wonder if more of a bullet format, you know to get major points across, would be better because I don't think people would stop to read that." • "I think the same thing because I do like that the main point is big, but if it is a bill board that you are driving or walking by more quickly, you are not going to look at that information."
		Spacing	<ul style="list-style-type: none"> • "The spacing at the bottom is odd."

			<ul style="list-style-type: none"> • "I don't understand the random spacing at the bottom."
Graphics	Chalkboard	Indicates it's educational	<ul style="list-style-type: none"> • I like how it looks like a chalkboard. It looks like it is more education you than telling you this is the way." • "I like the chalkboard look and the bottle."
	Bottle	Draws attention	<ul style="list-style-type: none"> • The picture of the bottle, as a mom, if something related to children I'm more likely to look that way." • "The baby bottle grabs my attention."
	Images	Bold	<ul style="list-style-type: none"> • "I like that it's bold. So that draws my eye to it and I want to see what it is talking about."
Design	Color scheme	Add more color	<ul style="list-style-type: none"> • "I would add more color."

Figure 2: “Two Hours. One Life. No Exception.”



Table 5. Results of quantitative evaluation for “Two Hours. One Life. No Exception.”	
Rating scale: 1 = very poor, 2 = poor, 3 = ok, 4 = good, 5 = very good	
	Average score (n = 24)
Rate how easy this display is to understand?	4.25 ± 0.79
Rate the overall aesthetic appeal (attractiveness) of the display.	4.5 ± 0.66
Rate the color scheme of the display.	4.38 ± 0.70
Rate the text style of the display.	4.08 ± 1.02
Rate the pictures and figures of the display.	4.63 ± 0.65
Rate the overall persuasiveness of the display.	4.52 ± 0.58
Rate the overall acceptability of the display.	4.25 ± 0.79

Table 6. Summary of written comments for “Two Hours. One Life. No Exception.”	
List any words or concepts that you do not understand or feel are unclear.	<ul style="list-style-type: none"> • “I think it should say: Don't use room temperature prepared formula after 2 hours.” • “2 hours. One life. No exceptions.” • "no exceptions"
What do you like most about the display?	<ul style="list-style-type: none"> • “The ‘2 hours. One life. No exceptions.’ grabs your attention. It made me want to keep reading.” • “The message was very clear, it put much more emphasis on the importance of discarding formula after 2 hours.” • “to the point/very persuasive” • “I like that it grabs attention with a baby picture and the ‘one life’.” • “The baby and mommy are looking and smiling at each other.” • “the colors and pictures” • “bright colors, know it is in reference to babies”
What changes would you make to the display?	<ul style="list-style-type: none"> • “The picture is cute, but it is too big and tends to be distracting.” • “Enlarge font at the bottom.” • “Change color of font at the bottom because it blends with the background.” • “bolder color scheme” • “different title” • “Make words in purple circle bigger, move the 2 so it's not also in front of the one life, that's confusing.” • “Outline the purple lettering inside the bubble in white.”
Comments:	<ul style="list-style-type: none"> • “attractive poster; message maybe not as clear as it could be.” • “This one shows how much mom loves her baby” • “I like it don't change it!” • “The information at the bottom may get overlooked- eyes are drawn to large text on top and purple bubble.” • “This poster puts the emphasis on the baby's health and how harmful bacteria can risk that precious life.” • “almost scares you from formula” • “‘no exceptions’ seems to harsh/untrue”

Table 7: Themes from focus group discussion for “Two Hours. One Life. No exceptions.”			
	Code	Theme	Quote
Information	Title	Interesting	<ul style="list-style-type: none"> • "The title strikes my interest. I would keep reading." • "I like the title because it leaves you wanting to know what the poster is about." • "I like the Two hours. One life. No exceptions. It catches your attention."
	Message	Serious	<ul style="list-style-type: none"> • "The very top part made me want to keep reading, but it was almost too harsh for me." • "It is framed as a negative message from the get go." • "I think it talks about the importance of life and how death could be the result of formula. It is a more serious message"
	Vocabulary	"discard"	<ul style="list-style-type: none"> • not understood
Text	Color	Needs contrast	<ul style="list-style-type: none"> • "The font color and design color are too close together. You have to work to read it." • "I think the colors need to contrast more." • "Purple on purple is hard to read." • "I'd outline the purple font in the purple bubble so that it stands out more." • "I think the bottom is kind of dark and disappears."
Graphics	Baby	Draws attention	<ul style="list-style-type: none"> • "Having a baby makes you know it is about infants." • "It's more eye catching having a mom holding a baby, it makes you want to look at the poster more." • "A lot of people are visual...especially pregnant women will be drawn more to the baby." • "It gets to your emotions." • "I like that it's sweet."
	Mom	Smiling	<ul style="list-style-type: none"> • "The baby stands out and the image of the mom smiling at her is nice." • "The woman and baby look happy. You can see the love."
	Size	Too large	<ul style="list-style-type: none"> • "I thought the picture was too big. That's what my eye goes to and I just looked at that."
Design	Color scheme	Complimentary colors	<ul style="list-style-type: none"> • "The yellow and purple work well together." • "It's pretty."
	Format	Organized	<ul style="list-style-type: none"> • "I think the organization is good."

Figure 3: “Protect Your Infant”



Table 8. Results for quantitative evaluation for “Protect Your Infant”	
Rating scale: 1 = very poor, 2 = poor, 3 = ok, 4 = good, 5 = very good	
	Average score (n=24)
Rate how easy this display is to understand?	4 ± 0.93
Rate the overall aesthetic appeal (attractiveness) of the display.	4.02 ± 0.91
Rate the color scheme of the display.	4.08 ± 0.93
Rate the text style of the display.	3.63 ± 1.10
Rate the pictures and figures of the display.	4.17 ± 0.87
Rate the overall persuasiveness of the display.	3.9 ± 0.96
Rate the overall acceptability of the display.	3.77 ± 1.08

Table 9. Summary of written comments for “Protect Your Infant”	
What do you like most about the display?	<ul style="list-style-type: none"> • “everything, the colors, the picture, the font” • “that the baby is smiling and looking at you” • “the black and white baby with blue eyes” • “the picture of the baby & the way it is worded” • “Protect message- everyone wants to protect child from harm” • “font style and size” • “words stand out against the background” • “image of the bottle” • “the info in the oval over the baby bottle”
What changes would you make to the display?	<ul style="list-style-type: none"> • "Make the info on the bottom right bigger & darker." • “needs to be more multiracially friendly.” • “no cursive or italics, it's hard to read” • "The information is at too many different spots on poster." • “the colors, message, text, almost everything” • “Combine the two "protect" statements.” • “Make the baby picture at top all in color- the blue eyes are too distracting.” • “smaller bottle picture, move word bubble from in front of bottle” • “huge bottle is unattractive, would probably get rid of that pic all together” • "The two 'protects' seem redundant. Combine the two statements."
Comments:	<ul style="list-style-type: none"> • "well designed, it's beautiful" • “I would post it on billboards.” • "Hard to read the messages." • “I would not read this poster unless instructed to.” • “This poster sounds like it is against formula because it has bacteria and makes babies sick.”

