



Western WIC Participant-Centered Nutrition Education

Literature Review



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EXECUTIVE SUMMARY

In August 2006, the state of Arizona contracted with Altarum Institute to develop a participant-centered education (PCE) model for delivering nutrition education for the states in the U.S. Department of Agriculture Western Region. The project is designed to assess the readiness of staff members within the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) to implement and expand PCE, develop models for implementation, and assist with the implementation process. Specifically, this effort aims to facilitate change in nutrition behaviors of families participating in the WIC program in the Western Region States.

To facilitate the assessment and model-building process, Altarum's first step has been to gather information and examples of PCE from the literature to identify and assess different models in the context of nutrition education and behavior change. Literature also was examined to assess the limitations created by outside factors that are not changeable by nutrition education interventions. This literature review will allow the project staff and state officials to begin building definitions for PCE and develop the necessary assessment tools to examine readiness of states for implementing this new approach for delivering nutrition education. It is expected that the findings from this literature review can then be used both by the project team to develop the state assessment tools and by the states to set the context for which changes to existing approaches to nutrition education will need to be examined.

This report summarizes the results of Altarum's review of the existing literature and includes the following six sections:

1. An introduction which offers background information regarding PCE, as well as a discussion of the methodology and the purpose of the literature review.
2. A brief explanation of the theoretical constructs which frame the discussion of PCE and behavioral change.
3. A description of client factors that influence behavior change.
4. A summary of key findings and additional questions, which will be completed through a facilitated discussion with the Western WIC PCE Steering Committee at a 2-day planning meeting. This discussion will focus on translating the findings into the WIC service delivery context.
5. A bibliography of works cited in the literature review and works referenced during the development of the literature review.
6. A matrix of cited works that has been indexed by topic for easy reference to specific information. We also include any Web links to information that is available electronically.

I. INTRODUCTION

A. Background

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) seeks to encourage WIC participants to adopt healthy eating and nutrition-related behaviors (e.g., breastfeeding) for themselves and their children. Due to the broad reach of the program, WIC nutrition education offers the potential to promote healthy behaviors among a large number of low-income women and children. However, it is important to understand that WIC nutrition education is very limited, both in terms of time available to provide nutrition education and the scope of topics covered. These limitations must be considered when discussing opportunities to transform WIC nutrition education services to a more participant-centered approach.

WIC nutrition education is usually offered either at the time of certification, recertification, or when a WIC participant goes into the clinic to get the food instrument (WIC Check). Traditionally, WIC nutrition education is provided to the client in either a one-on-one consultation or in group classes. Information can be provided by a nutrition professional, such as a registered dietitian, or by a paraprofessional nutrition educator. These individual consultation and group classes traditionally have been didactic in nature, using the limited amount of time available to improve participant knowledge. However, more recently, WIC agencies in some States have been transitioning nutrition education to a more participant-centered approach, hoping to be more effective in changing behaviors.

Participant-centered education (PCE) is part of an overall effort by the U.S. Department of Agriculture (USDA) to improve nutrition education in the WIC program, through an initiative known as Revitalizing Quality Nutrition Education. As a part of this revision of nutrition education, the USDA and the National WIC Association have developed a process to change the nature of nutrition education assessments from primarily being an eligibility determination tool to a process that examines the health needs of the individual participant. This project, known as Value Enhanced Nutrition Assessment (VENA), requires a change in both approach and competencies of WIC staff members conducting nutrition education. PCE can be an important part of meeting new Federal requirements for VENA, which must be implemented by states by October 1, 2009.

As noted above, the didactic method has been the most commonly used delivery approach, whereby a nutrition educator presents information following a traditional teacher-student model. However, while didactic approaches are generally successful at conveying information and increasing participant *knowledge* about nutrition, they are not nearly as effective in motivating participants to incorporate this knowledge into changing *behaviors*.

On the other hand, learner or PCE techniques hold a greater promise for creating interventions designed to change behavior. Broadly defined, PCE places the participant or learner at the center of the nutrition education process and focuses the education on topics of interest to the participant. Rather than placing the instructor in the role of an authority figure and the learner as the recipient of information, PCE places the instructor in the role of a listener, motivator, or counselor who helps guide the participant through a behavioral change process that addresses their unique needs and circumstances. PCE may be applied in either an individual or a group setting, and it is especially effective in targeting and improving some of the most important determinants of behavior change, such as self-efficacy, skills building, and readiness to change.

Although PCE is a promising delivery method for nutrition education, researchers still are investigating which specific techniques are most useful and in which circumstances they should be applied. The literature indicates that researchers are still involved in an ongoing process to define and clarify the factors that influence nutrition behavior change and subsequently the interventions that are most effective.

B. Methodology

In order to narrow the focus of this literature review and create a basis for identifying appropriate research, Altarum relied on the information regarding the effectiveness of WIC nutrition education approaches among WIC participants prepared by Samuels and Associates for the California WIC Association (Samuels & Associates, 2001). While creating a baseline for discussion and review of PCE approaches, additional research was done to supplement the findings and conclusions of Samuels by reviewing the most recent and relevant published research on the following aspects of PCE:

- Different models of PCE and the context in which they have been used
- Strengths and weaknesses of various approaches in changing behaviors
- Environmental factors that need to be addressed within the service delivery system to implement PCE
- Any existing evaluations of PCE.

Literature was identified from a search of the relevant medical and social science databases. The search was designed to find the most recent and pertinent articles and books, limited to studies and reviews that occurred inside the United States and that were published between 1992 and 2006. As additional inclusion criteria, Altarum required that the literature report on the effectiveness of a specific nutrition education approach through original research, reviews, and analyses and that it describe at least one of the following: the theoretical underpinnings of behavior change, the use of

PCE in changing behavior, and the effect of nutrition education approaches for the WIC-eligible population.

A total of 80 articles were initially identified from the selected journals through the PubMed, Medline, PsycINFO, Psychology and Behavioral Sciences Collection, and Google Scholar databases using the search criteria “nutrition OR WIC” AND “participant-centered OR patient-centered OR learner-centered OR client-centered OR motivational interviewing” AND “nutrition education” AND “WIC.” Additional search terms used include “literacy” AND “nutrition OR WIC” OR “nutrition OR WIC” AND “peer counselor OR peer educator OR peer counseling OR peer education.” After conducting a preliminary analysis of these articles, 51 were determined to be appropriate for abstracting. To ensure that seminal articles in other journals were not omitted, a snowball technique was used to gather references for studies or reviews cited in the 51 articles that appeared to meet the literature review criteria. Our final literature review includes 84 relevant articles and studies.

In addition to reviewing published research findings and reports, Altarum worked with a team of consultants who are experts in nutrition behavior change, adult learning, cultural competence, and WIC. These experts helped to develop the conceptual framework for the report, reviewed and commented on various drafts, and identified additional articles and authors important to the review.

C. Limitations to the Review

Many of the studies included in this literature review possess limitations common to research in the social sciences, which often must implement and test interventions in “live” environments in which surrounding variables cannot be perfectly controlled. Common limitations included the following:

- Lack of control groups
- Lack of controlled environments
- Small sample sizes
- Short length of study periods

Such limitations often made it difficult for authors to show conclusively that changes in behavior or in other variables resulted from the study interventions or to form accurate conclusions about behavior change across the life span. However, despite the limitations of individual studies, the overall picture painted by this body of research is clear enough to allow for generalizations about the effectiveness of PCE in different contexts.

Other broader limitations include the complexity of behavior change and the multitude of societal and organizational factors influencing educator and client behavior. Although the report does include a brief discussion of these broader factors, the discussion is limited to specific aspects of behavior change at the client level.

II. PCE AND BEHAVIOR CHANGE

A. Defining PCE

As noted earlier, PCE is a framework for providing nutrition education that places the participant or learner at the center of the nutrition education process. Rather than serving as an authority figure, the instructor acts as a counselor or advisor, who listens and helps guide the participant based on his or her unique level of knowledge and needs. By its very nature, PCE is highly interactive and must be designed so that the information conveyed during a nutrition education session makes sense within the context of the learner's life and experiences. It may be applied in either an individual or a group setting, and it is particularly suitable for adult learners with varying levels of literacy, English comprehension, cultural expectations, and diverse frames of reference (Mead & Bower, 2000; Miller & Kinsel, 1998). Participant-centered nutrition education is especially effective in targeting and improving some of the most important determinants of behavior change, such as self-efficacy, skills, and readiness to change.

This literature review examines how the broad parameters of PCE potentially could be applied in the WIC context. PCE employs a wide range of techniques to change behavior, including a participant-centered method called motivational interviewing (MI) and role playing through either one-on-one counseling or group classes. This often involves operationalizing a definition to fit the WIC experience. For example, one such approach is the OARS MI technique, which is starting to be put into use by WIC agencies. This form of MI includes the techniques of (1) **O**pen-ended questions, (2) **A**ffirmations, (3) **R**eflective listening, and (4) **S**ummative statements. Other models include techniques and components similar to OARS. Key commonalities of different approaches are discussed later in this report.

B. Cultural Competence

Recognizing that culture plays a critical role in an individual's nutrition habits and food selection, it is important that a systemwide approach to addressing cultural competency issues is developed and incorporated into the PCE approach. In order to design and implement effective nutrition behavior change programs, WIC must develop a system that not only addresses the unique set of circumstances and the cultural context of the individual but recognizes that cultural competency must be built and integrated into nutrition education delivery systems as well as clinical, professional, and staff skills and competencies.

The National Center for Cultural Competence has developed a definition of cultural competence which mirrors the conceptual framework of PCE, in that it does not try to define the needs of an individual by their particular race or ethnicity but recognizes that each program should be tailored to the unique needs of the individual, child, family, organization, and community served.

The National Center states that cultural competence is the capacity of systems, agencies, or professionals to work effectively in cross-cultural situations through a congruent set of attitudes, behaviors, policies, structures, and practices. Cultural competence requires that organizations develop the following:

- A defined set of values and principles, behaviors, attitudes, policies, and structures that enable them to work effectively cross-culturally
- The capacity to (1) value diversity, (2) conduct self-assessment, (3) manage the dynamics of difference, (4) acquire and institutionalize cultural knowledge, and (5) adapt to diversity and the cultural contexts of the communities they serve
- The ability to incorporate the above in all aspects of policymaking, administration, practice, and service delivery and involve systematically consumers, key stakeholders, and communities.

Cultural competence is a developmental process that evolves over an extended period. Both individuals and organizations are at various levels of awareness, knowledge, and skills along the cultural competence continuum (adapted from Cross et al., 1989).

C. Theoretical Approaches to Behavior Change

The delivery of nutrition education is based on the assumption that individuals enrolled in WIC are in need of making behavioral changes to improve overall health and nutrition for themselves and their family members. An understanding of behavior change theory helps to clarify the many factors, both internal and external, which influence health-related behaviors. Behavior change theory attempts to describe the most effective methods of promoting change. A few of the more instrumental theories and models include:

- Knowledge-Attitude-Behavior Model
- Behavioral Learning Theory
- Health Belief Model
- Social Cognitive Theory
- Transtheoretical Model and Stages of Change
- Socioecologic Model

Although each of these theories can be useful in constructing a framework for PCE, it is not clear which theory or combination of theories is most likely to create behavioral changes such as preventing obesity and improving nutritional health (Baranowski et al., 2003). In general, researchers believe that a combination of the best features of these theories that address the psychosocial, environmental, and biological influences on behavior are important to include in any understanding and addressing of complex food-related decisions (Achterberg & Miller, 2004). While the literature can demonstrate that different strategies have been effective in different circumstances, the effectiveness of each theory depends on multiple factors, such as the type of behavioral change attempting to be induced, an individual's readiness to change, gender, age, and other external and internal factors.

Although the theories of behavior change noted above may differ in their fundamental approach, most of them posit three common conditions which must be satisfied for behavior change to occur:

- An individual must form an intention to perform the new behavior
- There should not be any environmental constraints that will prevent the behavioral change from occurring
- The individual must have the skills necessary to perform the behavior (Fishbein et al., 2001)

Additionally, many theories suggest that change is more likely under the following conditions:

- An individual believes that changing behavior is more advantageous than not changing behavior and that surrounding social/normative pressures are in favor of the behavior change
- Changing behavior is consistent with the individual's self-image
- The individual's emotional reaction to the behavior will be a more positive than negative experience, in the sense that the individual has the self-efficacy necessary to change behavior (Fishbein et al., 2001)

Most, if not all, of the above conditions can be addressed by PCE, and regardless of the desired behavior change, experts seem to agree that nutrition educators must move from the traditional didactic model of nutrition education to one in which nutrition educators engage in a dialogue with participants to identify needs, set goals, increase self-efficacy, and address the barriers to change.

D. Behavior Change in the WIC Nutrition Education Context

Behavior change is a complex process for a WIC client and involves a variety of factors – some of which the WIC program staff can influence or mediate and some that they cannot. Client mediating factors such as skills, intention, and clients' belief that they can change are factors that the WIC staff can influence in a PCE approach. However, the WIC staff also must consider the client contextual

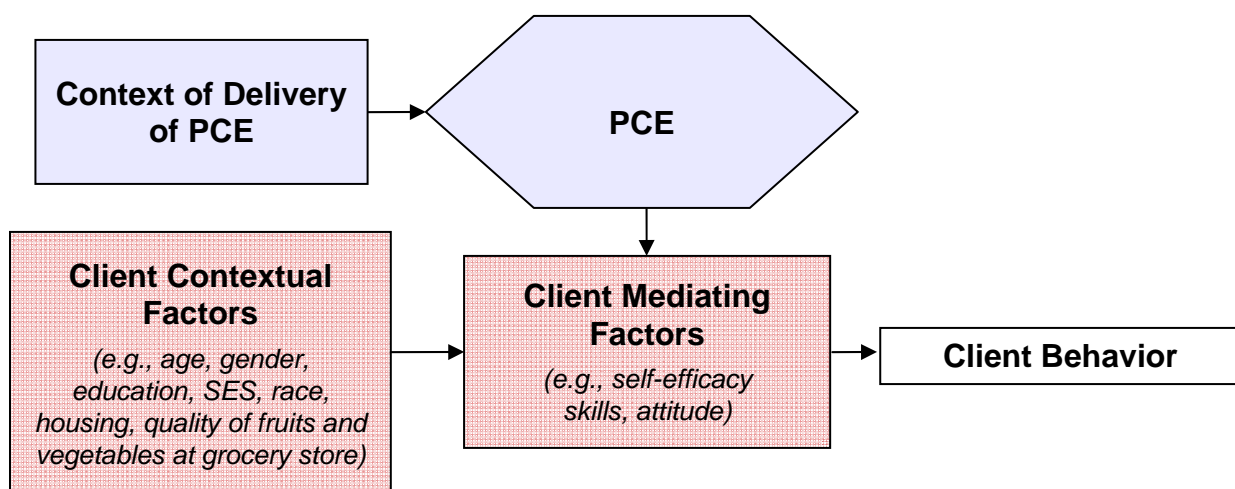
factors like age, socioeconomic status, culture, and literacy level when designating their education interventions and relating to the client. By identifying those factors that can be changed, as well as adapting WIC services with an understanding of the theoretical underpinnings of behavior change, it becomes possible to develop and implement PCE in a WIC setting.

