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# ***Hi5+: Systematic Development of a Family Intervention to Increase Fruit and Vegetable Intake***

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*This article describes the development of a peer-led home-based intervention to increase fruit and vegetable (FV) intake and family interaction among fourth graders and their families. Hi5+ intervention content and delivery strategies were developed using two complementary processes: cognitive mapping (CM), a consumer-based approach to identifying salient issues, and intervention mapping (IM), a comprehensive planning model. Step 1 involved creating plans to guide the design, implementation, and evaluation of Hi5+. We delineated our performance objectives and then prioritized those determinants we felt were most salient and changeable. Step 2 involved selecting and utilizing cognitive and behavioral theory constructs to develop intervention methods and strategies. Step 3 involved designing and pilot testing the instructional materials and other intervention components. Step 4 entailed developing plans for program adoption and implementation, while the final step (Step 5) involved creating a comprehensive evaluation plan. Implications of this multistep approach to intervention development are discussed.*

**Keywords:** *fruit and vegetable intake; nutrition; family; children; family activities; intervention mapping; intervention development; social cognitive theory*

**C**urrent fruit and vegetable intakes of children and adults are not commensurate with optimal health. Only 20% of children regularly consume the recommended 5 or more servings of fruits and vege-

tables (FV) daily (Basch, Zyburt, & Shea, 1994; Kann et al., 1995; Krebs-Smith et al., 1996), posing a significant attributable risk for cancer (Block, Patterson, & Subar, 1992; Potter & Steinmetz, 1996) and coronary heart disease (Hu & Willett, 2002; Kris-Etherton et al., 2002). Risk behaviors that develop in childhood often track into adulthood (Webber, Cresanta, Voors, & Berenson, 1983) providing a strong rationale for interventions to increase FV intake in childhood (Kelder, Perry, Klepp, & Lytle, 1994). Thus, targeting healthy children was an initial focus of dietary change interventions, with schools providing convenient access to large numbers of children.

As with many of the earlier dietary change interventions, our previous work, High 5 Alabama (Reynolds et al., 2000), was a school-based intervention targeting fourth-grade children and their parents. Although this program significantly increased initial FV intake among the children, this increase was only partially sustained at the 2-year follow-up. In addition, a less intensive take-home intervention directed at the parents yielded smaller and unsustainable increases in parent FV intake. Despite the minimal obligations of the parent component in High 5 Alabama, only 30% of parents even completed this portion of the program. Identifying effective methods for increasing parental participation in child FV interventions would be highly beneficial, given that dietary intake aggregates within families (Laskarzewski et al., 1980; Vauthier, Lluch, Lecomte, Artur, & Herbeth, 1996), and is influenced by the eating behaviors modeled by parents (Fisher & Birch, 2002; Tibbs et al., 2001), and the frequency of family meals together (Vauthier et al., 1996). Because the family is a critical influence in modeling and shaping children's health behaviors (Baranowski & Nader, 1985; Patterson et al., 1989), there are strong theoretical as well as practical reasons for using a social ecological intervention approach that tar-

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gets the family environment to influence dietary behaviors. Such an approach fosters the application of information, skills training, motivational strategies, and environmental supports that are consistent, repeated, and received by all family members. Thus, the family context provides an important environmental and interpersonal setting for interventions that seek to improve health behaviors, including increased FV intake.

Although the idea of engaging the family in behavior change interventions for children is not new, efforts to do so and positive outcomes resulting from such efforts are lacking in the literature. Yet the tremendous advantages to be gained if effective family interventions were developed (including enhanced potential for initiation and the maintenance of desired behaviors and reduced likelihood that negative influences will persist in the family environment) militates in favor of continued efforts to develop them. Recognizing the importance of the family context as well as the challenges of engaging the family in an intervention, we sought to develop an intervention that carefully considered both of these issues.