Table 10: Themes from Focus Group discussion for “Protect Your Infant”			
	Code	Theme	Quote
Information	Title	Draws attention	<ul style="list-style-type: none"> • "The words 'Protect' and 'Bacteria' draw my attention." • "The word protect is emphasized." • "Everyone wants to protect their kids so the 'Protect' stood out to me."
		Repetitive	<ul style="list-style-type: none"> • "The 'Protect your infant from serious illness' and 'Protect your infant from bacteria in infant formula' seemed repetitive."
	Message	Too much information	<ul style="list-style-type: none"> • "You only have a couple of seconds to get information across...if you are walking down a hallway, you wouldn't stop and read it." • "That is my exact comment. I would not read this poster unless it struck me."
		Unclear	<ul style="list-style-type: none"> • "It's pretty sure that it's about a baby, but other than that..."
		Warns against using formula	<ul style="list-style-type: none"> • "To me this says don't use formula." • "When I see 'Protect your infant from serious illness. Protect your infant from bacteria in powdered infant formula' that says don't use formula." • "To me it says formula is bad."
	Vocabulary	Misleading	<ul style="list-style-type: none"> • Message is perceived to be "about serious illness, not the 2 hours." • "You could say food poisoning instead of foodborne illness does not imply food poisoning."
Text	Font	Hard to read	<ul style="list-style-type: none"> • "The lettering is hard to read." • "The cursive is hard to read." • "I don't like that it is in all caps. It is hard to read." • "It's too much work to read."
		Too many styles	<ul style="list-style-type: none"> • "There are a lot of changes in the types and sizes of font."
	Format	Scattered	<ul style="list-style-type: none"> • "There is too much that is all the same size. You are not sure where you want to look first."
	Color	Darker	<ul style="list-style-type: none"> • "maybe the letters need to be black."
	Size	Too small	<ul style="list-style-type: none"> • "The font on the bottom is too small." • "Make the information on the bottom bigger and darker."
Graphics	Baby	Draws attention	<ul style="list-style-type: none"> • "The baby is so cute." • "I agree, the baby stands out most."
	Blue eyes	Draws attention	<ul style="list-style-type: none"> • "The baby's eyes jump out."
		Symbolism	<ul style="list-style-type: none"> • "Blue eyes do not include babies of other races." • "Maybe the eyes are blue to make people sad."

	Bottle	Stands out	<ul style="list-style-type: none"> • "I like the picture of the baby and the picture of the bottle."
		Too large	<ul style="list-style-type: none"> • "I think the bottle is too big."
	Images	Give insight into message	<ul style="list-style-type: none"> • "I like that it's a picture of a baby and a bottle. If you look at the visual then it gives you a summary about what is on the poster."
		Gender neutral	<ul style="list-style-type: none"> • "I like how it is gender neutral."
	Design	Symbolic	<ul style="list-style-type: none"> • "The design looks like a plant which displays another form of life emphasizing the importance of life."
		Distracting	<ul style="list-style-type: none"> • "I think that it is the design behind those words that really diverts your attention elsewhere." • "It's too fancy. You can't focus on the words."
	Design	Colorful	<ul style="list-style-type: none"> • "It is very colorful." • "I like the colors."
		Flows	<ul style="list-style-type: none"> • "Flows really nicely."
Design	Layout	Disorganized	<ul style="list-style-type: none"> • "Too busy" • "A jumble of parts."

Figure 4: “Cow Manure”



Table 11. Results of quantitative data for “Cow Manure”	
Rating scale: 1 = very poor, 2 = poor, 3 = ok, 4 = good, 5 = very good	
	Average score (n=24)
Rate how easy this display is to understand?	3.5 ± 1.35
Rate the overall aesthetic appeal (attractiveness) of the display.	2.9 ± 1.46
Rate the color scheme of the display.	3.25 ± 1.27
Rate the text style of the display.	3.87 ± 1.10
Rate the pictures and figures of the display.	3.13 ± 1.55
Rate the overall persuasiveness of the display.	3.35 ± 1.3
Rate the overall acceptability of the display.	2.67 ± 1.45

Qualitative

Table 12. Summary of written comments for “Cow Manure”	
What do you like most about the display?	<p>"gets your attention"</p> <p>"The point is <u>very</u> clear and bold."</p> <p>"how blunt the picture is"</p> <p>"The poop"</p> <p>"the comparison that cow poop has the same bacteria as infant formula"</p> <p>"the warning"</p> <p>"sense of humor"</p> <p>"There is no design behind the explanation at the bottom"</p> <p>"Nothing"</p>
What changes would you make to the display?	<p>"make discard formula after 2 hours bigger/more prominent"</p> <p>"remove the cow poop"</p> <p>"the picture"</p> <p>"maybe change word infant to baby"</p> <p>"different caption to tell me actual message"</p> <p>"tell what's in formula that is good"</p> <p>"everything"</p> <p>"nothing"</p>
Comments:	<p>"a little too sharp of a contrast"</p> <p>"I'm just not a fan of how the point is made though funny."</p> <p>"I wouldn't use it. I feel it could be insulting to some."</p> <p>"I don't like this concept at all, does not connect with me on an emotional level."</p> <p>"message discourages use powdered formula at all"</p> <p>"Way harsh!"</p> <p>"The wording is offensive."</p>

Table 13: Themes from focus group discussion for “Cow Manure”			
	Code	Theme	Quote
Information	Message	Don't use formula	<ul style="list-style-type: none"> • "That absolutely says formula is BAD and shouldn't be fed to babies." • "Until you read the fine print, I think it's telling me that formula is bad for my child." • "I think this is the only poster that would deter me from bottle feeding." • "If you want people to use something other than formula this is great." The message to throw it away in 2 hours is not apparent. • "It definitely makes me never want to use formula ever."
		Negative	<ul style="list-style-type: none"> • "That says you are feeding your child poop. Comparing formula to cow poop is way too harsh." • "It's just negative. I'd be embarrassed if I had a bottle of formula and was standing by this poster." • "I think even after you read the fine print, it will make people feel guilty." • "I'd be mad if I saw this poster."
		Bold	<ul style="list-style-type: none"> • "I understand that it is trying to be bold and it did that." • "I like how blunt it is, but at the same time it is telling you to steer clear from it which is not easy to do" • "The message is very clear and in your face."
		Grabs attention	<ul style="list-style-type: none"> • "It does get your attention. It depends on what audience you are trying to go for whether they will look at it or not." • "I liked it because it grabbed my attention."
		Humorous	<ul style="list-style-type: none"> • "I think it's more funny than serious." • "It's not as serious as far as the concept."
Text	Font	Main message too small	<ul style="list-style-type: none"> • "You can barely read the message to get rid of formula after two hours."
		Easy to read	<ul style="list-style-type: none"> • "The dark green background makes it easy to read." • "The font at the tops sticks out because it's a really easy font to read."
Graphics	Images	Unattractive	<ul style="list-style-type: none"> • "It's just ugly. It is a big pile of cow poop and it is in your face."
		No association with babies	<ul style="list-style-type: none"> • "I don't even see this and think baby at all. If I was walking by I would not even stop and look at it." • "Especially being from Nebraska, there are so many things about cows. I would not even think that it has anything to do with infants or bottle feeding." • "There is no baby, there is no bottle, and there are piles of manure so I don't connect with it personally at all."
		Unclear	<ul style="list-style-type: none"> • "The cows are blurry. It's hard to tell what it is."