In addition to addressing the factors that can be associated with the client, PCE must be adapted to the context in which WIC services are delivered. As noted earlier, WIC nutrition education services are often delivered either in a one-on-one situation or through group education. Either of these methods can be constructed in a manner that promotes PCE. However, because traditional didactic education has been the standard approach to providing nutrition education in the WIC program, the WIC staff must examine how best to incorporate systemwide changes in the structure of nutrition education delivery to best implement PCE.

WIC service delivery systems have both benefits and limitations on how well they can be used to implement PCE. For example, benefits of the WIC delivery system could include a high level of trust among clients towards WIC staff, the use of dedicated bilingual and bicultural staff members, and a positive environment that promotes healthy birth outcomes and child development. Limitations, on the other hand, could include short and infrequent education sessions, limitations on topic areas, lack of inclusion of family members and other persons of influence in nutrition education sessions, or lack of trained staff members to provide PCE.

Incorporating both facilitating and limiting factors into the design of PCE is critical to behavioral change. The flow chart below illustrates the process of behavior change (Figure 1).

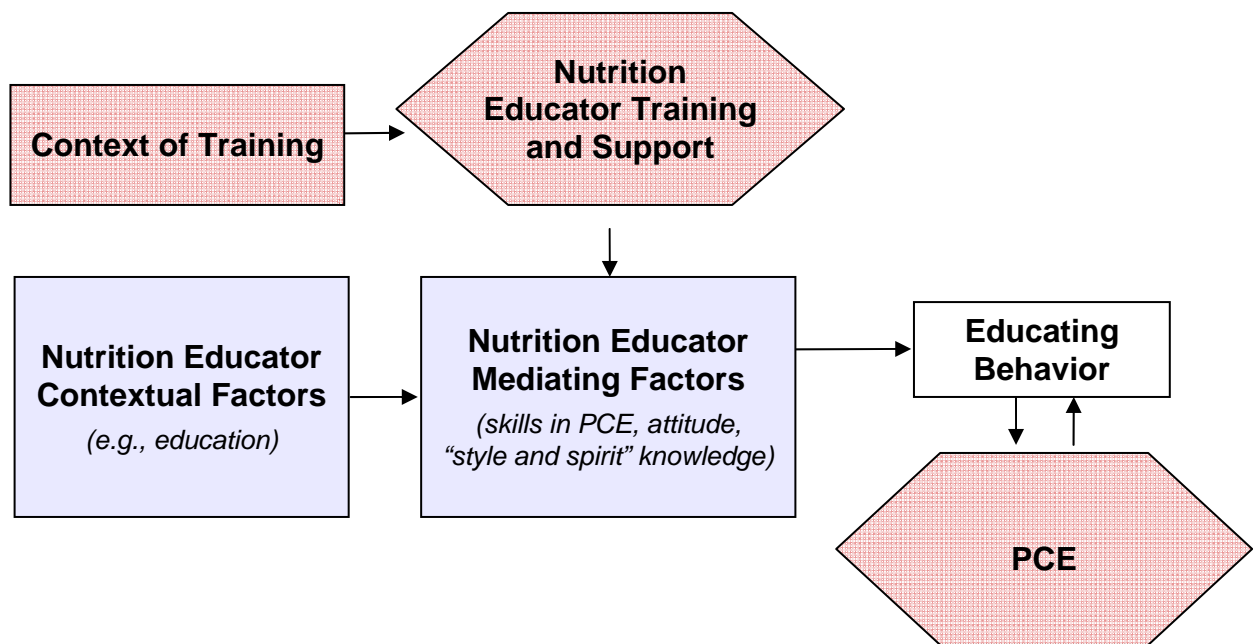
Figure 1. Behavior Change Process



Nutrition educators also play an important role in determining the effectiveness of PCE. The nutrition educator has her own set of influencing factors – both those that can be modified by WIC, like skill

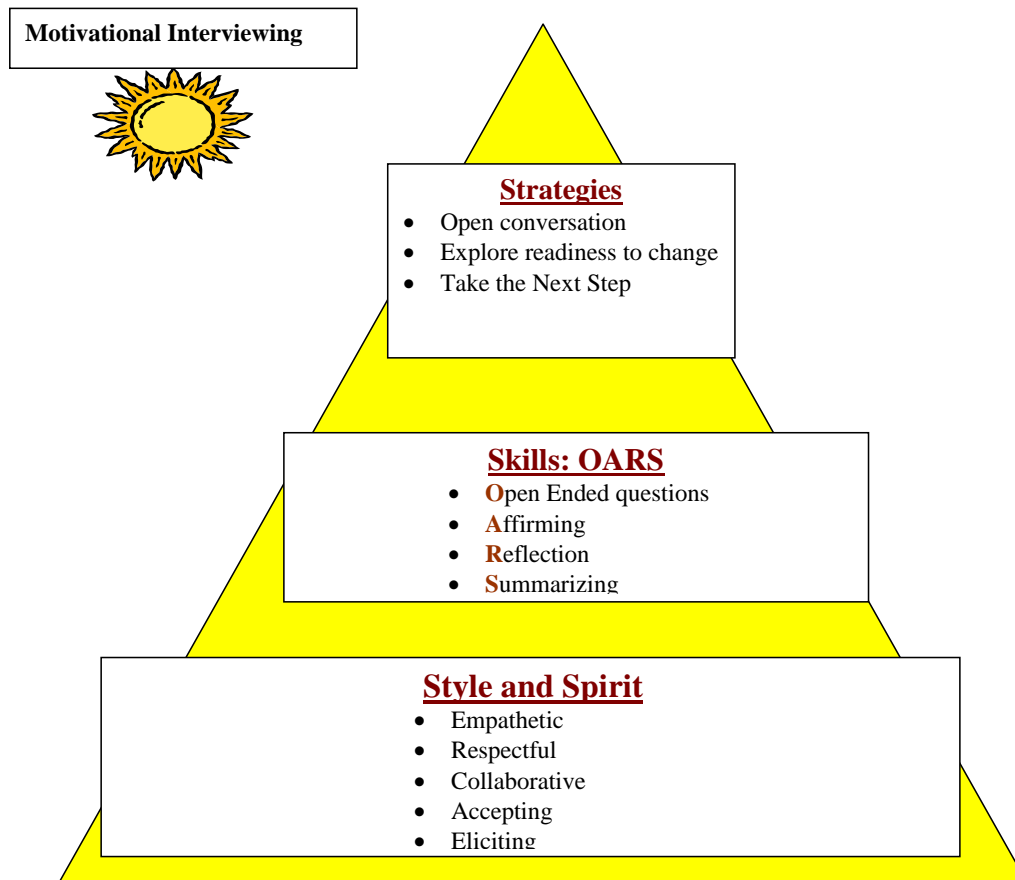
level, attitude, and self-efficacy; and those that cannot be modified, like educational background, prior experience with WIC clients and previous nutrition education experience. Therefore the clinic management and State policymakers must consider carefully how to increase these skills, improve attitudes, etc. so that the educator is best equipped to provide nutrition education (Figure 2). Just as in PCE delivery to the client, the context of the delivery is also a consideration. The length and duration of classes, followup provided, and whether the classes are mandated all contribute to the context in which the educator training is provided.

Figure 2. Delivery of Nutrition Education



The state of California has developed a useful diagram to think about the important characteristics and associated training needed for a WIC nutrition educator that will be implementing PCE (Figure 3). The state staff believes that at the highest level, there needs to be appropriate tools and resources, such as circle charts, rulers, and curricula. However, at a broader level, skills such as those used in implementing OARS are key to setting the proper context for PCE. Finally, even more important than appropriate tools and implementing OARS is the need for the nutrition educator to have the style and spirit, as well as the interest, to engage clients in these techniques.

Figure 3. California WIC Learning Model

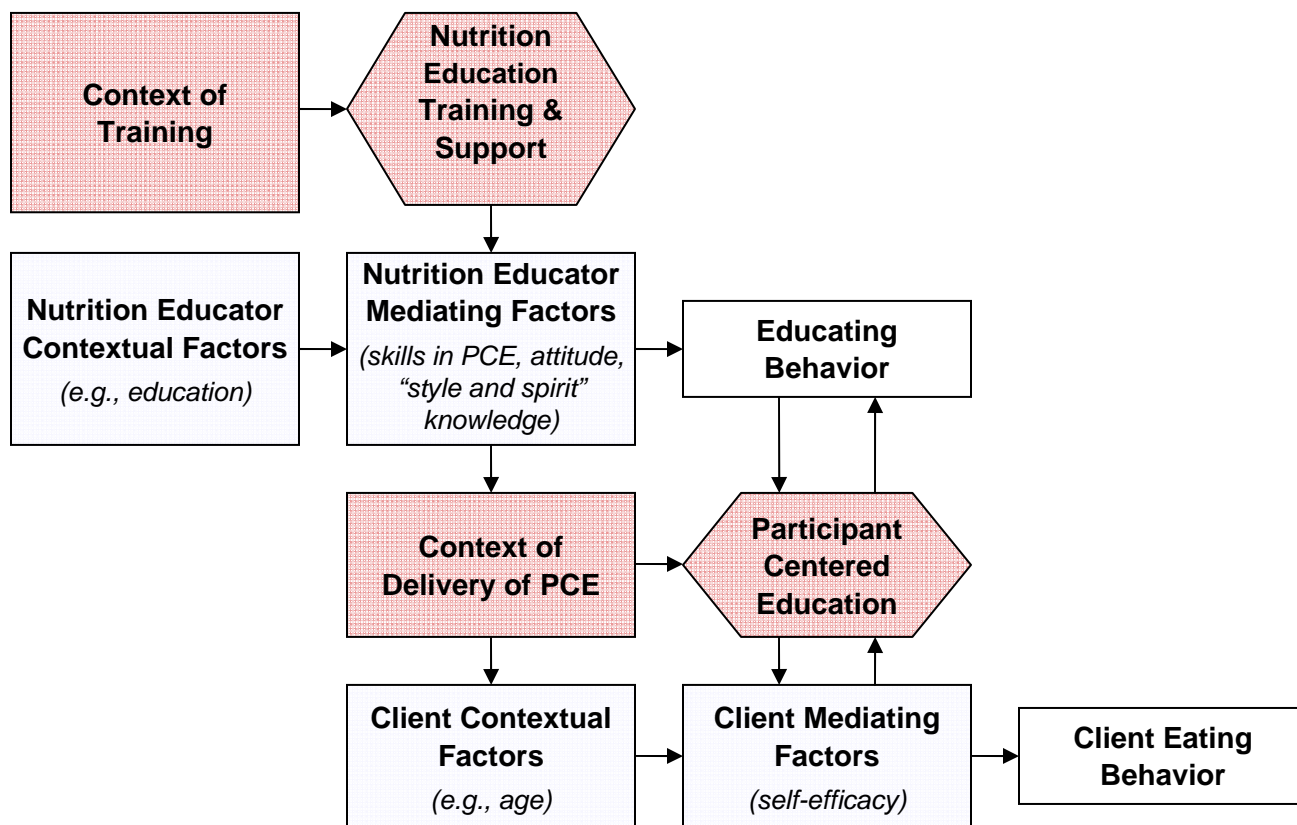


The Altarum Team observed this conceptual framework in practice during observations of California WIC clinics in October 2006. After observing numerous educators in the WIC context, we found that none of the pyramid levels are sufficient on their own. The Altarum staff observed one teacher who had the tools (a detailed class curriculum) and the enthusiasm but had not been trained in MI yet. She had a difficult time engaging the clients to describe their nutrition-related questions or issues; the class sessions were didactic. Similarly, Altarum observed an educator who had been trained and mentored in MI and used the circle chart tool but seemed disinterested in the client and established very little rapport. During her meetings with clients, the client said very little.

In addition to the contextual and mediating factors of the client and the nutrition educator, there are clinic factors such as time with the client, lack of staff members, skills of WIC program supervisors, and the enthusiasm and motivation of management to support PCE. Additionally, local staff members also noted that there are state-level factors, such as budget limitations to provide staffing and supplies for implementing PCE, training opportunities, and agency involvement in implementing competing priorities (such as new data systems).

All of these factors must be considered in the context of WIC nutrition education: Do clinical factors such as staff members, client flow, and resources support or restrict PCE? Where are the client, nutrition educator, clinic staff members, and state officials in regard to supporting changes in nutrition education delivery? What could be done to help move each of these stakeholders to being more receptive to supporting change in delivery systems? (Figure 4)

Figure 4. Interaction of Factors Affecting Delivery of Nutrition Education



While all of these elements are important, there is little in the literature to support discussion of how these factors interact within the WIC environment. Therefore, this literature review focuses primarily on the client factors. However, to the extent possible, it also identifies the provider and clinic factors which should be assessed in the development and implementation of PCE.

The next section examines the factors that should be considered in developing the overall plan for assessment and model building. Combining these factors into the context of readiness of State and local agencies to implement PCE will be the key to developing appropriate assessment tools and models. The beginning of this process will occur during a 2-day planning meeting with the Western WIC PCE Steering Committee in November 2007.

III. FACTORS INFLUENCING BEHAVIOR CHANGE

A. Trainers and Training

While there is a growing body of literature that helps us to understand behavior change in nutrition, the specific programmatic inputs necessary to achieve this change are still being determined. This section describes the literature to date on the type of delivery staff members; their training; and the session length, duration, and location. Much, however, still needs to be learned in this area. As noted before, the nutrition educator has contextual and mediating factors that impact how effectively they receive PCE training and how effectively they in turn can deliver PCE.