The goal of our current study, Hi5+, was to promote and maintain increased family FV intake by intervening with fourth-grade children and their families. To meet this goal, we sought to develop, implement, and evaluate a family intervention to complement our existing fourth-grade school program. To best identify and address the underlying issues that influence family FV intake in our priority population, we used a cognitive mapping (CM) approach (Shewchuk, Franklin, Harrington, Davies, & Windle, 2004). Issues that surfaced from this process were then translated into performance objectives within an intervention mapping (IM) framework (Bartholomew, Parcel, & Kok, 1998; Bartholomew, Parcel, Kok, & Gottlieb, 2001) to develop the Hi5+ intervention.

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IM provides a structure within which to apply theoretical constructs and specific information about the priority population to intervention planning. It extends previous planning models in several ways. First, although containing many of the attributes of the PRECEDE/PROCEED planning model (Green & Kreuter, 1999), IM can be applied to projects of any size or scale and can be done by planners with limited human and/or financial resources. In addition, it requires the up-front creation of detailed plans for program development, adoption, implementation, monitoring, and evaluation. This process specifies what needs to be changed, ensures consideration of all the factors that influence behavior, and the means to reach desired outcomes, including the feasibility of all possible change strategies. Furthermore, feedback from the priority population is continually obtained through this iterative 5-step process. This prevents practitioners from losing sight of the project's priorities, which have, in large part, been defined by the intended audience. This article describes in detail the integration of a CM approach into an IM framework in developing the Hi5+ family intervention. Figure 1 presents a flow chart illustrating the integration of the CM and IM processes.

### ► **IM STEP 1: PREPARE MATRICES OF PROXIMAL PROGRAM OBJECTIVES**

The first step in IM involves creating matrices to guide the design, implementation, and evaluation of the intervention. This step requires defining the audience, selecting behaviors for change, and examining both empirically identified and audience-derived issues related to the behavior. Our intended audience was defined by our previous work with fourth graders in High 5 Alabama (Reynolds et al., 2000), as the new family intervention (Hi5+) was designed to complement this existing school curriculum. This earlier work also generated our primary intervention goal to create and maintain significant increases (.5 or more servings/day) in FV intake among fourth graders as well as their parents. Thus, we created a matrix where behavioral performance objectives related to family FV intake intersected with relevant and changeable personal and environmental determinants of behavior. The cells at these intersections stipulate the proximal program objectives and state who and what will change as a result of the intervention. Performance objectives and determinants were derived from the theoretical and empirical literature, and by collecting new qualitative and quantitative data from the intended audience. Although IM endorses the participation of the priority population in the intervention development process, we extensively elaborated on IM Step 1 by developing our performance objectives through a multistep CM approach.

CM consists of several analytic procedures that effectively blend quantitative and qualitative methodolo-

gies. First, it involves identifying clusters of predisposing issues that relate to the outcome of interest (in this case, FV intake). Clusters represent a collection of underlying constructs that are based on individuals' perceptions. Issues cluster together based on their relevance rating and how they fit together with other identified issues. These clusters represent a composite that enhances our understanding of the individual issues by the other issues they are associated (grouped) with, strengthening the level of explanation over individual factors. Greater detail of the CM approach used in the current study is described elsewhere (Shewchuk et al., 2004).

The outcome-related issues and issue clusters that emerged from the priority population through the CM process were the substance of our intervention. Nominal group technique (NGT) –structured focus group meetings were employed to elicit salient issues related to FV intake in the priority population. NGT focus groups were initially conducted with parents of fourth graders ( $n = 64$ ) to identify barriers and facilitators of family FV intake. Participants at these meetings generated a total of 60 nonredundant responses. Card sort and rating scale tasks were then developed to quantify the perceived similarity and importance of the responses. These tasks were administered to a larger sample of parents of fourth graders. Approximately 80% of the completed tasks ( $n = 265$ ) were returned for analysis. From this work, the 60 NGT statements were distilled down to 11 attitudes that were determined to be significantly associated with parental FV intake (see Table 1). These responses were then combined with three empirically derived measures of family context, including family cohesion (Olson, Portner, & Lavee, 1985), parental monitoring (Shelton, Frick, & Wooten, 1996), and shared activities (Jacob, Moser, Windle, Loeber, & Stouthamer-Loeber, 2000) to form what we have termed a “cognitive map diagnostic” or CMD assessment. Preliminary analyses of these pilot data indicate that CMD can be used to describe four distinct family profiles that differ with respect to FV eating behavior. The apparent psychometric strength of the CMD has provided not only the substantive content of our intervention but also the means by which different content can be tailored to the specific needs of different family types. Families within each group tended to have some behaviors that were salient to them but not to others.