			<ul style="list-style-type: none"> "You don't notice right away the pile of manure. You have to look at it for a moment and get that there are cows back there." "I thought it was an alligator."
	Cow pie	Grabs attention	<ul style="list-style-type: none"> "I would look at this and be like why is there a poster of cow poop and look at it to find out why." "It makes you think why would that be on a wall? You're used to seeing pictures of babies. It does grab your attention."
		Offensive/disgusting	<ul style="list-style-type: none"> "It makes me want to look away. I wouldn't read it."
		Humorous	<ul style="list-style-type: none"> "I have a pretty dry sense of humor so I like it. I think it's funny." "I think it's funny and people get the importance quicker."
	UNL logo	Too large	<ul style="list-style-type: none"> "It definitely sticks out at the top and it is not the most important part of the poster."
Design	Color scheme	Unattractive	<ul style="list-style-type: none"> "The colors are bad." "The colors to me say agriculture."

After reviewing the four displays, participants rank ordered the displays. Results are provided in Table 14.

Display Ranking

Table 14. Display Ranking Form (n = 24)									
	1= worst		2		3		4= best		
Poster	n	%	n	%	n	%	n	%	Mean
1- Bottle<2 Hrs	5	20.8	10	41.7	6	25	3	12.5	2.3 ± 0.95
2- Two Hours. One Life. No Exceptions.	2	8.3	3	12.5	10	41.7	9	37.5	3.1 ± 0.92
3- Protect Your Infant	3	12.5	8	33.3	3	12.5	10	41.7	2.8 ± 1.13
4- Cow Manure	14	58.3	3	12.5	5	20.8	2	8.33	1.8 ± 1.06

* Highlighted numbers indicate which number was most selected the most for each display.

The Knowledge Survey was administered before and after the focus group discussion. Results are provided in Table 15.

Table 15: Quantitative Knowledge Survey Frequencies (Pre and Post Focus Group)					
	Before		After		Variance
Formula fed infants are at an increased risk of food poisoning compared to breastfed infants.	n	%	n	%	P-value
TRUE *	13	56	20	87	0.022
FALSE	5	22	2	9	
I don't know	5	22	1	4	
Which of the following formula is not sterile and contains germs (bacteria) that could cause illness in infants?	n	%	n	%	P-value
Liquid concentrate formula	5	22	0	0	<0.0001
Powdered infant formula *	2	9	20	87	
Ready-to-feed formula	1	4	0	0	
Both A& B	3	13	1	4	
All of the above	9	39	2	9	
None of the above	3	13	0	0	
Powdered infant formula may contain Salmonella and E. coli.	n	%	n	%	P-value
TRUE *	5	22	13	56	0.015
FALSE	8	35	2	9	
I don't know	10	43	8	35	
Which of the following is true about prepared powdered infant formula?	n	%	n	%	P-value
It should be prepared for immediate use	1	4	1	4	0.033
It should not set out at room temperature for longer than 2 hours	4	17	9	39	
Leftover formula should be discarded after use	0	0	0	0	
All of the above *	18	78	13	57	
None of the above	0	0	0	0	
Which of the following is true about powdered infant formula?	n	%	n	%	P-value
Heating formula in the microwave alters the nutrient quality of the milk	4	17	0	0	0.371
It is not sterile and contains germs (bacteria) that could cause illness	1	4	14	61	
Freezing could damage formula	1	4	0	0	
Both B & C	7	30	2	9	
All of the above *	10	44	7	30	
None of the above	0	0	0	0	
All bottled water is sterile.	n	%	n	%	P-value

TRUE	4	17	3	13	0.209
FALSE *	18	78	15	65	
I don't know	1	4	5	22	
Which is true regarding cleaning bottles properly?	n	%	n	%	P-value
It is ok to only rinse bottles and bottle parts with water between uses	0	0	1	4	1
Bottles and bottle parts need to be washed with hot soapy water or in a dishwasher between uses *	22	96	22	96	
If bottles are sterilized between uses, they do not need to be washed	1	4	0	0	
Washing hands before preparing formula:	n	%	n	%	P-value
Increases your chance of foodborne illness (food poisoning)	0	0	0	0	1
Decreases your chance of foodborne illness (food poisoning) *	21	91	21	91	
Makes no difference regarding foodborne illness (food poisoning)	2	9	2	9	
Washing hands after changing a diaper:	n	%	n	%	P-value
Increases your chance of foodborne illness (food poisoning)	1	4	0	0	0.393
Decreases your chance of foodborne illness (food poisoning) *	19	83	21	91	
Makes no difference regarding foodborne illness (food poisoning)	3	13	2	9	
Infants have highest rate of many foodborne illnesses (compared to other age groups).	n	%	n	%	P-value
TRUE *	14	61	19	83	0.106
FALSE	1	4	1	4	
I don't know	8	35	3	13	
Foodborne illnesses are more serious for infants than most other age groups.	n	%	n	%	P-value
TRUE *	18	78	22	96	0.086
FALSE	2	9	0	0	
I don't know	3	13	1	4	
Prepared infant formula can be safely left out of the refrigerator for:	n	%	n	%	P-value
2 hours or less *	20	87	23	100	0.083
2-4 hours	2	9	0	0	
Up to 6 hours	1	4	0	0	

*indicates correct answer

Final Display DevelopmentA poster with a blue and yellow background. At the top, a large white circle contains the number '2', followed by the word 'HOURS' in large white capital letters. Below this, the text 'Your infant's health could depend on it ...' is written in a smaller font. To the left, a baby bottle is shown with a circular callout that reads 'Prepared formula should be discarded after 2 hours at room temperature.' To the right, a woman is smiling and looking up at a baby who is holding a bottle. At the bottom left, there is a logo for the College of Education and Human Sciences and the text 'Developed by Krista Godfrey, MS, RD'.

2 HOURS

*Your infant's health
could depend on it ...*

Powdered infant formula may contain bacteria that can cause food poisoning and even death if improperly prepared or handled. Children under one year of age have the highest risk of food poisoning and it is more harmful to them because their immune systems are still developing.