Selecting Staff Members for PCE Delivery

Selecting appropriate staff members is a major key to the success of PCE implementation. Successful models of PCE have demonstrated that peer educators, paraprofessionals, public health nurses, nutritionists, and to a lesser extent physicians are all effective candidates for implementing PCE. Paraprofessionals are educators who often live in the community in which they teach, and thus have an understanding of cultural and community variables. Peer educators, *abuelas* (older Hispanic female educators), and *promotoras* (lay health educators) are examples of paraprofessionals who can participate as trainers in PCE. As a result of their linkages to the community and culture, paraprofessionals may be a good choice to deliver PCE, because clients prefer that their nutrition information come from friends and families over physicians, nurses, and nutritionists (Macario et al., 1998). Professionals such as public health nurses and nutritionists also may be appropriate to deliver PCE because of their expertise and the respect that they are afforded as knowledgeable individuals (Macario et al., 1989). When constructing the assessment tool, it will be important to identify how local WIC agencies recruit and select PCE educators.

Training Staff in PCE

An additional important factor to the success of PCE is staff training. There are very few studies that assess the skills, attitudes, beliefs, knowledge, and subsequent training needs of professionals and paraprofessionals and none that assess these for the individual. Focus groups suggest that the two groups have different needs and wants from their training (Palmeri et al., 1998). Most health professionals, including nutrition educators, spend little time reviewing areas of behavior modification and counseling skills, which are important in PCE (Rosal et al., 2001). However, Palmeri et al. (2001) did evaluate a day-long educator training session and found that the training was effective in changing the following educator behaviors:

- More providers elicited client perspective
- Increase in the level of engagement in negotiating with the client
- Providers asked more questions
- The ratio of talking time between educator and client improved

Interestingly, some of the providers showed no behavior change. This may imply that various mediating and contextual factors affecting the providers receiving training can impact the training's effectiveness.

The literature describes two particularly effective training approaches. These methods include training PCE educators directly with a specialist and training through a "train-the-trainer" model. However, of the two, the approach that seems to hold the highest risk for not being effective is the specialist approach, particularly with large audiences. The literature is not clear on how much PCE educators benefit from a single large-group training session with a specialist, indicating that there are some concerns that benefits may be outweighed by such factors as size and lack of interaction with the professional. Moreover, the prohibitive cost of hiring a specialist trainer favors the use of a train-the-trainer approach (Gordon et al., 2004).

Although there is little guidance for training professionals and paraprofessionals in PCE-based nutrition education, a review of 20 innovative WIC programs suggested a number of successful methods for preparing educators to work with clients. For example, by limiting class size and training time, including two or more trainers, and implementing new and innovative strategies, WIC programs can improve the effectiveness of training for their PCE deliverers. Additionally, by providing incentives to the trainers and by seeking buy-in from both the local agency and participant, WIC programs can increase the likelihood that educators will pursue training (Gordon et al, 2004). Mock counseling sessions and role plays with hired simulated clients have also helped trainees learn and practice new skills (Newes-Adeyi et al., 2004).

Many of the programs evaluated emphasized the importance that the state agency follow up with the local agency to ensure that the new approach, curricula, and materials are being used appropriately. The state agency also can use this opportunity to provide technical assistance to help the local agencies. States identified two main methods for ensuring followup: dialogue and data systems. In some cases, Nutrition Education Committees established at the local level provide information to the state agency regarding implementation (Gordon et al., 2004).

The need for retraining or followup PCE training may be different for paraprofessionals and professionals (GAO 2004) and also may be dependent on how recently the educator has used those techniques (Taylor et al., 2000).

Frequency, Length, and Followup of Nutrition Education

Studies have shown that frequency, length, and followup of nutrition education can impact how effective interventions are in changing behavior (Rubak et al, 2003; Rosal et al., 2001; Macario et al., 1998). According to the General Accounting Office (GAO) Nutrition Education Report, the average WIC participant received less than 20 minutes of nutrition education twice every 6 months. A systematic review and meta-analysis of randomized controlled trials using MI as an intervention “has shown that motivational interviewing can be effective even in brief encounters of only 15 minutes and that more than one encounter with a patient increases the likelihood of effect” (Rubak et al., 2003). It also is important that nutrition messages are consistent over time and address patient-specific values and barriers (Van Weel, 2003). Nutrition educators can help ensure that participants receive a sustained and consistent message by delivering services through multiple channels (GAO Nutrition Education, 2004; Van Weel, 2003). Another strategy to address infrequent contact between peer educators and WIC clients is to send participants four different personalized letters throughout the 6-month intervention period (Feldman et al., 2000).

Consideration of Other Environmental Factors

Altarum did not find any literature that evaluated environmental impact specific to PCE. However, the following suggestions come from innovative and successful state WIC programs and could be replicated for positive results (Gordon et al., 2004):

- **Make the environment comfortable.** Providing a comfortable environment may increase the number of postpartum visits by mothers
- **Shorten the wait.** Decreasing wait time also may increase the number of postpartum visits by mothers
- **Make it fun.** Group discussions that include food demonstrations seem to be the most popular format for receiving nutrition education (Macario, 1998)
- **Make it convenient.** Group education should take place just before bimonthly distributions (if applicable)

Some of the factors that might inhibit PCE implementation include no-shows for group education sessions, a lack of interest in the topic or nutrition education in general, transportation and work schedules that inhibit attendance, and loud and chaotic WIC clinic interview areas. To overcome some of these factors, clinics may need to develop strategies to be more available to working parents, extend hours, redesign the workplace, and conduct telephone visits.

B. Nutrition Education Delivery Settings and Mechanisms

The actual setting of nutrition education provision is an important factor to consider. Nutrition education can be provided in a classroom, home, or office and either individually or in a group. On the whole, there are several methods for the delivery of nutrition education that can be effective, which may include a combination of locations, such as classrooms and WIC certification offices. In addition, the approach used by the WIC clinic to deliver nutrition education can vary. This section examines some of the methods used by WIC agencies and how they might occur in the context of PCE. See Table 1 for a summary of the delivery mechanisms used by various interventions.

Mediated Communication

Also known as indirect education, mediated communication is the delivery of nutrition education through sources other than a nutrition educator. Mediated communication involves the distribution of information and resources that are primarily designed to increase participant awareness of nutrition. Mediated communication includes any mass communications, public events, or materials distribution that are not part of social marketing or direct education efforts. It also can include computer-based education or any other autonomous intervention that does not require the direct supervision of the education delivery staff.

Mediated communication is a very popular method of nutrition education delivery (e.g., Campbell et al., 1999c; Gordon, Hartline-Grafton, & Nogales, 2004; Resnicow et al., 2005; Long, Martin, & Janson-Sand, 2002; Whitaker et al., 2004), primarily because, by itself, it does not require significant amounts of staff time to implement (and even design time can be reduced if previous mediated communication materials are reused). However, interventions which rely on mediated communication alone often increase client knowledge, but fail to lead to behavior change (see Contento et al., 1995, for a review). As such, more recent interventions usually prefer to use mediated communication as a supplemental method of delivery in addition to another delivery type. While Campbell et al. (1999c) showed that a purely indirect approach (using printed pamphlets) can increase fruit and vegetable consumption significantly when compared to a control group receiving no intervention, Resnicow et al. (2005) showed that mediated communication materials (such as pamphlets and videos), when combined with cultural sensitivity and an MI approach (see below), increased physical activity and fruit and vegetable consumption significantly more than mediated communication materials alone.

Participant-centered mediated communication: Most mediated communication cannot be participant centered, as mediated communication usually provides static and invariant information that cannot be responsive to and adapted for the needs of individual participants. However, some recent interventions have begun using computer-based indirect nutrition education, which offers significant advantages over printed materials. With computer-based interventions, mediated communication methods can ask questions of participants and provide information in an interactive

fashion – in other words, they become participant centered (e.g., Serrano & Anderson, 2004; Prochaska et al., 2000). Recently, Bensley et al. (2004) have described a conceptual model for a web-based participant centered education tool, which they label the “eHealth Behavior Management Model.” In their model, an eHealth Behavior Management system is a complex computer algorithm designed to diagnose a client’s Stage of Change (see Section C.4, below) and, if possible, help the client progress towards a more advanced stage of change. EHealth systems have been developed and piloted for Midwestern WIC programs and for an Asthma Management Project, with successful results.

Group Education

Providing nutrition education in groups is popular among many educators, because it allows staff members with limited time to reach the largest number of participants. Traditionally, group education has been provided via lecture-style classes which follow the traditional teacher-student model where information is simply disseminated to the participants. The instructor determines what the participant should learn and how and when the material is taught. This model is based on the assumption that the instructor is an expert and that participants have little to offer the learning environment.

Lecture-style classes are popular in the literature (Long, Martin, & Janson-Sand, 2002; Hartman et al., 1997; Peterson et al., 2002; Ashley et al., 2001; Taylor et al., 2000; Cox et al., 1998), though they have encountered mixed results in modifying behavior. One article (Hartman et al., 1997) reported no significant intervention effects on behavior among adult Expanded Food and Nutrition Education Program participants in four attitude scales, six eating behavior scales, and four dietary quality scales, while another study (Long, Martin, & Janson-Sand, 2002) reported significant effects on some measures of dietary quality among pregnant adolescents but no significant effects on maternal weight gain. It is worth noting that no intervention reviewed used group lectures exclusively; all used mediated communication materials as well (except for Ashley et al., 2001, which provided meal replacement bars).

Participant-centered group education: A new form of group education has emerged in recent years. Known as facilitated group discussion, this form of nutrition education is an interactive method of group teaching that involves the active participation of the leader and members of the group. It is a way to get learners involved in and focused on the learning. In a facilitated group discussion, the experiences of each member of the group are shared and compared; thus, the primary flow of information is not from the educator to the group members, but from the group members to other group members, with the role of the educator being to keep the discussion on target and focused. The general outcome of facilitated dialogue is to create a safe environment for learners to consider changing behaviors (Abusabha, Peacock, & Achterberg, 1999). Within the broad technique of facilitated group discussion, other delivery techniques such as role playing

(Banister & Begoray, 2004), barrier identification (Whitaker et al., 2004), and food demonstrations (Feldman, Damron, & Anliker, 2000) can be employed additionally.

In a 2000 study, Feldman, Damron, & Anliker demonstrated the effectiveness of facilitated group discussions. They showed that compared to a control group, an intervention involving facilitated group classes significantly increased participants' readiness to change with regard to fruit and vegetable consumption (though it should be noted that the use of facilitated group classes was only one of three techniques in the authors' intervention). Despite these encouraging signs, few studies of interventions using facilitated group discussions have been conducted in the context of nutrition education. While the potential for providing education that is both time effective and responsive to the interests and needs of participants is attractive, more research is likely needed to refine the technique.

One-on-one Education

In many ways, one-on-one education sessions are the ideal format for nutrition education, as they allow educators to target the education to individuals more precisely and effectively. Additionally, in some situations, one-on-one education can be conducted over the telephone (Resnicow et al, 2005 & 2003) rather than requiring participants to travel to a centralized location such as a WIC clinic.

While a few interventions use a noninteractive, didactic format for one-on-one education sessions method (Hartman et al., 1997; Greene & Rossi, 1998), many nutrition education interventions take advantage of the opportunity to interact closely with participants in order to provide PCE.

Participant-centered one-on-one education: The majority of one-on-one nutrition education interventions use MI. First described by Miller & Rollnick (1991), MI focuses on the client's needs, desires, and intrinsic motivation for behavior change. The counselor guides the participant in making decisions about the steps that he or she needs to take to initiate and/or continue behavior change (Hecht et al., 2005; Resnicow et al., 2002c; Rubak et al., 2005; Emmons & Rollnick, 2001). MI helps the client identify any barriers to behavior change and how to overcome those barriers.

Studies of nutrition education interventions have shown MI to be effective in changing a variety of dietary behaviors, including energy intake from fat (Bowen et al., 2002; Berg-Smith et al., 1999), fruit and vegetable intake (Resnicow et al., 2005 & 2003), and cholesterol consumption (Berg-Smith et al., 1999). In a meta-review, Rubak et al. (2005) found that 74 percent of the 72 randomized and controlled MI intervention studies they reviewed showed significant intervention effects (including 8 of 10 studies involving weight loss or physical activity), and none showed any adverse effects. In a review of interventions delivered to pregnant women, Contento et al. (1995) found that individual nutrition education sessions are most effective when they focus on the client's specific needs in a participant-centered fashion.

As with all one-on-one interventions, the major obstacle to implementing MI is the large time commitment required of educators. According to Rubak et al. (2005), MI produces intervention effects more frequently when sessions last an hour or more (30 of 38 reviewed studies, 79 percent) than when they last less than an hour (19 of 28 studies, 68 percent) and more frequently when interventions involve multiple sessions (41 out of 46 studies, 89 percent) than when they only involve one session (10 out of 25 studies, 40 percent). These trends indicate that delivering the most effective one-on-one MI intervention to a large number of people requires a substantial time commitment.

C. Mediating Variables

While the ultimate goal of any nutrition education program is behavior change (which presumably will lead to improved health outcomes), the difficulty of changing a participant's lifelong behaviors means that focusing exclusively on behavior change can be self-defeating. Many interventions choose instead to focus on achieving more proximate goals in their clients in order to manipulate the factors within participants which mediate between the intervention and behavior change.

Modification of these mediating variables, in turn, will increase the probability of behavior change. In this section, we will explore the intermediate steps towards behavior change targeted by nutrition interventions. These intermediate steps include increases in knowledge, self-efficacy, and skill building. There is also a specific section on the studies that have reviewed the stages of change and corresponding strategies. See Table 1 for a summary of the mediating factors addressed by various interventions.

Knowledge

Nutrition education interventions most commonly attempt to change behavior by increasing participants' nutrition knowledge. Nutrition interventions have provided information about the importance of eating fruits and vegetables (Campbell et al., 1999c; Feldman et al., 2000; Taylor et al., 2000), healthy recipes (Gould & Anderson, 2002; Resnicow 2001), food resource management (Gould & Anderson, 2002), the Food Pyramid (Serrano & Anderson, 2004; Taylor et al., 2000), and low-fat foods (Gordon, Hartline-Grafton, & Nogales, 2004). Interventions often use mediated communication methods such as printed materials and videos to increase knowledge, as these methods may be used even in situations where nutritionists and counselors have limited time available.