These 11 parent-generated responses, along with the three family measures described above, constituted the 14 most salient predisposing, reinforcing, and enabling factors influencing FV intake in our priority popula-

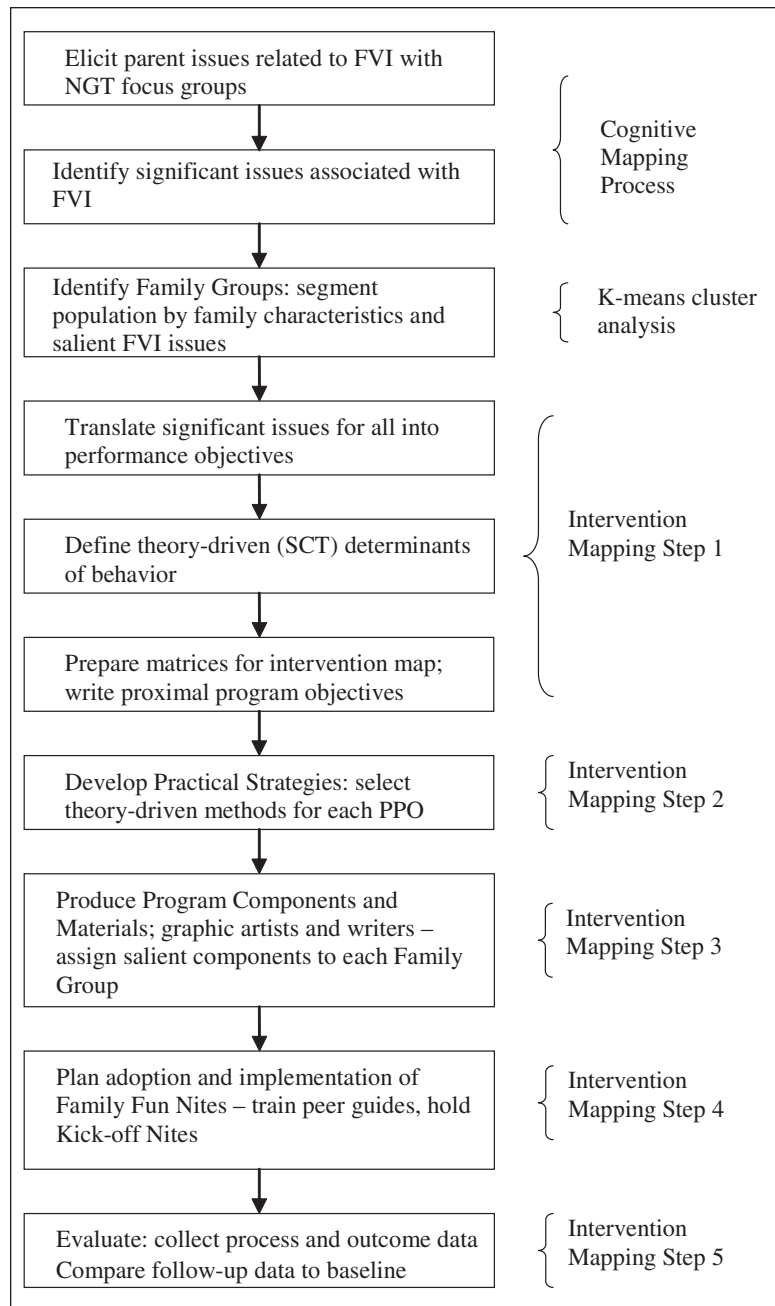


FIGURE 1 Intervention Development: Flow Chart of Activities

tion, thus serving as the performance objectives that anchored one axis of the IM Step 1 matrix. In some cases, the audience-derived statements were translated into objectives that stated a specific, measurable behavior. For example, *poor meal planning* was revised to *plan meals in advance*. Other statements were already in the form of a performance objective, such as *let kids choose some of what's served*. Table 1 lists the 14 performance objectives for Hi5+.