*Prepared
formula should
be discarded after
2 hours at room
temperature.*

N COLLEGE OF EDUCATION
AND HUMAN SCIENCES

Developed by Krista Godfrey, MS, RD

Chapter 4: Discussion

Expert Evaluation

The changes made as a result of the expert panel's suggestions narrowed the message to one clear and concise statement. This helped make the message easier to convey and more effective because it could be conveyed more quickly. The change in message also had a more practical application. People would be more likely to accept the information because the recommendation was easier to follow.

Recruitment

Parents of infants proved to be a difficult population to recruit even when childcare was provided. This could be due to this population having more demands on their time. After only two participants for the first focus group, childcare was provided at 3 of the 4 following focus groups (the focus group that was at a pregnancy center was geared toward expecting mothers and fathers so it did not provide childcare). The final focus group had the largest turnout, more than twice as many participants than any other focus group. It was the only focus group to use social websites as a recruitment tool. This recruitment method proved to be the most effective possibly because it is easier to access a larger volume of people through social media and because of the frequency this population uses social sites.

Focus Groups

The intention was to have 4 focus groups of 8-12 participants based on recommendations by University of Wisconsin Extension (2002) and Kruger (2002).^{44,47}

Because of the low participation rate, most of the focus groups did not have the desired number of individuals in each, and an additional focus group was necessary to get an adequate sample size. Additionally, one focus group was thrown out due to language barriers. Each of the three participants in that focus group spoke a different language and their understanding of English was minimal. The final focus group had individuals from higher income and education levels and balanced the proportion of individuals from different social classes.

A disclaimer was included in the focus group script to explain that the intention of the displays is to educate on how to properly prepare powdered infant formula. The displays are not intended to either encourage or discourage a particular feeding method (ie formula or breastfeeding).

The responses to the ice breaker question explains that family is the primary influence on infant food safety knowledge and practices. Therefore, infant food safety messages could also be helpful if directed at other family members.

Demographics

Sixty-seven percent of first time pregnant mothers in the study planned to exclusively breastfeed (Table 1). There were no first time mother's in the study that planned to exclusively feed formula (Table 1). Forty-two percent of the participants in the study with infants were exclusively breastfeeding (Table 1). Fifty-eight percent of the participants in the study with infants fed their child formula before the age of one year (Table 1). National average shows that 73.3% of babies receive formula by the age of one year.¹² The percentage of focus group participants could be lower because the children

are still under 1 year of age. Of the participants that fed their child formula before the age of 1 year, 21% breastfed for a duration of 3-6 months (79% breastfed for a shorter duration). National averages show that 40.2% of babies are exclusively breastfed at 3 months and 49.2% are breastfed at 6 months (18.8% exclusively breastfed).¹² Again these numbers could be lower than the national average because some of the infants were under 3-6 months of age. The remainder of participants only used formula. This explains that despite the majority of pregnant first time mothers planning to breastfeed, the majority of infants are fed formula before the age of 1 year. This might explain that first time parents are harder to reach with a message about formula. However, the research by Trepka (2006) suggests that women may be most receptive to food safety education during their first pregnancy.²¹

Display Evaluation

The display evaluation form provided detailed information on key aspects of the displays. Readability of the displays was good; participants reported that they understood the language that was used with the exception of the word 'discard' and the < symbol. Participants gave more feedback on these forms than during focus group discussion. Additionally, participants tended to give more verbal feedback on the aspects of the displays they didn't like, so the display evaluation form was an important tool to gather information about positive aspects of the displays. Responses varied among posters, but participants were more congruent with what they didn't like than what they did like. On the rating portion of the form, there was the least deviation between responses for "Two Hours. One Life. No Exceptions" (Table 5). Participants consistently rated this poster

well. It received the highest average score for overall acceptability (4.25 ± 0.79) of the four displays on the Display Evaluation Form (Table 5). “Cow Manure” had the largest deviation in responses (Table 11). The strong message of the “Cow Manure” polarized responses. Participants did not feel indifferent about this display, They either rated it well or rated it poorly. Some of the participants who rated it well noted that they found the message humorous. It received the lowest average score for overall acceptability (2.67 ± 1.45) of the four displays on the Display Evaluation Form (Table 11). This result contrasts from the recommendation by Wilson (2007) that strong fear messages are more effective to convince readers when the threat is severe and to follow the purposed response to reduce or eliminate the threat.³² If the message is insulting, participants voiced they would be less likely to read or accept the information.

Qualitative

Participants’ responses varied some among posters. Participants were more congruent with what they didn't like than what they did like. The majority of participants reported that they did not like offensive or negative messages, message or symbols that are unclear, layout that is too busy or disorganized, text that is difficult to read due to size, font, or color, and lack of color. Positive key features that were consistently discussed throughout all displays were the following:

- Title that captures attention
- Message that was concise, easy to read/understand and emphasizes importance
- Text (font) that was large, simple, and dark

- Graphics that appeal to parents and associate with babies/bottle feeding, evoke emotion, and were racially diverse
- Design that was simple and cohesive (too many design elements can be distracting), emphasizes main message, and uses soft/warm colors

Poster Ranking

The poster ranking results gave clarity to which poster(s) the participants favored. “Protect Your Infant” had the largest number of participants rank it the highest, yet “Two Hours. One Life. No Exceptions” had the highest mean score (3.1) which indicates that it is the poster preferred overall (Table 14). Although most participants (n=10) ranked it a 3, several others ranked it a 4 (n=9). Two Hours. One Life. No Exceptions was ranked highest among expecting parents. Overall, expecting parents ranked the displays similar to parents with infants as did men and women. The lowest ranked display was Cow Manure (1.8; Table 14).

Knowledge Survey

There was a significant difference in the answers before and after viewing the displays on many of the questions that related to the content of the displays (Table 15). The results showed a significant difference for the following topics: Formula fed infants are at an increased risk of food poisoning compared to breastfed infants; PIF is not sterile and contains germs (bacteria) that could cause illness in infants; PIF may contain *Salmonella*; prepared PIF must be disposed after 2 hours at room temperature. These results suggest that this information is not well known and there is a need for parents to

be educated on these topics. This finding is consistent with Labiner-Wolfe (2008) and Trepka (2006).^{11, 21} Interestingly, the question “Which of these is true about prepared infant formula” had a significant difference between before and after questionnaires. Seventy-eight percent of participants answered correctly “all of the above,” but only 58% answered correctly after the focus group. Because the posters focused on one of the key points, participants changed their answer to “it should not set out at room temperature for more than 2 hours” which increased from 17% to 39%.

There were questions on the knowledge survey that did not relate to the content on the displays, but represented other food safety concerns for infants less than 1 year. There was no significant difference between the answers on the knowledge survey pre and post focus group for those questions. The majority of participants answered those questions correctly initially, including the questions about hand washing. Ninety-one percent of participants responded that hand washing after changing a diaper and before preparing a bottle decreases the chance of foodborne illness in their infants. This is not consistent with the research of both Trepka (2006) and Labiner-Wolfe (2008) which found that participants did not consistently wash their hands after changing their children’s diapers due to lack of knowledge and almost half the mothers, did not always wash their hands with soap before preparing formula.^{11, 21} This explains that the other infant food safety measures are not an important focus area for infant food safety education.