Providing such information-based interventions often increases participants' knowledge effectively. However, many feel that because humans are almost never "rational actors" who act in their own best interest based on their current knowledge, increasing knowledge alone is not enough to effect behavior change (Baranowski et al., 2003). Indeed, in a review of nutrition interventions delivered to pregnant and postpartum women, Contento et al. (1995) found that knowledge increases alone universally failed to lead to behavior change. Rather, knowledge increases seem to mediate self-

efficacy (see below) but are not directly related to changes in behavior (Schnoll & Zimmerman, 2001), and they often have only weak correlations to behavior change (Feldman et al., 2000). Thus, while interventions which increase participant knowledge have been shown to improve food preparation and resource management (Taylor et al., 2000) as well as fruit and vegetable intake (Campbell et al., 1999c), no reviewed interventions reported changes in participant behavior resulting from knowledge increases alone. Successful behavioral change interventions incorporate knowledge delivery as only one part of nutrition education.

Attitudes

Regardless of the knowledge base of nutrition education intervention participants, the probability that the intervention will result in behavior changes is greatly reduced if the participants do not believe the following:

1. The benefit of performing the behavior is greater than the cost.
2. The behavior is consistent with their self-images.
3. No social/normative pressures oppose the adoption of the behavior (Fishbein et al., 1992).

Taken together, these three participant beliefs can be described generally as the participant's *attitude* towards behavior change.

A number of interventions have attempted to improve participant attitudes towards behavior change (Hartman et al., 1997; Havas et al., 1998; Kloben et al., 1999; Gordon, Hartline-Grafton, & Nogales, 2004; Feldman et al., 2000; Serrano & Anderson, 2004; Anderson, 1998). The majority of these interventions target the participant's cost-benefit beliefs about a behavior, as other facets of participant attitude (e.g., self-image consistency, social/normative pressures) can be more difficult to change in limited nutrition education sessions. Interventions targeting cost-benefit attitude change have proven effective both in increasing fruit and vegetable intake (Havas et al., 1998; Feldman et al., 2000) and in reducing fat intake (Hartman et al., 1997).

Interestingly, Fishbein et al. (1992) note that because attitudes are often so tightly linked to behavior, it is entirely possible for attitude change to result from behavioral performance rather than the other way around. In this light, it can be argued that any successful behavioral intervention can result in at least some attitude change, whether the intervention targets participant attitudes or not.

Self-efficacy

Self-efficacy is a person's belief or confidence that a specific behavior can be performed. Self efficacy is not a general personality characteristic; one person's self efficacy may vary significantly from one situation to the next (Abusabha & Achterberg, 1997). Raising self-efficacy among nutrition education target populations is desirable because "people with greater levels of self-efficacy, or confidence, will more likely engage in a certain behavior, persist until they get it right, and maintain

the behavior” (Baranowski et al., 2003). As such, self-efficacy has proven to be a powerful predictor of health behavior in a number of domains (for a review, see Abusabha & Achterberg, 1997).

While self-efficacy is relatively easy to measure by using survey items such as “I am able to plan meals and snacks using the Food Guide Pyramid” (Serrano and Anderson, 2004), it is more difficult to modify a participant’s self-efficacy directly than it is to increase knowledge or skills. Often, education methods targeting self-efficacy must be incorporated into knowledge or skill training. One of the best methods that various interventions have used to increase self-efficacy is to break down the performance of a desired skill or behavior into smaller steps, which then seem more manageable to participants (Campbell et al., 1999a; Chamberlin et al., 2002). Allowing for small rewards after completion of each smaller step can help build self-efficacy (Molaison, 2002), as can encouraging goal-setting behaviors in participants (Schnoll & Zimmerman, 2001).

Building self-efficacy is a process that is particularly poorly suited for didactic or indirect styles of nutrition education. Participant feedback is essential for nutritionists and paraprofessionals to provide targeted self-efficacy-building encouragement. Participant-centered counseling techniques can help focus this encouragement by allowing educators to learn the areas in which clients are already confident and the areas in which they lack confidence (e.g., Resnicow, 2001; Molaison, 2002; Resnicow 2003; Sigman-Grant, 2004).

Increasing participant self-efficacy has been associated with lower fat intake (Campbell et al., 1999a), increased fruit and vegetable intake (Resnicow et al., 2001; Resnicow 2003; Havas et al., 1998), and increased dietary fiber (Schnoll & Zimmerman, 2001).

Intention to Change and the Transtheoretical Stages of Change

While self-efficacy determines a client’s self-perceived ability to change behaviors, the intention to change dietary behaviors is often measured by a client’s position within the Transtheoretical Model of Stages of Change (Molaison, 2002; Greene, Velicer, & Prochaska, 1999; Kristal et al., 1999). According to the model, an intervention participant may be ignoring the idea of behavior change (precontemplation stage), considering behavior change (contemplation stage), preparing to change behaviors (planning stage), engaging in efforts to change behaviors (action stage), or maintaining changed behaviors (maintenance stage). Individuals in the early stages of change are significantly less likely to change their dietary behavior than individuals in later stages (Resnicow, McCarty, & Baranowski, 2003).

Interestingly, an individual’s stage of change has a strong correlation with self-efficacy (Feldman et al., 2000; Molaison, 2002; Resnicow, 2003; Havas et al., 1998), possibly because self-efficacy may be a key factor in moving into the action phase (Baranowski et al., 2003). As a result, many interventions which incorporate the stages of change use a participant’s stage as a measure of progress made (Taylor et al., 2000) or progress needed (Kristal et al., 1999) rather than as a trait to be directly targeted by intervention.

Information about a participant's stage of change is also useful to help implement a more participant-centered intervention by assessing a participant's stage of change and then tailoring interventions as needed (e.g., Campbell et al., 1999c). In such tailoring, individuals in the precontemplation and contemplation stages should be given information about the benefits of dietary changes and feedback on their specific dietary risk, while the process of counseling participants who are in planning and action phases should involve building skills and self-efficacy as well as setting goals. Participants in the maintenance phase, meanwhile, should be given relapse prevention strategies (Rosal et al., 2001). It should be noted that tailoring an intervention to participants' readiness to change can be effective even if the Transtheoretical Model is not explicitly used (e.g., Berg-Smith et al., 1999).

Interventions which attempt to increase participants' stage of change have shown to be successful in changing a variety of dietary behaviors, including food preparation and food safety (Taylor, 2000), decreased fat intake (Greene and Rossi, 1998), and increased fruit and vegetable intake (Feldman et al., 2000; Resnicow et al., 2003; Havas et al., 1998). Additionally, Kristal et al. (1999) showed in a review that stage of change in multiple past studies has been associated with fat intake, fiber intake, and fruit and vegetable intake. Interventions which do not attempt modify participants' stages of change but instead tailor interventions to the stage (or readiness) of change have been effective at modifying participants' fat intake, cholesterol consumption (Berg-Smith et al., 1999), and fruit and vegetable intake (Campbell et al., 1999c).

Skill Building

While self-efficacy and stage of change are important steps towards behavior change, the belief that behaviors can change and the willingness to change are irrelevant if participants do not have the necessary skills to change their eating habits. For many aspects of nutrition education, such as eating fruits and vegetables, changing eating habits does not require a great deal of skill. For others, such as eating lower-fat foods and preparing healthy recipes, a participant may know a great deal about the benefits of changing behavior and may be willing to change but may not be able to do so. Most skill-building nutrition interventions focus in particular on food purchasing skills. Without food purchasing skills, clients may assume that low-fat or high-nutrient diets are impossible on limited budgets (Gordon, Hartline-Grafton, & Nogales, 2004; Kloben & Batish, 1999), they may lack the skills needed to use food assistance programs (Taylor et al., 2000), or they may be simply unfamiliar with reading nutrition labels (Murphy et al., 1996; Taylor et al., 2000). Some interventions also have focused on meal planning skills as a way to ensure that food quantities remain reasonable (Gordon, Hartline-Grafton, & Nogales, 2004), while others have taught participants how to ensure that balanced portions of different food groups are included in meals (Serrano & Anderson, 2004; Taylor et al., 2000).

Some skill-building interventions use mediated communication, but many intervention designers feel that interactive demonstrations are more useful in building skills. These demonstrations are rarely participant centered, as educators must direct clients in order to teach skills, not the other way around. However, some participant-centered features may be incorporated in dynamic skill-building interventions that assess which skills the participants lack and on which skills the intervention should focus (e.g., Begoray & Banister, 2005).

Interventions which focus on building skills have proven effective in improving food safety and preparation behaviors (Taylor et al., 2000) as well as in reducing consumption of sweets and increasing consumption of fruits (though not significantly) (Murphy et al., 1996). One limitation of skill building is that it is often difficult to measure how much a participant's skills have improved (Baranowski et al., 2003).

Table 1: Summary of Delivery Methods, Mediating Factors, and Behavior Change Associated with Reviewed Interventions

Delivery Method	PCE	Mediating Factors Showing Significant Changes	Behaviors Showing Significant Change	Study
Didactic one-on-one education Mediated communication	No	Stage of Change	Fat intake	Greene & Rossi, 1998
	No	-	Weight loss	Ashley et al., 2001
Didactic one-on-one education Facilitated group discussions	Yes	Knowledge Skills	-	Murphy et al., 1996
Didactic one-on-one education Group lectures Mediated communication	No	Attitudes	Low-fat food consumption	Hartman et al., 1997
Didactic one-on-one education Facilitated group discussions Mediated communication	Yes	Knowledge Self-efficacy Attitudes	Fruit and vegetable intake	Havas et al., 1998
Didactic one-on-one education Group lectures Facilitated group discussions MI Mediated communication	Yes	Knowledge Attitudes	-	Gordon, Hartline-Grafton, & Nogales, 2004 (Multiple interventions discussed)
Facilitated group discussion Mediated communication	Yes	Knowledge Attitudes Self-efficacy Stage of Change	Fruit and vegetable intake	Feldman et al., 2000
	Yes	Knowledge	-	Whitaker et al., 2004
	No	Knowledge Skills	Food preparation resource management	Taylor et al., 2000
Group lectures Mediated communication	No	Knowledge	Dietary quality	Long, Martin, & Janson-Sand, 2002
	No	Knowledge Attitudes	Fruit and vegetable intake	Cox et al., 1998 (also described in Anderson et al., 1998)
	No	Knowledge Attitudes Skills	Energy intake from fat	Caballero et al., 2003 (also described in Davis et al., 1999)
Facilitated group discussion Mediated communication	Yes	Knowledge Attitudes Self-efficacy Stage of Change	Fruit and Vegetable intake	Feldman et al., 2000
	Yes	Knowledge	-	Whitaker et al., 2004
	No	Knowledge Skills	Food preparation resource management	Taylor et al., 2000

Delivery Method	PCE	Mediating Factors Showing Significant Changes	Behaviors Showing Significant Change	Study
Group lectures Mediated communication	No	Knowledge	Dietary quality	Long, Martin, & Janson-Sand, 2002
	No	Knowledge Attitudes	Fruit and vegetable intake	Cox et al., 1998 (also described in Anderson et al., 1998)
MI	Yes	-	Energy intake from fat	Bowen et al., 2002
	Yes	Readiness to Change	Energy intake from fat Cholesterol Consumption	Berg-Smith et al., 1999
MI Mediated communication	Yes	-	Fruit and vegetable intake	Resnicow, Jackson, & Blissett, 2005
	Yes	-	Fruit and vegetable intake	Resnicow, 2001
	Yes	Knowledge Stage of Change Self-efficacy	Fruit and vegetable intake	Resnicow, McCarty, & Baranowski, 2003
Mediated communication	No	Knowledge	Fruit and vegetable intake	Campell et al., 1999c
	Yes	Knowledge Self-efficacy Stage of Change	Dietary quality	Campell et al., 1999a
	Yes	Knowledge Attitudes Skills Self-efficacy	-	Serrano & Anderson, 2004
	Yes	Stage of Change Self-efficacy	-	Bensley et al., 2004
Other (self-directed intervention)	Yes	Knowledge Self-efficacy	Dietary fiber consumption	Schnoll & Zimmerman, 2001

D. Client Contextual Factors

In this section, we will examine the methods that various nutrition education interventions have undertaken to reach specific target populations best. However, this is not a comprehensive evaluation of every program that has delivered nutrition education to these populations, but rather a review of studies that used specific knowledge and concepts about those populations as the theoretical underpinnings of their interventions.

Socioeconomic Status

As the “gatekeepers” for their families, women with children are responsible not only for selecting their own dietary habits but also for establishing the dietary habits of their children. Nutrition education programs must address a number of challenges in order to help these mothers effectively to improve the nutritional behaviors and eating habits of their children and families. For low-income women, in particular, there are a number of unique needs of and obstacles to nutrition behavior change. While much of the discussion below may apply to all women, we limited our review to articles that specifically assessed nutrition behavior and interventions for women who were low-income.

A successful nutrition education program must seek to inform low-income women of the importance of specific nutritional guidelines (such as the needed level of folate intake for pregnant women) and correct any misconceptions that these women may have about the difficulty and cost of maintaining various aspects of a nutritionally healthy diet (Kloben & Batish, 1999). Helping low-income mothers to change the dietary habits of their children can be particularly challenging, as mothers often resist the idea of nutrition education because it implies that their children are overweight, or because the recommended dietary changes seem too difficult for their children to handle (Chamberlin et al., 2002). In order to overcome these challenges sensitively but effectively, nutrition education must aim to teach mothers the importance of setting limits with their children around food, which often can be difficult for mothers from low-income families (Chamberlin et al., 2002). Additionally, programs must encourage low-income mothers to recognize these nutritional goals for their children as both reasonable and achievable while promoting a commitment to sustained behavioral change. By providing a more participant-centered approach to counseling, WIC can help establish reasonable, parent-endorsed goals that clients see as manageable.

Success in changing the nutritional misperceptions and behaviors of low-income women depends on an effective delivery method. MI, group classes, and provision of printed recipes have been shown to be effective when targeting low-income women (Peterson et al., 2002). Less conventional methods of delivery also have proven to be effective. One study indicates that entertainment value is particularly important to the successful delivery of PCE (Campbell, 1999a). A nutrition education intervention can be very successful if it manages to be entertaining enough to attract and hold a

participant's attention. For instance, researchers found that formatting messages in soap opera-like videos can be particularly effective in improving knowledge, self-efficacy, stage of change, and dietary behavior among the study population of low-income women (Campbell, 1999a).