The questions “When preparing infant formula, it is acceptable to use: commercially sterile water (at room temperature), tap water (at room temperature), bottled drinking water (at room temperature), filtered water (at room temperature), tap water that has been boiled and cooled, none of the above” was thrown out due to being a

trick question as well as not relating to the information on the displays after message changed. Boiled water and commercially sterile water are best, but all are acceptable and do not affect food safety significantly in areas where there is availability to safe drinking water.

Final Poster Development

Aspects of both “Two Hours. One Life. No Exceptions,” the poster with the highest mean score on the Display Ranking Form, and “Protect Your Infant,” the display with the second highest mean score but the highest percentage of ranking as best, were used in development of the final display. Themes from the focus group discussion were also considered in the final display development.

Limitations

Displays were presented in a consistent order. There could have been a benefit to a random order of displays. The order in which displays were presented could have impacted participants’ responses when they compared them to previous displays. The study was unable to measure differences in knowledge retention after exposure to each display concept to see if there is a difference in effectiveness between different display concepts because each concept had displayed the same information. Additionally, the small sample size could have been a limitation. Each of the four groups yielded similar responses, but it is uncertain whether a larger sample size would have provided different responses.

Future implications

The final poster would be beneficial for use in obstetrics and gynecology offices or birthing classes, because research explains most people view posters in waiting rooms and risk of foodborne illness is most effective if communicated by health care provider.^{25,40} However, it might be even more beneficial for use in WIC offices because other researchers have concluded that food safety education is most likely to be effective if the educational materials are targeted toward at-risk populations and behaviors.^{24,40} The research by Treka (2006) explained that WIC clients had several deficiencies in their food safety knowledge and practices.¹⁹ The WIC Program may be well positioned to help its clients, particularly pregnant women, improve food safety practices. Further research could evaluate the effectiveness of the final display in regards to comprehension of the main message, change in knowledge and impact on behavior change after a shorter duration of viewing the display.

Chapter 5: Conclusion

Infants under one year of age are at higher risk than most other age groups and have the highest incidence of many foodborne illnesses. The majority (73%) of infants receive infant formula before the age of one.¹² Powdered infant formula (PIF) is not sterile, and if not prepared or handled appropriately, may cause foodborne illness. Researchers suggest that parents of infants are not knowledgeable about the increased risk of foodborne illness with use of PIF. Quantitative results showed a significant increase in knowledge that PIF is not sterile and contains germs (*Salmonella*) that could cause illness.

Additionally, the majority of mothers do not receive information regarding safe handling of infant formula, and many do not use recommended procedures when preparing formula.^{5,11,19,21} Trepka (2006)²¹ noted that leaving bottles outside of the refrigerator was a problem, but Labiner-Wolfe (2008)¹¹ documented only six percent of mothers leaving prepared PIF at room temp less than two hours. This study showed a significant increase in knowledge among participants that prepared PIF must be disposed after two hours when held at room temperature. This explains that it is a food safety concern that parents need education.

Studies show displays to be an effective form of education. Qualitative data elucidated key features of display effectiveness to be: title that captures attention; concise and easy to understand message; simple, large, dark font; graphics that appeal to parents, evoke emotion, and are racially diverse; simple and cohesive design with soft/warm colors. These results are supported by many other sources.^{35, 37, 38, 39, 41, 45, 46}

The results of this research suggest that parents of infants are not well informed of safe food handling of PIF and effective displays can be used to convey messages to parents on these topics.

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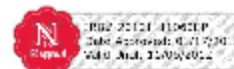
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APPENDIX A: Informed Consent with IRB Approval



College of Education and Human Sciences
Department of Nutrition and Health Sciences

Informed Consent

Title of Project: Evaluating Food Safety Posters for Mothers with Infants

Purpose of Research: Children under 1 year of age have the highest incidence of foodborne illness and are at greatest danger because their lower weight and immature immune system makes bacteria more harmful to them. Proper handling of infant formula is important in reducing the risk of foodborne illness in infants because it is not sterile.

Procedures: You were recruited for this focus group because you have a child/children under 1 year of age. You must be at least 19 years old to be eligible to participate. The focus group discussion will be taped and a person will be taking notes throughout the session. After you read and sign this consent form, you will be asked to fill out a demographic and knowledge survey. Next you will be participating in a focus group discussion about the effectiveness of educational displays about infant formula preparation and handling. You will be shown a series of posters and asked to complete an evaluation form after viewing each one. The focus group discussion leader will be asking open ended questions about each poster for you to respond to. Your input is important to us in the development of educational materials for families with infants. After the completion of the focus group discussion, you will be asked to rank the posters using the Display Ranking Sheet and complete another knowledge survey. It will take approximately 1 hour for the focus group discussion and completion of the surveys. The focus group tapes will be transcribed and compared with the notes taken during the session. Your names will not be linked to any information given during the focus group or on the surveys.

Risks: There are no known risks associated with this study.


Benefits: The benefit of participating in this study is that you will contribute to current knowledge about what makes educational messages about food safety effective. You will also gain new food safety information.

Confidentiality: The information shared within the focus group will be kept confidential to the extent possible by the researcher, but the investigator cannot control what other participants of the group might disclose after the session. Information will only be seen by the researchers conducting the focus groups and will be stored in a locked cabinet at the University of Nebraska-Lincoln. All the information, including the tapes of the focus groups, will be destroyed after 2 years. Your name will not be used in any reports or publication. The compiled information from all the participants may be presented at a scientific meeting and/or published.

Compensation: You will receive a \$20 Walmart gift card for participating in this study. In order to receive the gift card you will need to complete and return the attached sheet with your name and social

APPENDIX B: Initial Displays

**MAKE SURE IT'S
ABOVE THE LINE**



Heat water to 149°F when preparing infant formula

Powdered infant formula contains bacteria that can cause serious foodborne illness and even death if milk is not prepared or handled properly. Children under 1 year of age have the highest risk of many foodborne illnesses. A child's lower weight means that it takes a smaller amount of bacteria to cause an infant to become sick than it would an adult, and foodborne illness is more harmful to infants because their immune systems are still developing. Prepared formula should be discarded after 2 hours.

149°F

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149°F

Anything less is risking your infant's health



Heat water to 149°F when preparing infant formula to kill bacteria.

Powdered infant formula contains bacteria that can cause serious foodborne illness and even death if milk is not prepared or handled properly. Children under 1 year of age have the highest risk of many foodborne illnesses. A child's lower weight means that it takes a smaller amount of bacteria to cause an infant to become sick than it would an adult, and foodborne illness is more harmful to infants because their immune systems are still developing. Once prepared, formula should be discarded after 2 hours.

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PROTECT YOUR INFANT FROM SERIOUS ILLNESS
PROTECT YOUR INFANT FROM BACTERIA IN FORMULA.