In addition to helping low-income women overcome negative behaviors and perceptions, nutrition education must seek to help these women overcome a host of equally challenging obstacles to proper nutrition. A lack of affordable housing, fears regarding neighborhood safety, and limited transportation all can influence negatively a woman's decisions regarding nutrition, as well as her access to affordable nutritious food for her family. Limitations on time and money may play a similar part in determining the food choices that a woman makes in feeding her children; for instance, a low-income mother may choose prepackaged dinners or fast food as opposed to more nutritious options in order to reduce preparation time. In working with mothers from low-income families, nutrition education programs must seek ways to address these obstacles specifically in order to help women establish successful and healthy nutrition habits for both themselves and their families.

Age

In working with pregnant and parenting teens, PCE programs must accommodate these young parents by recognizing the specific learning patterns and behaviors typical to adolescents, who are often in the initial or exploratory stages of adopting healthy behaviors. Generally, adolescent behaviors, both adverse and healthful, are often only weakly established, and MI and other PCE techniques are particularly useful tools to use with adolescents in general, because they allow the participants a sense of control over the intervention, which is something many adolescents feel they lack in their everyday lives. This sense of control seems to be most effective when nutrition education is delivered in individualized counseling sessions rather than in group classes (see Contento et al., 1995, for a review).

Such participant-centered approaches have been shown to be successful with adolescents in recent nutrition education interventions (Berg-Smith et al., 1999; Long, Martin, & Janson-Sand, 2002), as well as in interventions focusing on dating behavior (Banister & Begoray, 2004; Begoray & Banister, 2005). The success with participant-centered approaches in these interventions suggests that such an approach also would be effective with parenting or pregnant teens.

Language

One of the best ways to reach bilingual and non-English-speaking populations is to use bilingual nutrition educators and to provide bilingual education materials. One survey of Hmong and Hispanic clients who received nutrition education from trained bilingual educators "indicated that they [clients] were more aware of why they were eligible for the program, more comfortable sharing health information, and more honest and open compared to similar clients who did not work with a bilingual" (Gordon, Hartline-Grafton, & Nogales, 2004). Several studies have shown that bilingual

education materials can play a significant part in a successful intervention (Taylor, 2000), making an intervention targeting low-income bilinguals as effective as one targeting nonbilinguals (Serrano, 2004). The costs of training bilingual educators to reach bilingual and non-English-speaking clients can be very high (Taylor, 2000), meaning that in some cases, simply developing bilingual educational materials may be more cost-effective in the long run than using bilingual educators (Gould & Anderson, 2002) – although this does not take into account that educators likely would produce greater behavior changes in participants than materials (see Nutrition Education Delivery Methods, above).

Literacy Level

The literacy level of a client can impact the efficacy of some types of nutrition education strongly, as many of the most common types of indirect education (such as brochures and pamphlets) are designed at an eighth-grade literacy level or above and cannot be used effectively with low-literacy or illiterate groups. Though it would seem intuitive to use correspondingly more video and audio media, Macaro et al. (1998) conducted interviews of experts, providers, and volunteers from adult basic education classes which suggest that these formats are not particularly welcomed by populations with low literacy. Audiotapes were disliked by adults with low literacy, and videotapes were seen as ineffective unless carefully tweaked to be linguistically appropriate. Traditional nutrition education staples such as recipes are ineffective, as they are too difficult to remember (Murphy et al., 1996). Instead, group discussions in which clients help teach one another are viewed as very effective. Additionally, nutrition education should be targeted not only to the client with low literacy but also to the client's family and friends, if possible, as clients are more likely to follow advice from family and friends than from physicians or nutritionists. This literacy-sensitive and family-oriented approach has been shown to have strong results with low-literate populations (Murphy et al., 1996).

One interesting study by Hartman, et al. (1997) demonstrates the importance of literacy-appropriate education materials by its failure, rather than by its success. The authors conducted a low-fat education intervention among adults with low literacy but did not modify their materials. Their curriculum included some literacy-appropriate educational activities but also many inappropriate materials such as printed recipes, written information, and take-home reinforcements such as refrigerator magnets. The authors found that the intervention produced increases in measures of attitudes and eating behaviors compared to standard nutrition education, but not one of the increases was statistically significant.

Culture

Culture often plays a key role in shaping lifestyle and food preferences. As a result of these variations in diet and exercise among populations from different cultures, some nutrition- and diet-related health issues are more common in some cultures and populations than in others. For

instance, while the majority of Americans consume a diet that is high in fat and sodium and low in calcium, African-American populations are more likely to have diets low in fiber, and Hispanic populations are more likely to have diets low in iron and folic acid. Asian-Americans may eat diets high in sodium and carbohydrates and low in calcium (Nutrition Update, 2005). Native American populations, like White populations, may lead sedentary lifestyles while eating high-fat and high-sodium diets (Davis et al., 1999). In order to provide nutrition education to any specific population best, specific tactics and approaches may be useful and effective (Nutrition Update, 2005). Providing nutrition education becomes even more complex when the client base is diversely multiethnic and multicultural.

Various authors recently have developed theories and models of culturally competent nutrition education based on intimate knowledge of and sensitivity to culturally rooted differences in attitudes and behaviors (Brannon, 2004; Tripp-Reimer et al., 2001; Brown, 2003; Teufel, 1997; Thakeray & Neiger, 2003; Nutrition Update, 2005). These models and theories are designed to increase the effectiveness of nutrition education delivery to specific groups as well as to diverse and multiethnic client populations. Organizations such as the American Dietetic Association have taken the position that cultural competence is a necessary component of nutrition interventions (Anderson, Palombo, & Earl, 1998).

There is actually a paucity of studies in the literature which evaluate the effects of culturally sensitive and/or competent interventions on the provision of nutrition education to diverse and multicultural client bases. It is not that cultural competence has been shown to be ineffective; rather, the technique simply has not been adequately evaluated in nutrition education to make a determination on its effectiveness, even though there are strong theoretical arguments supporting its use.

Indeed, this paucity of evidence extends throughout the broader literature on health promotion (Brach & Fraserirector, 2000). Multiple studies have been conducted suggesting that targeting standard nutrition education interventions to various racial and ethnic minorities can improve nutrition behaviors and reduce intercultural disparities among Hispanics (Taylor et al., 2000; Serrano & Anderson, 2000), African-Americans (Resnicow et al., 2001; Campell et al., 1999c; Resnicow et al., 2005), and Native Americans (Caballero et al., 2003). But while evidence for the efficacy of targeted interventions providing standard nutrition education is common, there is no evidence that such interventions must be culturally competent to be successful (Brach & Fraserirector, 2000). No studies have been done which explicitly compare culturally competent nutrition education interventions to non-culturally competent interventions. Even the position taken by the American Dietetic Association does not seem to be based on data. This lack of evidence does not suggest that culturally competent interventions do not work, but rather that more evaluations should be conducted to determine their true effectiveness.

IV. KEY FINDINGS AND ADDITIONAL QUESTIONS

This section was originally designed to highlight the key findings from the literature review and examine key issues that need to be addressed in the development of the assessment tool. As the Project Team and consultants worked on this document, it became clear that the diversity in approach to WIC service delivery across States; the variance in readiness; and factors such as size, participant demographics, and approach to nutrition education required a more flexible approach to identifying relevant key findings.

Because the purpose of this project is to assess, design, and implement PCE, the Project Team felt that a “PCE approach” to identifying the relevant findings would be the best approach to creating a conclusions chapter. We therefore used time at the 2-day planning meeting to facilitate a discussion around this literature review and to identify key findings in the context of a broad-based discussion with the participating States. This approach helped us both to identify those issues of importance and interest to States and to develop a contextual framework for discussing the findings. Some findings that are relevant to one State may not be to another, and the findings then can be discussed in terms of limitations and application. Below we summarize the results of the discussion with the States, which will ultimately lead to the development of the assessment tools and the PCE approach.

Factors for Nutrition Educators (both paraprofessional and professional)

We began our discussion with states by reviewing the factors or influences on a provider’s nutrition education techniques. In general, it was agreed that staff’s education, background, experience, and self-confidence were key determinants of desire and ability to provide PCE. However, it also was noted that a higher level of education did not necessarily equate to a greater ability to use PCE. In some cases RDs were less willing to embrace PCE than peer or paraprofessional educators because they believed that using PCE will displace them as the “expert” imparting knowledge to their clients.

Participants noted that often educators focus on improving knowledge, with little effort placed on changing the client’s attitudes or self-efficacy. For example, staff do not acknowledge the small steps taken by their clients, yet we know from the literature that attitudes can be changed with this recognition of success. Key to the PCE model, therefore, will be building in follow-up documentation between visits, and evaluating staff, in part, by their ability to reinforce setting goals and supporting client achievements.

Participants noted that training for staff in PCE must include:

- Adult education techniques. States reported that educators at all levels lacked skills in adult education and that many, especially RDs, had little to no formal training in adult education
- Explanation of the determinants of behavior change and understanding the staff's role in addressing them
- Motivational Interviewing
- Critical thinking. Moving to a more participant-centered model will require staff to adapt the discussion to help the client meet their needs

Mediated communication

Participants explained that brochures, videos and posters are used extensively throughout WIC. There was much discussion around the unavoidability of handing or sending people information – and the belief that, as one participant expressed, “knowledge is power”. In only one or two States, however, did educators adapt them to the client's specific needs. In these cases, educators worked with the client to write their goals or next steps on a brochure which the client took with her.

Client Factors

Participants explained that while WIC programs are trying to improve knowledge, skills and self-efficacy of their clients, they are most likely only successful in increasing knowledge. The one exception is around breastfeeding where there is an increase in rates, which is most likely due to both an increase in skills and self-efficacy.

Participants then identified the factors they believe influence the client's ability to make needed behavior changes:

- Other competing needs related to socio-economic status: electricity, lack of potable water, housing status
- Culture
- Perceived cost of healthier foods
- Lack of skills to budget, purchase and cook healthy foods
- Media/advertising
- Misinformation
- Time
- Lack of decision making power within their household

Of these reasons, participants believe that WIC can mediate: Misinformation, food purchasing, cooking, budgeting, and alternative ways to prepare traditional dishes. They also can refer clients to social services in their area.

States have various ways of adapting their WIC services to the client's culture. Examples include: hiring bi-lingual, bi-cultural staff, providing extensive translation services, using education and outreach materials that are culturally appropriate with pictures of the population and use of culturally appropriate foods. They also adapt the style of education based on culture. For example, states reported the importance of building a relationship with the Latino clients so the client does not find WIC invasive of their privacy.

Summary

At the end of the literature review discussion, Altarum asked participants about their overall thoughts on the literature review and presentation.

- They stated that the literature review 'fit' with their experience in WIC, particularly that didactic only changes knowledge, not behavior
- It was useful to see how culturally competency can also be reflected in policies and procedures
- The California Pyramid was a good visual tool
- There was a discussion on whether the studies that identified WIC best-practice are appropriate to use. Usually best-practice is self-identified rather than being in a peer-reviewed journal of practices that show an impact on nutrition behavior

Participants identified additional questions for next steps: To what extent does the Culture of Poverty influence how PCE should be delivered? Have there been any studies of telephonic one-on-one counseling? What about the effect of PCE based on rural/urban differences?

Table 2. Reviewed Literature Relating to Delivery Factors

Author	Year Published	Article Name	Publication	Delivery Method			Delivery Context				Client Content		
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues
Abusabha R, Achterberg C.	1997	Review of self-efficacy and locus of control for nutrition and health-related behavior.	<i>Journal of the American Dietetic Association</i> . 1997;97(10):1122-32.										
Abusabha R, Peacock J, Achterberg C	1999	How to make nutrition education more meaningful through facilitated group discussions.	<i>Journal of the American Dietetic Association</i> . January 1999;99(1):72–76.										
Achterberg C, Miller C	2004	Is one theory better than another in nutrition education? A viewpoint: more is better.	<i>Journal of Nutrition Education and Behavior</i> . January–February 2004;36(1):40–42.	x			x						
Ammerman A, Lundquist C, Lohr K, Hersey J	2002	The efficacy of behavioral interventions to modify dietary fat and fruit and vegetable intake: a review of the evidence.	<i>Preventive Medicine</i> . July 2002;35(1):25–41.									various	
Anderson AS, Cox DN, McKellar S, Reynolds J, Lean MEJ, Mela DJ	1998	Take Five, a nutrition education intervention to increase fruit and vegetable intakes: impact on attitudes towards dietary change.	<i>British Journal of Nutrition</i> . 1999;80:133–140.		x		x						
Anderson JV, Palombo RD, Earl R	1998	Position of the American Dietetic Association: the role of nutrition in health promotion and disease prevention programs	<i>Journal of the American Dietetic Association</i> . 1998;98(2):205–208.								x		
Ashley JM, St. Jeor ST, Perumean-Chaney S, Schrage J, Bovee V	2001	Meal replacements in weight intervention.	<i>Obesity Research</i> . 2001;9(4 Suppl):312S–320S.		x	x							
Banister E, Begoray D	2004	Beyond talking groups: strategies for improving adolescent health education.	<i>Health Care for Women International</i> . May 2004;25(5).									adolescent	

Author	Year Published	Article Name	Publication	Delivery Method			Delivery Context				Client Content		
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues
Baranowski T, Cullen K, Nicklas T, Thompson D, Baranowski J	2003	Are current health behavioral change models helpful in guiding prevention of weight gain efforts?	<i>Obesity Research</i> . October 2003;11(Suppl):23S–43S.										
Begoray D, Bannister E	2005	Using curriculum design principles to improve health education for adolescent girls.	<i>Health Care for Women International</i> . April 2005;26(4):295–307.	x								adolescents	
Bensley RJ, Mercer N, Brusk JJ, Underhile R, Rivas J, Anderson J, Kelleher D, Lupella M, de Jager A.	2004	The eHealth Behavior Management Model: a Stage-based Approach to Behavior Change and Management	<i>Preventing Chronic Disease</i> , 2004;1(4):1-12.	x	x								
Berg-Smith, SM, Stevens VJ, Brown KM, Van Horn L, Gernhofer N, Peters E, Greenberg R, Shetselaar L, Ahrens L, Smith K	1999	A brief motivational intervention to improve dietary adherence in adolescents.	<i>Health Education Research</i> . 1999;14(3):399–410.	x		x						adolescents	
Betterley C, Bentley A	2001	<i>Increasing Cultural Competency of Nutrition Educators Through Travel Study Programs</i> .	Prepared for Food and Culture in Tuscany and Florence, E33.2208.099: <i>International Study in Food and Nutrition</i> , June 17–July 6, 2001.						x		x		