HEAT WATER TO 149°F WHEN PREPARING INFANT FORMULA TO KILL BACTERIA

Powdered infant formula contains bacteria that can cause serious foodborne illness and even death if milk is not prepared or handled properly. Children under 1 year of age have the highest risk of many foodborne illnesses. A child's lower weight means that it takes a smaller amount of bacteria to cause an infant to become sick than it would an adult, and foodborne illness is more harmful to infants because their immune systems are still developing. Once prepared, formula should be discarded after 2 hours.



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ONE life.
minute.
temperature. **149°F**

HEAT WATER TO 149°F WHEN PREPARING INFANT FORMULA
It only takes one minute.

Powdered infant formula contains bacteria that can cause serious foodborne illness and even death if milk is not prepared or handled properly. Children under 1 year of age have the highest risk of many foodborne illnesses.

PREPARED FORMULA SHOULD BE DISCARDED AFTER 2 HOURS

A child's lower weight means that it takes a smaller amount of bacteria to cause an infant to become sick than it would an adult, and foodborne illness is more harmful to infants because their immune systems are still developing.



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ONE

life.
minute.
temperature.

149°F

Heat water to 149°F when preparing infant formula

Powdered infant formula contains bacteria that can cause serious foodborne illness and even death if milk is not prepared or handled properly. Children under 1 year of age have the highest risk of many foodborne illnesses.



Prepared formula should be discarded after 2 hours.

A child's lower weight means that it takes a smaller amount of bacteria to cause an infant to become sick than it would an adult, and foodborne illness is more harmful to infants because their immune systems are still developing.




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ONE

hour.
life.
No exceptions.

**DISCARD PREPARED
POWDERED FORMULA
AFTER 1 HOUR AT
ROOM TEMPERATURE**



Powdered infant formula contains bacteria that can cause food poisoning and even death if milk is not handled properly. Children under 1 year of age have a high risk of becoming ill from food poisoning because of their low weight and immature immune systems.

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**UNIVERSITY OF
Nebraska
Lincoln**

YOU WOULDN'T FEED YOUR INFANT THIS.

But powdered formula contains the same harmful bacteria.


Heat water to 149°F when preparing infant formula to kill bacteria. Powdered infant formula contains bacteria that can cause serious foodborne illness and even death if milk is not prepared or handled properly. Children under 1 year of age have the highest risk of many foodborne illnesses. A child's lower weight means that it takes a smaller amount of bacteria to cause an infant to become sick than it would an adult, and foodborne illness is more harmful to infants because their immune systems are still developing. **Once prepared, formula should be discarded after 2 hours.**

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APPENDIX C: Revised displays

Figure 1: “Bottle < 2 Hours”

THE RIGHT FORMULA



BOTTLE < 2 HOURS

DISCARD PREPARED POWDERED FORMULA AFTER 2 HOURS AT ROOM TEMPERATURE

Powdered infant formula contains bacteria that can cause food poisoning and even death if it is not handled properly. Children under 1 year of age have a high risk of becoming ill from food poisoning because of their low weight and immature immune systems.

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Lincoln

APPENDIX C: Revised displays

Figure 2: “Two Hours. One Life. No Exceptions.”



**2 Hours.
One life.
No exceptions.**

**DISCARD PREPARED
POWDERED FORMULA
AFTER 2 HOURS AT
ROOM TEMPERATURE**

Powdered infant formula contains bacteria that can cause food poisoning and even death if milk is not handled properly. Children under 1 year of age have a high risk of becoming ill from food poisoning because of their low weight and immature immune systems.

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APPENDIX C: Revised displays

Figure 3: “Protect Your Infant”

protect your infant
from serious illness

protect your infant
from bacteria in
powdered formula

Discard prepared
powdered formula after
2 hours
at room temperature

POWDERED INFANT FORMULA CONTAINS BACTERIA
THAT CAN CAUSE FOOD POISONING AND EVEN
DEATH IF IT IS NOT HANDLED PROPERLY. CHILDREN
UNDER ONE YEAR OF AGE HAVE A HIGH RISK OF
BECOMING ILL FROM FOOD POISONING
BECAUSE OF THEIR LOW WEIGHT AND
IMMATURE IMMUNE SYSTEMS.

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APPENDIX C: Revised displays

Figure 4: “Cow Manure”



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Lincoln

YOU WOULDN'T FEED YOUR INFANT THIS.

**But powdered formula
contains the same harmful
bacteria.**

Discard prepared powdered formula after 2 hours at room temperature. Powdered infant formula contains bacteria that can cause food poisoning and even death if it is not handled properly. Children under 1 year of age have a high risk of becoming ill from food poisoning because of their low weight and immature immune systems.

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APPENDIX D: Focus Group Script

Focus Group Script

Good afternoon/evening and welcome to our session today/tonight.

Thank you for taking the time to join our discussion. My name is Krista Klosterman and I am from the University of Nebraska-Lincoln. My assistant, _____, is also from the University of Nebraska-Lincoln. We would like to gain information about the effectiveness of educational displays regarding food safety for infants.

Because you are a primary care provider for a child under one year of age and are 19 years old or older, we are very interested in your views on our food safety display.

As we talk about the effectiveness of the displays there are no right or wrong answers but rather differing opinions. Please feel free to share your point of view even if it differs from what others have said.

This is a research project to gain information from you. The intention is not to educate about food safety. We will need to tape record the session because we do not want to miss any of your comments. Please speak one at a time because your input may not come across clearly on the tape if there are several talking at the same time. _____ will be taking written notes also. I will make sure that everyone gets a chance to say what they would like to say. We will be on a first name basis today/tonight; however, in our reports we will not attach any names to comments. Information shared within the focus group will be kept confidential to the extent possible by the researcher, but the investigator cannot control what other participants of the group might disclose after the session.

Our session will last about 1-1.5 hours and there will not be any breaks. If you need to get up to stretch or use the restroom (which is located _____), please feel free to do so quietly. We also ask that you turn your cell phones on silent as they can be a distraction.

In front of you there is a packet of papers that we will be going through one by one (consent form, demographic survey, pre and post knowledge questionnaires, evaluation sheets for each display, and final ranking sheet). Please do not look ahead in your packet. I would like you to start by reading and signing the consent form if you agree to participate in this discussion. When you are finished, please return the consent form to the folder.

Well, let's begin. We've given name cards to everyone, but let's go around the room/table and tell everyone your name as well as (Where do you get most of your information about feeding your baby?).

Now, I would like you to fill out the demographic survey and knowledge questionnaire. When you are finished, please return the forms to the folder. (Allow time for completion.)

Let's begin looking at the displays. (Present display #1)

This display is developed to educate those who provide care to children under one year of age. Please take a couple of minutes to view the display. When you are finished, please complete the first evaluation sheet in your packet to assess the display. Feel free to make any additional comments or observations in the blank space provided. When you are finished, please return the evaluation sheet to the folder.

Now that you have looked at the display, please share your thoughts. (Gather information about the display using the probing questions below- do not require participants to share their insights):

Questions (focused on comprehension, acceptability, persuasiveness, attractiveness)

1. What message stands out to you in this display?
2. What about this display stands out to you the most?
3. What did you learn from this display that you hadn't known?
4. What about this display do you find favorable?
5. What about this display appeals to you visually (do you find visually attractive)?
6. How can this display be made more convincing?
7. What about this display would you change?
8. Explain how acceptable you find this display overall.

Now we will move on to the next display and follow the same procedure. Please take out the next evaluation sheet. Do not change any answers from the previous evaluation(s) after viewing this next display.

(Present displays #2-#4. Repeat evaluation procedure and scripted discussion after each display)

That is the final display for evaluation. (Present all displays side-by-side) Please take out the display rating sheet and rank each of these displays from best to worst, best being assigned #1 and worst being assigned #4. Do not rank any display the same as another. When you are finished, please return the rating sheet to the folder.

What is the main message being conveyed in the displays? Is there a second message? (If they answer yes) What is this message?

Now I would like you to fill out the knowledge questionnaire once again to learn if you have gained any knowledge from the posters. When you are finished, please return the questionnaire to the folder and leave it on the table when you leave.

That completes our session. Thank you for your information about the displays. We have a \$20 Walmart gift card to thank you for your participation in this discussion.

This display is developed to educate those who provide care to children under one year of age. Please take a couple of minutes to view the display. When you are finished, please complete the first evaluation sheet in your packet to assess the display. Feel free to make any additional comments or observations in the blank space provided. When you are finished, please return the evaluation sheet to the folder.

Now that you have looked at the display, please share your thoughts. (Gather information about the display using the probing questions below- do not require participants to share their insights):

Questions (focused on comprehension, acceptability, persuasiveness, attractiveness)

1. What message stands out to you in this display?
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3. What did you learn from this display that you hadn't known?
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5. What about this display appeals to you visually (do you find visually attractive)?
6. How can this display be made more convincing?
7. What about this display would you change?
8. Explain how acceptable you find this display overall.

Now we will move on to the next display and follow the same procedure. Please take out the next evaluation sheet. Do not change any answers from the previous evaluation(s) after viewing this next display.

(Present displays #2-#4. Repeat evaluation procedure and scripted discussion after each display)

That is the final display for evaluation. (Present all displays side-by-side) Please take out the display rating sheet and rank each of these displays from best to worst, best being assigned #1 and worst being assigned #4. Do not rank any display the same as another.

When you are finished, please return the rating sheet to the folder.

What is the main message being conveyed in the displays? Is there a second message? (If they answer yes) What is this message?

Now I would like you to fill out the knowledge questionnaire once again to learn if you have gained any knowledge from the posters. When you are finished, please return the questionnaire to the folder and leave it on the table when you leave.

That completes our session. Thank you for your information about the displays. We have a \$20 Walmart gift card to thank you for your participation in this discussion.

APPENDIX E: Demographic Survey

Demographic Survey

Instructions: Please fill in the circle that best describes your answer. If you have any **comments** about a question (e.g. unclear, needs rewording etc.), please write your comments beside the question.

1. Race/Ethnicity (Choose **all** that apply):

- ☐ Caucasian or White
- ☐ Native American
- ☐ Asian
- ☐ African American or Black
- ☐ Hispanic or Spanish origin
- ☐ Native Hawaiian or other Pacific Islander
- ☐ Other, please specify _____

2. In what year were you born? _____

3. What is the last grade or year of school that you have **completed**?

- ☐ Less than high school
- ☐ Some high school
- ☐ High school (graduate or GED)
- ☐ Additional training beyond high school (not college)
- ☐ Some college
- ☐ College graduate
- ☐ Post-graduate

4. How many children aged 5 years or younger are currently living in your household?

Please list the year and month each child was born (e.g. May 2009)

First child _____ Third child _____ Fifth child _____

Second child _____ Fourth child _____

5. Are you or anyone in your household pregnant?

- ☐ Yes
- ☐ No

6. How do you feed (or plan to feed) your baby?

- ☐ Breastfeed **ONLY**
- ☐ Use baby formula **ONLY (Skip to question 8)**
- ☐ Breastfeed and use baby formula

7. Please indicate how often your child receives breast milk.

- ☐ My infant has never been fed breast milk.
- ☐ My infant was fed breast milk until he/she was _____ old (indicate weeks or months), but now is only fed formula
- ☐ My infant is routinely fed both breast milk and formula
- ☐ My infant is exclusively fed breast milk **(Skip to question 10)**

8. Please indicate how often your child receives formula.

- ☐ My infant has never been fed formula **(Skip to question 10)**
- ☐ My infant has been fed formula, but is not fed formula regularly
- ☐ My infant is routinely fed both formula and breast milk
- ☐ My infant is strictly fed formula

9. If your child is fed formula, please indicate which type of formula he/she receives.

- ☐ Powdered infant formula
- ☐ Liquid concentrated infant formula
- ☐ Ready-to-feed infant formula

10. Are you:

- ☐ Employed and work outside of the home full-time
- ☐ Employed and work outside the home part-time

- ☐ Employed and work from home full-time
- ☐ Employed and work from home part-time
- ☐ Not employed

11. Which of the following best describes your work experience caring for children under 1 year of age?

- ☐ I have never worked in a job in which I was responsible for the care of a child under 1.
- ☐ I previously worked a job in which I was responsible for the care of a child under 1.
- ☐ I currently work a job in which I am responsible for the care of a child under 1.

12. Where did you learn how to handle your infant's food/formula?

- ☐ Parents, grandparents, or other relatives
- ☐ Friends
- ☐ Books/magazines
- ☐ Internet
- ☐ WIC consultant/dietician
- ☐ Doctor or health professional
- ☐ Other _____

APPENDIX F: Knowledge Survey

Knowledge Survey

Instructions: Please fill in the circle next to the best answer. If you have any **comments** about a question (e.g. unclear, needs rewording, etc.), please write your comments beside the question.

1. Formula fed infants are at an increased risk of food poisoning compared to breastfed infants.
☐ True
☐ False
☐ I don't know
2. When preparing infant formula, it is acceptable to use: **(mark all that apply)**
☐ A. Commercially sterile water (at room temperature)
☐ B. Tap water (at room temperature)
☐ C. Bottled drinking water (at room temperature)
☐ D. Filtered water (at room temperature)
☐ E. Tap water that has been boiled and cooled
☐ F. None of the above
3. Which of the following formula is not sterile and contains germs (bacteria) that could cause illness in infants?
☐ A. Liquid concentrate formula
☐ B. Powdered infant formula
☐ C. Ready-to-feed formula
☐ D. Both A and B
☐ E. All of the above
☐ F. None of the above
4. Powdered infant formula may contain *Salmonella* and *E.coli*.