Author	Year Published	Article Name	Publication	Delivery Method				Delivery Context				Client Content			
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served	Literacy Level
Bowen, D, Ehret, C, Pederson, M, Snetselaar, L, Johnson, M, Tinker, L, Hollinger, D, Lichty, I, Bland, K, Sivertsen, D, Ocken, D, Staats, L, & Beedoe, JW	2002	Results of an adjunct dietary intervention program in the Women's Health Initiative.	<i>Journal of the American Dietetic Association</i> . 2002;102(11):1631-1637.	x		x						x			
Brach C, Fraserirector I	2000	Can cultural competency reduce racial and ethnic health disparities? A review and conceptual model.	Medical Care Research and Review. 2000;57(1 Suppl):181-217.										x		
Brannon C	2004	Cultural competency: values, traditions, and effective practice.	<i>Today's Dietician</i> . November 2004. Available at: http://www.todaysdietitian.com/cpe/TDCPE_1104.pdf . Accessed October 27, 2006.							x			x		
Brown TL	2003	Meal-planning strategies: ethnic populations.	<i>Diabetes Spectrum</i> . 2003;16(3):190-192.										x		
Buttriss J, Stanner S, McKeivitch B, Nugent AP, Kelly C, Phillips F, Theobald HE	2004	Successful ways to modify food choice: lessons from the literature.	<i>Nutrition Bulletin</i> . December 2004;29:333.	x	x			x		x	x	x	x		
Caballero B, Clay T, Davis SM, Ethelbah B, Rock BH, Lohman T, Norman J, Story M, Stone EJ, Stephenson L, Stevens J	2003	Pathways: a school-based, randomized controlled trial for the prevention of obesity in American Indian schoolchildren.	<i>American Journal of Clinical Nutrition</i> . 2003;78:1030-1038.		x		x						x	Native American schoolchildren	

Author	Year Published	Article Name	Publication	Delivery Method				Delivery Context				Client Content			
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served	Literacy Level
Campbell MK, Demark-Wahnefried W, Symons M, Kalsbeek W, Dodds J, Cowan A, Jackson B, Motsigner B, Hoben K, Lashley J, Demisse S, McClelland J	1999	Fruit and vegetable consumption and prevention of cancer: the Black Churches United for Better Health project.	<i>American Journal of Public Health</i> . September 1999;89(9):1390–1396.		x							x	x	African-American	
Campbell MK, Bernhardt JM, Waldmiller M, Jackson B, Potenziani D, Weathers B, Demissie S	1999	Varying the message source in computer-tailored nutrition education.	<i>Patient Education and Counseling</i> . February 1999;36(2):157–169.		x			church				x		African-American	
Campbell MK, Honess-Morreale L, Farrell D, Carbone E, Brasure M	1999	A tailored multimedia nutrition education pilot program for low-income women receiving food assistance.	<i>Health Education Research</i> . April 1999;14(2):257–267		x									low-income women	
Chamberlin LA, Sherman SN, Jain A, Powers SW, Whitaker RC	2002	The challenge of preventing and treating obesity in low-income, preschool children: perceptions of WIC health care professionals.	<i>Archives of Pediatric and Adolescent Medicine</i> . 2002;156:662–668.	x									x	low-income	
Contento IR, Balch GI, Bronner YL, Paige D, Lytle L.	1995	The effectiveness of nutrition education and implications for nutrition education policy, programs and research.	<i>Journal of Nutrition Education</i> . 1995;27:277–422.	x	x	x	x			x				pregnant women	X

Author	Year Published	Article Name	Publication	Delivery Method				Delivery Context				Client Content			
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served	Literacy Level
Cox DN, Anderson AS, Reynolds J, McKellar S, Lean MEJ, Mela DJ	1998	Take Five, a nutrition education intervention to increase fruit and vegetable intakes: impact on consumer choice and nutrient intakes.	<i>British Journal of Nutrition.</i> 1998;80:123–131.		x		x								
Craypo L, Wolf K, Carroll AM, Samuels SE	2001	<i>Nutrition Education: A Review of Models, Approaches, and Theories.</i>	Prepared for the California WIC Association.	x	x				x				x		x
Cross T, Bazron B, Dennis K, Isaacs M	1989	<i>Towards a Culturally Competent System of Care: A Monograph on Effective Services for Minority Children Who Are Severely Emotionally Disturbed</i> , vol. I.	Washington, DC: Georgetown University Child Development Center.	x			x								
Davis SM, Going SB, Hlitzer DL, Twufel NI, Snyder P, Gittelsohn J, Metcalfe L, Arviso V, Evans M, Smyth M, Brice R, Altaha J	1999	Pathways: a culturally appropriate obesity-prevention program for American Indian schoolchildren.	<i>American Journal of Clinical Nutrition.</i> 1999;69(Suppl), 796S–802S.		x		x			x			x	Native American schoolchildren	
Eliades DC, Suitor CW	1998	<i>Celebrating Diversity: Approaching Families Through Their Food.</i>	Revised Edition, 1998.										x		
Emmons K, Rollnick S	2001	Motivational interviewing in health care settings: opportunities and limitations.	<i>American Journal of Preventive Medicine.</i> 2001;20(1):68–74.	x			x								
Epstein RM, Cole DR, Gawinski BA, Piotrowski-Lee S, Ruddy NB	1998	How students learn from community-based preceptors.	<i>Archives of Family Medicine.</i> March–April 1998;7(2):149–154.	x							x				

Author	Year Published	Article Name	Publication	Delivery Method				Delivery Context				Client Content				
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served	Literacy Level	
Feldman RH, Damron D, Anliker J, Ballesteros M, Langenberg P, DiClemente C, Havas S	2000	The effect of the Maryland WIC 5-A-Day Promotion Program on participants' stages of change for fruit and vegetable consumption.	<i>Health Education and Behavior.</i> 2000;27(5):649–663.	x	x		x					x			low-income	
Fishbein M, Triandis HC, Kanfer FH, Becker M, Middlestadt SE, Eichler A	1992	<i>Factors Influencing Behavior and Behavior Change.</i>	Report prepared for the National Institute of Mental Health. Bethesda, MD: National Institute of Mental Health.	x			x									
Gany F, Thiel de Bocanegra H	1996	Maternal-child immigrant health training: changing knowledge and attitudes to improve health care delivery.	<i>Patient Education and Counseling.</i> January 1996;27(1):23–31.	x						x		x	x		immigrants; language issues	
Gordon, Hartline-Grafton, & Nogales	2004	<i>Innovative WIC Practices: Profiles of 20 Programs.</i>	Available at: http://www.ers.usda.gov/publication/s/efan04007/efan04007.pdf . Accessed October 27, 2006.	x	x	x	x	x	x	x	x	x	x		many	
Gould SM, Anderson J	2002	Economic analysis of bilingual interactive multimedia nutrition education.	<i>Journal of Nutrition Education and Behavior.</i> September–October 2002;34(5):273–278.		x		x			x	x		x		Hispanic	
Greene G, Rossi S, Rossi J Velicer W, Fava J, Prochaska J	1999	Dietary applications of the Stages of Change Model.	<i>Journal of the American Dietetic Association.</i> 1999:673–677.													
Greene G, Rossi S	1998	Stages of change for reducing dietary fat intake over 18 months.	<i>Journal of the American Dietetic Association.</i> 1998;98:529–534.	x	x											

Author	Year Published	Article Name	Publication	Delivery Method			Delivery Context				Client Content					
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served	Literacy Level	
Hartman TJ, McCarthy PR, Park RJ, Schuster E, Kushi LH	1997	Results of a community-based low-literacy nutrition education program.	<i>Journal of Community Health</i> , October 1997;22(5).		x	x	x									x
Havas S, Anliker J, Damron D, Langenberg P, Ballesteros M, Feldman R	1998	Final results of the Maryland WIC 5-A-Day Promotion Program.	<i>American Journal of Public Health</i> . August 1998;88(8):1161–1167.		x					x						
Hecht J, Borrelli B, Breger RKR, DeFrancesco C, Ernst D, Resnicow K	2005	Motivational interviewing in community-based research: experiences from the field.	<i>Annals of Behavioral Medicine</i> . April 2005;29(Suppl):29–34.	x		x	x				x	x	x		various	
Horachek T, White A, Betts N, Hoerr S, Georgiou C, Nitzke S, Ma J, Greene G	2002	Self-efficacy, perceived benefits, and weight satisfaction discriminate among stages of change for fruit and vegetable intakes for young men and women.	<i>Journal of the American Dietetic Association</i> .2002;1466-1470.												young adults	
Hoy MK, Lubin MP, Grosvenor MB, Winters BL, Liu W, Wong WK	2005	Development and use of a motivational action plan for dietary behavior change using a patient-centered counseling approach	<i>Topics in Clinical Nutrition</i> . April/June 2005;20(2):118–126,	x		x									adult women	well educated
James DCS	2004	Factors influencing food choices, dietary intake, and nutrition-related attitudes among African Americans: application of a culturally sensitive model.	<i>Ethnicity and Health</i> . 2004;9(4):349–367.											x	African - American	
Kloeblen AS, Batish SS	1999	Understanding the intention to permanently follow a high folate diet among a sample of low-income pregnant women according to the Health Belief Model.	<i>Health Education Research</i> . June 1999;14(3):327–338.												low-income pregnant women	

Author	Year Published	Article Name	Publication	Delivery Method				Delivery Context				Client Content			
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served	Literacy Level
Kolasa KM	2005	Strategies to enhance effectiveness of individual based nutrition communications.	<i>European Journal Of Clinical Nutrition</i> . August 2005;59(Suppl 1):S24–S30.	x		x		x							
Kristal AR, Glanz K, Curry SJ, Patterson RE	1999	How can stages of change be best used in dietary interventions?	<i>Journal of the American Dietetic Association</i> . June 1999;99(6):679–684.	x		x									
Kristal AR, Hedderson MM, Patterson RE, Neuhauser ML	2001	Predictors of self-initiated, healthful dietary change.	<i>Journal of the American Dietetic Association</i> . July 2001;101(7):762–726.				x								
Long VA, Martin T, Janson-Sand C	2002	The great beginnings program: impact of a nutrition curriculum on nutrition knowledge, diet quality, and birth outcomes in pregnant and parenting teens	<i>Journal of the American Dietetic Association</i> . March 2002;102(3 Suppl):S86–S89.		x		x					x	pregnant/nursing teenagers		
Macario E, Emmons KM, Sorensen G, Hunt MK, Rudd RE	1998	Factors influencing nutrition education for patients with low literacy skills.	<i>Journal of the American Dietetic Association</i> . May 1998;98(5):559–564.		x							x			x
Mead N, Bower P	2000	Patient-centeredness: a conceptual framework and review of the empirical literature.	<i>Social Science and Medicine</i> . 2000;51:1087–1110.	x						x					
Miller MA, Kinsel K	1998	Patient-focused care and its implications for nutrition practice.	<i>Journal of the American Dietetic Association</i> . February 1998; 98(2):177–181.	x								x			
Miller, WR, Rollnick S	1991	<i>Motivational Interviewing: Preparing People to Change Addictive Behavior</i> .	New York: Guilford Press.												

Author	Year Published	Article Name	Publication	Delivery Method				Delivery Context				Client Content		
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served
Miller, WR	1994	Motivational interviewing: III. On the ethics of motivational intervention.	<i>Behavioural and Cognitive Psychotherapy</i> . 1994;22:111–123.											
Moe EL, Elliot DL, Goldberg L, Kuehl KS, Stevens VJ, Breger RKR, DeFrancesco CL, Ernst D, Duncan T, Dulacki K, Dolen S	2002	Promoting Healthy Lifestyles: Alternative Models' Effects (PHLAME).	<i>Health Education Research</i> . October 2002;17(5):586–596.	x		x								
Molaison EF	2002	Stages of change in clinical nutrition practice.	<i>Nutrition in Clinical Care</i> . September–October 2002;5(5):251–257.									x		
Murphy PW, Davis TC, Mayeaux EJ, Sentell T, Arnold C, Rebouche C	1996	Teaching nutrition education in adult learning centers: linking literacy, health care, and the community.	<i>Journal of Community Health Nursing</i> . 1996;13(3):149–158.										African-American	x
Newes-Adeyi G, Helitzer DL, Roter D, Caulfield LE	2004	Improving client-provider communication: Evaluation of a training program for women, infants and children (WIC) professionals in New York State.	<i>Patient Education and Counseling</i> . November 2004;55(2):210–217.	x		x		WIC clinic					x	mothers
Nutrition Update	2005	<i>Providing Nutrition Guidance to a Multicultural Population: The Importance of Cultural Competency</i> .	Available at: http://scholar.google.com/url?sa=U&q=http://www.kraftfoods.com/health/knu/2005-Pro_Article-win-sp.pdf . Accessed October 27, 2006.								x			African American, Hispanic, Asian-American
Palmeri D, Auld GW, Taylor T, Kendall P, Anderson J	1998	Multiple perspectives on nutrition education needs of low-income Hispanics.	<i>Journal of Community Health</i> . 1998;23:301–316.								x			low income Hispanic

Author	Year Published	Article Name	Publication	Delivery Method				Delivery Context				Client Content			
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served	Literacy Level
Paquet C, St. Arnaud-McKenzie D, Ferland G, Dubè L	2003	A blueprint-based case study analysis of nutrition services provided in a midterm care facility for the elderly.	<i>Journal of the American Dietetic Association</i> . March 2003;103(3):363–368.									x		elderly	
Peterson KE, Sorensen G, Pearson M, Hebert JR, Gottlieb BR, McCormick MC	2002	Design of an intervention addressing multiple levels of influence on dietary and activity patterns of low-income, postpartum women.	<i>Health Education Research</i> . October 2002;17(5):531–540.	x		x	x	WIC clinic; home visits				x		low-income postpartum women	
Pomerleau J, Lock K, Knai C, McKee M	2005	Interventions designed to increase adult fruit and vegetable intake can be effective: a systematic review of the literature.	<i>Journal of Nutrition</i> . October 2005;135–2486–2495.												
Prochaska JJ, Zabinski MF, Calfas KJ, Sallis JF, Patrick K	2000	PACE+: interactive communication technology for behavior change in clinical settings.	<i>American Journal of Preventive Medicine</i> . 2000;19(2):127–131.	x				clinic waiting room						adolescents	
Resnicow K, Jackson A, Braithwaite R, Dilorio C, Blisset D, Rahotep S, Periasamy S	2002	Healthy Body/Healthy Spirit: a church-based nutrition and physical activity intervention.	<i>Health Education Research</i> . October 2002;17(5):562–573.	x	x	x							x		
Resnicow K, Dilorio C, Soet JE, Borrelli B, Hecht J, Ernst D	2002	Motivational interviewing in health promotion: it sounds like something is changing.	<i>Health Psychology</i> . September 2002;21(5):444–451.	x		x				x					
Resnicow K, Jackson A, Blisset D, Wang T, McCarty F, Rahotep S, Periasamy S	2005	Results of the Healthy Body Healthy Spirit trial.	<i>Health Psychology</i> . July 2005;24(4):339–48.	x	x	x		phone/ church		x		x	x	African-American	

Author	Year Published	Article Name	Publication	Delivery Method				Delivery Context				Client Content			
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served	Literacy Level
Resnicow K, Jackson A, Wang T, De AK, McCarty F, Dudley WN, Baranowski T	2001	A motivational interviewing intervention to increase fruit and vegetable intake through Black churches: results of the Eat for Life Trial.	<i>American Journal of Public Health.</i> 2001;91(10):1686–1693.	x	x	x		churches				x	x	African-American	
Resnicow K, McCarty F, Baranowski T	2003	Are precontemplators less likely to change their dietary behavior? A prospective analysis.	<i>Health Education Research.</i> December 2003;18(6):693–705.			x		churches					x	African-American	
Rollnick S, Mason P, Butler C	1999	<i>Health Behavior Change: A Guide for Practitioners.</i>	London: Churchill Livingstone, an imprint of Elsevier Limited.									x			
Rollnick S, Miller WR	1995	What is motivational interviewing?	<i>Behavioural and Cognitive Psychotherapy.</i> 1995;23:325–334.	x		x									
Rosal MC, Ebbeling CB, Lofgren I, Ockene JK, Ockene IS, Hebert JR	2001	Facilitating dietary change: the patient-centered counseling model.	<i>Journal of the American Dietetic Association.</i> March 2001;101(3):332–341.	x									x		
Rubak S, Sandbæk A, Lauritzen T, Christensen B	2005	Motivational interviewing: a systematic review and meta-analysis.	<i>British Journal of General Practice.</i> April 1, 2005;55(513):305–312.	x		x			x	x			x		
Samuels & Associates	2001	<i>Nutrition Education: A Review of Models, Approaches, and Theories.</i>	Executive summary prepared for California WIC. Available at: http://www.calwic.org/docs/reports/wic_nutrition_educ_rev.pdf . Accessed October 27, 2006.	x				WIC					x		x
Schnoll R, Zimmerman BJ	2001	Self-regulation training enhances dietary self-efficacy and dietary fiber consumption.	<i>Journal of the American Dietetic Association.</i> 2001;101(9):1006–1011.	x											

Author	Year Published	Article Name	Publication	Delivery Method				Delivery Context				Client Content			
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served	Literacy Level
Serrano EL, Anderson JE	2004	The evaluation of food pyramid games, a bilingual computer nutrition education program for Latino youth.	<i>Journal of Family and Consumer Sciences Education</i> . Spring/summer 2004;22(1).	x	x			school-based/computer		x			x	bilingual	
Sigman-Grant M	1996	Stages of change: a framework for nutrition interventions.	<i>Nutrition Today</i> . 1996;31:162-170. Available at: http://findarticles.com/p/articles/mi_m0841/is_n4_v31/ai_18682528/print . Accessed October 27, 2006.												
Sigman-Grant M	2004	<i>Facilitated Dialogue Basics: Let's Dance: A Self-study Guide for Nutrition Educators</i> .	Available at: http://www.unce.unr.edu/publications/SP04/SP0421.pdf . Accessed October 27, 2006.												
Sigman-Grant M	2002	Strategies for counseling adolescents.	<i>Journal of the American Dietetic Association</i> . 2002;102(3 Suppl):S32-S39.			x	x						x	adolescent	
St. Jeor ST, Perumean-Chaney S, Sigman-Grant M, Williams C	2002	Family-based interventions for the treatment of childhood obesity.	<i>Journal of the American Dietetic Association</i> . 2002;102(5):640-644.				x							children	
Taylor T, Serrano E, Anderson J, Kendall P	2000	Knowledge, skills, and behavior improvements on peer educators and low-income Hispanic participants after a stage of change-based bilingual nutrition education program.	<i>Journal of Community Health Volume</i> . June 2000;25(3).							x	x	x	x	bilingual	

Author	Year Published	Article Name	Publication	Delivery Method				Delivery Context				Client Content		
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served
Teufel NI	1997	Development of culturally competent food-frequency questionnaires.	<i>American Journal of Clinical Nutrition</i> . 1997;65(Suppl):1173S–1178S.									x	Native American	
Thackerary R, Neiger BL	2003	Use of social marketing to develop culturally innovative diabetes interventions.	<i>Diabetes Spectrum</i> . 2003;16(1):15–20.		x								x	
Thorpe M	2003	Motivational interviewing and dietary behavior change.	<i>Journal of the American Dietetic Association</i> . 2003;103(20):150–151.	x		x							x	
Tripp-Reimer R, Choi E, Kelley LS, Enslein JC	2001	Cultural barriers to care: inverting the problem.	<i>Diabetes Spectrum</i> . 2001;14(1):13–22.						x				x	various ethnic groups
U.S. General Accounting Office (GAO)	2004	<i>Nutrition Education: USDA Provides Services Through Multiple Programs, but Stronger Linkages Among Efforts Are Needed.</i>	GAO Report to the Committee on Agriculture, Nutrition, and Forestry.										x	
Van Weel C	2003	Dietary advice in family medicine.	<i>American Journal Of Clinical Nutrition</i> . April 2003;77(4 Suppl):1008S–1010S.	x									x	
Wagner C, Connors W	2006	<i>Motivational Interviewing: Resources for Clinicians, Researchers, and Trainers.</i>	Available at: http://www.motivationalinterview.org/ . Accessed October 27, 2006.	x		x								
Whitaker RC, Sherman SN, Chamberlin LA, Powers SW	2004	Altering the perceptions of WIC health professionals about childhood obesity using video with facilitated group discussion.	<i>Journal of the American Dietetic Association</i> . 2004;104(3):379–386.											
Wiist WH, Flack JM	1990	A church-based cholesterol education program.	<i>Public Health Reports</i> . 1990;105.					church		x	x		x	African-American

Author	Year Published	Article Name	Publication	Delivery Method			Delivery Context				Client Content			
				PCE	Mediated Communication	One-on-one	Group	Facilities	Session Length/Frequency	Training Issues	Peer Educators	Professional Dietitians	Cultural Issues	Population Served
Zimmerman GL, Olsen CG, Bosworth MF	2000	A 'stages of change' approach to helping patients change behavior.	<i>American Family Physician</i> . March 1, 2000;61(5):1409-1416.	x		x		doctor's office						

Table 3: Reviewed Literature Relating to Client Mediating Factors

Author	Year Published	Article Name	Publication	Mediating Factor				
				Skill Building	Self-efficacy or Confidence	Attitudes	Knowledge	Readiness to Change
Abusabha R, Achterberg C.	1997	Review of self-efficacy and locus of control for nutrition and health-related behavior.	<i>Journal of the American Dietetic Association.</i> 1997;97(10):1122-32.		X			
Abusabha R, Peacock J, Achterberg C	1999	How to make nutrition education more meaningful through facilitated group discussions.	<i>Journal of the American Dietetic Association.</i> January 1999;99(1):72–76.	X	X		X	
Achterberg C, Miller C	2004	Is one theory better than another in nutrition education? A viewpoint: more is better.	<i>Journal of Nutrition Education and Behavior.</i> January–February 2004 ;36(1):40–42.					X
Ammerman A, Lundquist C, Lohr K, Hersey J	2002	The efficacy of behavioral interventions to modify dietary fat and fruit and vegetable intake: a review of the evidence.	<i>Preventive Medicine.</i> July 2002;35(1):25–41.					
Anderson AS, Cox DN, McKellar S, Reynolds J, Lean MEJ, Mela DJ	1998	Take Five, a nutrition education intervention to increase fruit and vegetable intakes: impact on attitudes towards dietary change.	<i>British Journal of Nutrition.</i> 1998;133–140.			X	X	
Anderson JV, Palombo RD, Earl R	1998	Position of the American Dietetic Association: the role of nutrition in health promotion and disease prevention programs.	<i>Journal of the American Dietetic Association.</i> 1998;98(2):205–208.					
Ashley JM, St. Jeor ST, Perumean-Chaney S, Schrage J, Bovee V	2001	Meal replacements in weight intervention.	<i>Obesity Research.</i> 2001;9(4 Suppl):312S–320S.					
Banister E, Begoray D	2004	Beyond talking groups: strategies for improving adolescent health education.	<i>Health Care for Women International.</i> May 2004;25(5).					
Baranowski T, Cullen K, Nicklas T, Thompson D, Baranowski J	2003	Are current health behavioral change models helpful in guiding prevention of weight gain efforts?	<i>Obesity Research.</i> October 2003;11(Suppl):23S–43S.	X	X		X	X
Begoray D, Bannister E	2005	Using curriculum design principles to improve health education for adolescent girls.	<i>Health Care for Women International.</i> April 2005;26(4):295–307.	X			X	

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Bensley RJ, Mercer N, Brusk JJ, Underhile R, Rivas J, Anderson J, Kelleher D, Lupella M, de Jager A.	2004	The eHealth Behavior Management Model: a Stage-based Approach to Behavior Change and Management	<i>Preventing Chronic Disease</i> , 2004;1(4):1-12.				x	x
Berg-Smith, SM, Stevens VJ, Brown KM, Van Horn L, Gernhofer N, Peters E, Greenberg R, Snetselaar L, Ahrens L, Smith K	1999	A brief motivational intervention to improve dietary adherence in adolescents.	<i>Health Education Research</i> . 1999;14(3):399-410.					x
Betterley C, Bentley A	2001	<i>Increasing Cultural Competency of Nutrition Educators Through Travel Study Programs</i> .	Prepared for Food and Culture in Tuscany and Florence, E33.2208.099: <i>International Study in Food and Nutrition</i> , June 17-July 6, 2001.					
Bowen D, Ehret C, Pederson M, Snetselaar L, Johnson M, Tinker L, Hollinger D, Lichty I, Bland K, Sivertsen D, Ocken D, Staats L, Beedoe JW	2002	Results of an adjunct dietary intervention program in the Women's Health Initiative.	<i>Journal of the American Dietetic Association</i> . 2002;102(11):1631-1637.					
Brach C, Fraserirector I	2000	Can cultural competency reduce racial and ethnic health disparities? A review and conceptual model.	<i>Medical Care Research and Review</i> . 2000;57(1 Suppl):181-217.					
Brannon C	2004	Cultural competency: values, traditions, and effective practice.	<i>Today's Dietician</i> . November 2004. Available at: http://www.todaysdietitian.com/cpe/TDCPE_1104.pdf . Accessed October 27, 2006.					
Brown TL	2003	Meal-planning strategies: ethnic populations.	<i>Diabetes Spectrum</i> . 2003;16(3):190-192.	x				
Buttriss J, Stanner S, McKeivitch B, Nugent AP, Kelly C, Phillips F, Theobald HE	2004	Successful ways to modify food choice: lessons from the literature.	<i>Nutrition Bulletin</i> . December 2004;29:333.					

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Caballero B, Clay T, Davis SM, Ethelbah B, Rock BH, Lohman T, Norman J, Story M, Stone EJ, Stephenson L, Stevens J	2003	Pathways: a school-based, randomized controlled trial for the prevention of obesity in American Indian schoolchildren.	<i>American Journal of Clinical Nutrition.</i> 2003;78:1030–1038.	x		x	x	
Campbell MK, Demark-Wahnefried W, Symons M, Kalsbeek W, Dodds J, Cowan A, Jackson B, Motsigner B, Hoben K, Lashley J, Demisse S, McClelland J	1999	Fruit and vegetable consumption and prevention of cancer: the Black Churches United for Better Health project.	<i>American Journal of Public Health.</i> September 1999;89(9):1390–1396.				x	
Campbell MK, Bernhardt JM, Waldmiller M, Jackson B, Potenziani D, Weathers B, Demissie S	1999	Varying the message source in computer-tailored nutrition education.	<i>Patient Education and Counseling.</i> February 1999;36(2):157–169.	x	x		x	x
Campbell MK, Honess-Morreale L, Farrell D, Carbone E, Brasure M	1999	A tailored multimedia nutrition education pilot program for low-income women receiving food assistance.	<i>Health Education Research.</i> April 1999;14(2):257–267.		x		x	x
Chamberlin LA, Sherman SN, Jain A, Powers SW, Whitaker RC.	2002	The challenge of preventing and treating obesity in low-income, preschool children: perceptions of WIC health care professionals.	<i>Archives of Pediatric and Adolescent Medicine.</i> 2002;156:662–668.					
Contento IR, Balch GI, Bronner YL, Paige D, Lytle L.	1995	The effectiveness of nutrition education and implications for nutrition education policy, programs and research.	<i>Journal of Nutrition Education.</i> 1995;27:277–422.			x	x	
Cox DN, Anderson AS, Reynolds J, McKellar S, Lean MEJ, Mela DJ	1998	Take Five, a nutrition education intervention to increase fruit and vegetable intakes: impact on consumer choice and nutrient intakes.	<i>British Journal of Nutrition.</i> 1998;80:123–131.			x	x	
Craypo L, Wolf K, Carroll AM, Samuels SE	2001	<i>Nutrition Education: A Review of Models, Approaches, and Theories.</i>	Prepared for the California WIC Association.		x			x