- ☐ True
 - ☐ False
 - ☐ I don't know
5. Which of the following is true about prepared powdered infant formula?
- ☐ A. It should be prepared for immediate use
 - ☐ B. It should not set out at room temperature for longer than 1 hour
 - ☐ C. Leftover formula should be discarded after use
 - ☐ D. All of the above
 - ☐ E. None of the above
6. Which of the following is true about powdered infant formula?
- ☐ A. Heating formula in the microwave alters the nutrient quality of the milk
 - ☐ B. It is not sterile and contains germs (bacteria) that could cause illness
 - ☐ C. Freezing could damage formula
 - ☐ D. Both B and C
 - ☐ E. All of the above
 - ☐ F. None of the above
7. All bottled water is sterile.
- ☐ True
 - ☐ False
 - ☐ I don't know
8. Which of the following is true regarding cleaning bottles properly?
- ☐ A. It is ok to only rinse bottles and bottle parts with water between uses
 - ☐ B. Bottles and bottle parts need to be washed with hot soapy water or in a dishwasher between uses
 - ☐ C. If bottles are sterilized between uses, they do not need to be washed

- ☐ D. Both B and C
9. Washing hands before preparing formula:
- ☐ A. Increases your chance of foodborne illness (food poisoning)
 - ☐ B. Decreases your chance of foodborne illness (food poisoning)
 - ☐ C. Makes no difference regarding foodborne illness (food poisoning)
10. Washing hands after changing a diaper:
- ☐ A. Increases your chance of foodborne illness (food poisoning)
 - ☐ B. Decreases your chance of foodborne illness (food poisoning)
 - ☐ C. Makes no difference regarding foodborne illness (food poisoning)
11. Infants have the highest rates of many foodborne illnesses (compared to other age groups).
- ☐ True
 - ☐ False
 - ☐ I don't know
12. Foodborne illnesses are more serious for infants than most other age groups.
- ☐ True
 - ☐ False
 - ☐ I don't know
13. Prepared infant formula can be safely left out of the refrigerator for:
- ☐ 2 hours or less
 - ☐ 2-4 hours
 - ☐ Up to 6 hours

APPENDIX G: Display Evaluation Form

Display Evaluation Form (Note: Do not evaluate the display based on previously viewed displays.
If any question is unclear please make comments in the margins)

1. Rate how easy this display is to understand?

Very Poor	Poor	Ok	Good	Very Good
1	2	3	4	5

2. List any words or concepts that you do not understand or feel are unclear.

3. Rate the overall aesthetic appeal (attractiveness) of the display.

Very Poor	Poor	Ok	Good	Very Good
1	2	3	4	5

4. Rate the color scheme of the display.

Very Poor	Poor	Ok	Good	Very Good
1	2	3	4	5

5. Rate the text style of the display.

Very Poor	Poor	Ok	Good	Very Good
1	2	3	4	5

6. Rate the pictures and figures of the display.

Very Poor	Poor	Ok	Good	Very Good
1	2	3	4	5

7. Rate the overall persuasiveness of the display.

Very Poor	Poor	Ok	Good	Very Good
1	2	3	4	5

8. Would viewing this display result in heating water used to prepare formula to 149°F?
Why or why not?

9. What do you like most about this display?

10. What changes would you make to this display?

11. Rate the overall acceptability of this display.

Very Poor	Poor	Ok	Good	Very Good
1	2	3	4	5

Comments: _____

APPENDIX H: Display Ranking Form

Display Ranking Sheet

Instructions: Rank the displays from worst to best (designating 1 to the worst and 4 to the best). Rank each poster a different number.

	Worst			Best
Display #1	1	2	3	4
Display #2	1	2	3	4
Display #3	1	2	3	4
Display #4	1	2	3	4

APPENDIX I: Recruitment Letter/Flyers



College of Education and Human Sciences
Department of Nutrition and Health Sciences

(Date)

Dear Parent/Guardian,

Do you have a child under 1? If you are 19 years old or older, we are interested in having you visit with us about feeding your infant!

We would like you to join me at a focus group to evaluate educational posters about formula preparation and use. We would like to gain information about food safety from parents/guardians who prepare milk for their children, specifically children under 1 year of age and younger. We will be conducting focus groups (discussion groups) on (date, time, place) to gather your thoughts and opinions regarding these posters. This study is completely voluntary and all information shared will be kept confidential. It will take approximately one and a half hours, and childcare will be provided by a qualified provider if you choose to bring your children. For your time, you will be given a \$20 Walmart giftcard.

If you would like to participate, please fill out the enclosed self-addressed stamped card and mail before (Date). Thanks!

Sincerely,

Krista Klosterman
Graduate Student, University of Nebraska – Lincoln

Julie A. Albrecht, Ph.D.
University of Nebraska – Lincoln
(402) 472-8884
E-mail address: j.albrecht1@unl.edu

**Participate
and
receive a
free \$20
Walmart
gift card**



Focus groups will be held
at the East Campus Union

We will be conducting a discussion group to gain information about food safety posters for expecting parents or those with infants.

To participate: please contact Jeannie Pittam, by Wednesday, February 1st (402) 472-3717

You must be at least 19 years old to be eligible to participate.

UNIVERSITY OF
Nebraska
Lincoln

**Thursday,
February 9th
5:30 pm**

**Saturday,
February 11th
10:00 am**

**Do you have a infant that
is 1 years old or younger?
Are you the main care taker in
your household?**

If you answered **yes** to both,
we would like to invite you to join us
in our food safety study!

We will be conducting a discussion group to gain
information about food safety posters for parents
with infants on:

Tuesday August 3rd, 7:00 PM

Location: Lincoln Crisis Pregnancy Center

For participating in our research study, you will receive
a \$20 Walmart giftcard. Childcare will be provided by a
qualified provider.

Snacks and refreshment will be provided.

To participate on one of the days listed, please contact:
Jeannie Pittam, University of NE-Lincoln (402) 472-3717

APPENDIX J: Final Display

A poster with a blue and yellow background. At the top, a large white number '2' is inside a blue circle, followed by the word 'HOURS' in large white letters. Below this, the text 'Your infant's health could depend on it ...' is written in a smaller font. To the left, a baby bottle is shown with a blue circle around its middle containing the text 'Prepared formula should be discarded after 2 hours at room temperature.' To the right, a woman is smiling and looking up at a baby who is holding a white cloth to its face. At the bottom left, there is a logo for the College of Education and Human Sciences and a line of small text. At the bottom center, it says 'Developed by Krista Godfrey, MS, RD'.

2 HOURS

*Your infant's health
could depend on it ...*

Powdered infant formula may contain bacteria that can cause food poisoning and even death if improperly prepared or handled. Children under one year of age have the highest risk of food poisoning and it is more harmful to them because their immune systems are still developing.

***Prepared
formula should
be discarded after
2 hours at room
temperature.***

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AND HUMAN SCIENCES
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Developed by Krista Godfrey, MS, RD