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Cross T, Bazron B, Dennis K, Isaacs M	1989	Towards a culturally competent system of care: A Monograph on Effective Services for Minority Children Who Are Severely Emotionally Disturbed: Volume I.	Washington, DC: Georgetown University Child Development Center.					
Davis SM, Going SB, Hlitzer DL, Twufel NI, Snyder P, Gittelsohn J, Metcalfe L, Arviso V, Evans M, Smyth M, Brice R, Altaha J	1999	Pathways: a culturally appropriate obesity-prevention program for American Indian schoolchildren.	<i>American Journal of Clinical Nutrition.</i> 1999;69(Suppl):796S–802S.	x		x	x	
Eliades DC, Suitor CW	1998	<i>Celebrating Diversity: Approaching Families Through Their Food.</i>	Revised Edition, 1998.					
Emmons K, Rollnick S	2001	Motivational interviewing in health care settings: opportunities and limitations.	<i>American Journal of Preventive Medicine.</i> 2001;20(1):68–74.					
Epstein RM, Cole DR, Gawinski BA, Piotrowski-Lee S, Ruddy NB	1998	How students learn from community-based preceptors.	<i>Archives of Family Medicine.</i> March–April 1998;7(2):149–154.					
Feldman RH, Damron D, Anliker J, Ballesteros M, Langenberg P, DiClemente C, Havas S	2000	The effect of the Maryland WIC 5-A-Day Promotion Program on participants' stages of change for fruit and vegetable consumption.	<i>Health Education and Behavior.</i> 2000;27(5):649–663.		x	x	x	x
Fishbein M, Triandis HC, Kanfer FH, Becker M, Middlestadt SE, Eichler A	1992	<i>Factors Influencing Behavior and Behavior Change.</i>	Report prepared for the National Institute of Mental Health. Bethesda, MD: National Institute of Mental Health.	x	x	x	x	x
Gany F, Thiel de Bocanegra H	1996	Maternal-child immigrant health training: changing knowledge and attitudes to improve health care delivery.	<i>Patient Education and Counseling.</i> January 1996;27(1):23–31.			x	x	x
Gordon, Hartline-Grafton, & Nogales	2004	<i>Innovative WIC Practices: Profiles of 20 Programs.</i>	Available at: http://www.ers.usda.gov/publications/efan04007/efan04007.pdf . Accessed October 27, 2006.			x	x	x

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Gould SM, Anderson J	2002	Economic analysis of bilingual interactive multimedia nutrition education.	<i>Journal of Nutrition Education and Behavior</i> . September–October 2002;34(5):273–278.	x			x	x
Greene G, Rossi S, Rossi J Velicer W, Fava J, Prochaska J	1999	Dietary applications of the Stages of Change Model.	<i>Journal of the American Dietetic Association</i> . 1999;673–677.		x			x
Greene G, Rossi S.	1998	Stages of change for reducing dietary fat intake over 18 months.	<i>Journal of the American Dietetic Association</i> . 1998;98:529–534.					x
Hartman TJ, McCarthy PR, Park RJ, Schuster E, Kushi LH	1997	Results of a community-based low-literacy nutrition education program.	<i>Journal of Community Health</i> . October 1997;22(5).			x		
Havas S, Anliker J, Damron D, Langenberg P, Ballesteros M, Feldman R	1998	Final results of the Maryland WIC 5-A-Day Promotion Program.	<i>American Journal of Public Health</i> . August 1998;88(8):1161–1167.		x	x	x	x
Hecht J, Borrelli B, Breger RKR, DeFrancesco C, Ernst D, Resnicow K	2005	Motivational interviewing in community-based research: experiences from the field.	<i>Annals of Behavioral Medicine</i> . April 2005;29(Suppl):29–34.					
Horachek T, White A, Betts N, Hoerr S, Georgiou C, Nitzke S, Ma J, Greene G	2002	Self-efficacy, perceived benefits, and weight satisfaction discriminate among stages of change for fruit and vegetable intakes for young men and women.	<i>Journal of the American Dietetic Association</i> . 2002:1466–1470.		x			x
Hoy MK, Lubin MP, Grosvenor MB, Winters BL, Liu W, Wong WK	2005	Development and use of a motivational action plan for dietary behavior change using a patient-centered counseling approach.	<i>Topics in Clinical Nutrition</i> . April/June 2005;20(2):118–126,		x			x
James DCS	2004	Factors influencing food choices, dietary intake, and nutrition-related attitudes among African Americans: application of a culturally sensitive model.	<i>Ethnicity and Health</i> . 2004;9(4):349–367.			x		
Kloeblen AS, Batish SS	1999	Understanding the intention to permanently follow a high folate diet among a sample of low-income pregnant women according to the Health Belief Model.	<i>Health Education Research</i> . June 1999;14(3):327–338.		Intention			
Kolasa KM	2005	Strategies to enhance effectiveness of individual based nutrition communications.	<i>European Journal of Clinical Nutrition</i> . August 2005;59(Suppl 1):S24–S30.		x			x

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				Skill Building	Self-efficacy or Confidence	Attitudes	Knowledge	Readiness to Change
Kristal AR, Glanz K, Curry SJ, Patterson RE	1999	How can stages of change be best used in dietary interventions?	<i>Journal of the American Dietetic Association</i> . June 1999;99(6):679–684.		x			x
Kristal AR, Hedderson MM, Patterson RE, Neuhauser ML	2001	Predictors of self-initiated, healthful dietary change.	<i>Journal of the American Dietetic Association</i> . July 2001;101(7):762–766.				x	x
Long VA, Martin T, Janson-Sand C	2002	The great beginnings program: impact of a nutrition curriculum on nutrition knowledge, diet quality, and birth outcomes in pregnant and parenting teens.	<i>Journal of the American Dietetic Association</i> . March 2002;102(3 Suppl):S86–S89.				x	
Macario E, Emmons KM, Sorensen G, Hunt MK, Rudd RE	1998	Factors influencing nutrition education for patients with low literacy skills.	<i>Journal of the American Dietetic Association</i> . May 1998;98(5):559–564.	x			x	
Mead N, Bower P	2000	Patient-centeredness: a conceptual framework and review of the empirical literature.	<i>Social Science and Medicine</i> . 2000;51:1087–1110.					
Miller MA, Kinsel K	1998	Patient-focused care and its implications for nutrition practice.	<i>Journal of the American Dietetic Association</i> . February 1998;98(2):177–181.					
Miller, WR, Rollnick S	1991	<i>Motivational Interviewing: Preparing People to Change Addictive Behavior</i> .	New York: Guilford Press.					
Miller, WR	1994	Motivational interviewing: III. On the ethics of motivational intervention.	<i>Behavioural and Cognitive Psychotherapy</i> . 1994;22:111–123.					
Moe EL, Elliot DL, Goldberg L, Kuehl KS, Stevens VJ, Breger RKR, DeFrancesco CL, Ernst D, Duncan T, Dulacki K, Dolen S	2002	Promoting Healthy Lifestyles: Alternative Models' Effects (PHLAME).	<i>Health Education Research</i> . October 2002;17(5):586–596.		x			
Molaison EF	2002	Stages of change in clinical nutrition practice.	<i>Nutrition and Clinical Care</i> . September–October 2002;5(5):251–257.		x		x	x

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Murphy PW, Davis TC, Mayeaux EJ, Sentell T, Arnold C, Rebouche C	1996	Teaching nutrition education in adult learning centers: linking literacy, health care, and the community.	<i>Journal of Community Health Nursing</i> . 1996;13(3):149-158.	x			x	
Newes-Adeyi G, Helitzer DL, Roter D, Caulfield LE	2004	Improving client-provider communication: evaluation of a training program for women, infants and children (WIC) professionals in New York State.	<i>Patient Education and Counseling</i> . November 2004;55(2):210-217.					
Nutrition Update	2005	<i>Providing Nutrition Guidance to a Multicultural Population: The Importance of Cultural Competency</i> .	Available at: http://scholar.google.com/url?sa=U&q=http://www.kraftfoods.com/health/knu/2005-Pro_Article-win-sp.pdf . Accessed October 27, 2006.					
Palmeri D, Auld GW, Taylor T, Kendall P, Anderson J	1998	Multiple perspectives on nutrition education needs of low-income Hispanics.	<i>Journal of Community Health</i> . 1998;23:301-316.					x
Paquet C, St-Arnaud-McKenzie D, Ferland G, Dubè L	2003	A blueprint-based case study analysis of nutrition services provided in a midterm care facility for the elderly.	<i>Journal of the American Dietetic Association</i> . March 2003;103(3):363-368.					
Peterson KE, Sorensen G, Pearson M, Hebert JR, Gottlieb BR, McCormick MC	2002	Design of an intervention addressing multiple levels of influence on dietary and activity patterns of low-income, postpartum women.	<i>Health Education Research</i> . October 2002;17(5):531-540.					
Pomerleau J, Lock K, Knai C, McKee M	2005	Interventions designed to increase adult fruit and vegetable intake can be effective: a systematic review of the literature.	<i>Journal of Nutrition</i> . October 2005;135:2486-2495.					
Prochaska JJ, Zabinski MF, Calfas KJ, Sallis JF, Patrick K	2000	PACE+: interactive communication technology for behavior change in clinical settings.	<i>American Journal of Preventive Medicine</i> . 2000;19(2):127-131.					
Resnicow K, Jackson A, Braithwaite R, Dilorio C, Blisset D, Rahotep S, Periasamy S	2002	Healthy Body/Healthy Spirit: a church-based nutrition and physical activity intervention.	<i>Health Education Research</i> . October 2002;17(5):562-573.				x	x
Resnicow K, Dilorio C, Soet JE, Borrelli B, Hecht J, Ernst D.	2002	Motivational interviewing in health promotion: it sounds like something is changing.	<i>Health Psychology</i> . September 2002;21(5):444-451.					

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Resnicow K, Jackson A, Blissett D, Wang T, McCarty F, Rahotep S, Periasamy S	2005	Results of the Healthy Body Healthy Spirit trial.	<i>Health Psychology</i> . July 2005;24(4):339–348.				x	x
Resnicow K, Jackson A, Wang T, De AK, McCarty F, Dudley WN, Baranowski T	2001	A motivational interviewing intervention to increase fruit and vegetable intake through Black churches: results of the Eat for Life Trial.	<i>American Journal of Public Health</i> . 2001;91(10):1686–1693.		x		x	
Resnicow K, McCarty F, Baranowski T	2003	Are precontemplators less likely to change their dietary behavior? A prospective analysis.	<i>Health Education Research</i> . December 2003;18(6):693–705.					x
Rollnick S, Mason P, Butler C	1999	<i>Health Behavior Change: A Guide for Practitioners</i> .	London: Churchill Livingstone, an imprint of Elsevier Limited.					
Rollnick S, Miller WR	1995	What is motivational interviewing?	<i>Behavioural and Cognitive Psychotherapy</i> . 1995;23:325–334.					
Rosal MC, Ebbeling CB, Lofgren I, Ockene JK, Ockene IS, Hebert JR	2001	Facilitating dietary change: the patient-centered counseling model.	<i>Journal of the American Dietetic Association</i> . March 2001;101(3):332–341.		x			x
Rubak S, Sandbæk A, Lauritzen T, Christensen B	2005	Motivational interviewing: a systematic review and meta-analysis.	<i>British Journal of General Practice</i> . April 1, 2005;55(513):305–312.					
Samuels & Associates	2001	Nutrition Education: A Review of Models, Approaches, and Theories.	Executive summary prepared for California WIC. Available at: http://www.calwic.org/docs/reports/wic_nutrition_ed_uc_rev.pdf . Accessed October 27, 2006.					
Schnoll R, Zimmerman BJ	2001	Self-regulation training enhances dietary self-efficacy and dietary fiber consumption.	<i>Journal of the American Dietetic Association</i> . 2001;101(9):1006–1011.		x		x	
Serrano EL, Anderson JE	2004	The evaluation of food pyramid games, a bilingual computer nutrition education program for Latino youth.	<i>Journal of Family and Consumer Sciences Education</i> . Spring/summer 2004;22(2).	x	x	x	x	

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Sigman-Grant M	1996	Stages of change: a framework for nutrition interventions.	<i>Nutrition Today</i> . 1996;31:162–170. Available at: http://findarticles.com/p/articles/mi_m0841/is_n4_v31/ai_18682528/print . Accessed October 27, 2006.					x
Sigman-Grant M	2004	<i>Facilitated Dialogue Basics: Let's Dance: A Self-study Guide for Nutrition Educators</i> .	Available at: http://www.unce.unr.edu/publications/SP04/SP0421.pdf . Accessed October 27, 2006.		x		x	
Sigman-Grant M	2002	Strategies for counseling adolescents.	<i>Journal of the American Dietetic Association</i> . 2002;102(3 Suppl):S32–S39.					
St Jeor ST, Perumean-Chaney S, Sigman-Grant M, Williams C	2002	Family-based interventions for the treatment of childhood obesity.	<i>Journal of the American Dietetic Association</i> . 2002;102(5):640–644.					
Taylor T, Serrano E, Anderson J, Kendall P	2000	Knowledge, skills, and behavior improvements on peer educators and low-income Hispanic participants after a stage of change-based bilingual nutrition education program.	<i>Journal of Community Health</i> . June 2000;25(3).	x			x	x
Teufel NI	1997	Development of culturally competent food-frequency questionnaires.	<i>American Journal of Clinical Nutrition</i> . 1997;65(Suppl):1173S–1178S.					
Thackerary R, Neiger BL	2003	Use of social marketing to develop culturally innovative diabetes interventions.	<i>Diabetes Spectrum</i> . 2003;16(1):15–20.				x	
Thorpe M	2003	Motivational interviewing and dietary behavior change.	<i>Journal of the American Dietetic Association</i> . 2003;103(20):150–151.					
Tripp-Reimer R, Choi E, Kelley LS, Enslein JC	2001	Cultural barriers to care: inverting the problem.	<i>Diabetes Spectrum</i> . 2001;14(1):13–22.				x	
U.S. General Accounting Office (GAO)	2004	<i>Nutrition Education: USDA Provides Services Through Multiple Programs, but Stronger Linkages Among Efforts Are Needed</i> .	GAO Report to the Committee on Agriculture, Nutrition, and Forestry.					
Van Weel C	2003	Dietary advice in family medicine.	<i>American Journal Of Clinical Nutrition</i> . April 2003;77(4 Suppl):1008S–1010S.					

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Wagner C, Connors W	2006	<i>Motivational Interviewing: Resources for Clinicians, Researchers, and Trainers.</i>	Available at: http://www.motivationalinterview.org/ . Accessed October 27, 2006.					
Whitaker, RC, Sherman, SN, Chamberlin, LA, Powers, SW	2004	Altering the perceptions of WIC health professionals about childhood obesity using video with facilitated group discussion.	<i>Journal of the American Dietetic Association.</i> 2004;104(3):379-386.					
Wiist WH, Flack JM	1990	A church-based cholesterol education program.	<i>Public Health Reports.</i> 1990;105.					
Zimmerman GL, Olsen CG, Bosworth MF	2000	A 'stages of change' approach to helping patients change behavior.	<i>American Family Physician.</i> March 1, 2000;61(5):1409-1416.					x

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- Ashley JM, St. Jeor ST, Perumean-Chaney S, Schrage J, Bovee V. Meal replacements in weight intervention. *Obesity Research*. 2001;9(4 Suppl):312S-320S.
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