The second axis of the matrix specified determinants drawn from theory. Previous experience and empirical

**TABLE 1**  
**Portion of the Matrix for Parent Behavior Change**

<i>Performance Objectives for Parents</i>	<i>Personal Determinant: Learning Objectives</i>		<i>External Determinant: Change Objectives</i>
	<i>Skills</i>	<i>Outcome Expectations</i>	<i>Norms</i>
1. Plan and do more family activities Family Cohesion Scale <sup>a</sup> Shared Family Activities Scale <sup>a</sup> Subobjectives	Arrange family schedule for meals and time together	Expect meal and activity time together to provide fun, make the family feel closer, and enhance communication	Other families from school do activities as a family
2. Spend time as a family, doing things together	Set goal to do family activity		Other families eat meals together and support regular shared family meals
3. Eat meals together <sup>c</sup> “We just don’t eat a lot of meals together” <sup>b</sup>	Set goal to have meals together		Other children help their parents cook
4. Prepare meals together <sup>c</sup> “Kids who help cook them will eat them” <sup>b</sup>	Encourage and have child help in meal preparation	Expect it will be fun to have children help and will save time eventually	Other parents know what their children eat
5. Take a more active role in child’s diet Parental Monitoring Scale <sup>a</sup> Subobjectives	Monitor child diet		
6. State importance of healthy eating to family <sup>c</sup> “As parents we just don’t push the issue” <sup>b</sup>	Include FV in family meal menus	Expect family will perceive parents pushing FV as sign of love and concern	Other parents promote and encourage FV intake
7. “Tell family benefits of FV” <sup>b</sup>	Communicate benefits of FV in ways the family understands	Expect family will respond positively to hearing benefits of FV	Other parents present benefits of FV intake
8. Serve FV every day <sup>c</sup> “Just fix what you want them to have” <sup>a</sup>	Communicate what’s prepared is what family will eat; Serve FV to family	Expect family will eat what’s prepared for them	Other parents serve FV daily
9. Plan meals in advance “Poor meal planning” <sup>b</sup>	Plan meals to include FV	Expect planned meals are healthier and save time and money	Other parents plan ahead for purchase and preparation of FV
Subobjectives	Have ingredients on hand	Use grocery list to shop	Expect grocery list to help with meal preparation

(continued)

TABLE 1 (continued)

<i>Performance Objectives for Parents</i>		<i>Personal Determinant: Learning Objectives</i>		<i>External Determinant: Change Objectives</i>
		<i>Skills</i>	<i>Outcome Expectations</i>	<i>Norms</i>
10. "Serve their favorites (F OR V) more often" <sup>a,b</sup>		Prepare family's FV favorites frequently	Expect family to eat FV favorites served	Other parents serve favorite FV often
11. "Let kids choose some of what's served" <sup>b</sup>		Give children choices in FV prepared	Expect that children choosing FV will lead to their eating them	
12. Make FV part of regular eating habits "Poor eating habits" <sup>b</sup>		Set specific goal to eat FV	Expect that adding FV to regular eating will become habit	
Subobjectives				
13. Provide substitutions for junk food "junk food is so available, quick, and easy" <sup>b</sup>		Recognize stimuli that prompts junk food eating	Expect family will accept junk food alternatives; and expect healthy alternatives to be fast and easy	Others eat healthy food instead of junk food
14. Encourage children to independently choose foods "Kids eat what their friends eat" <sup>a,b</sup>		Encourage kids to decide for themselves what they prefer; Give children opportunities to make own choices	Expect that encouraging kids to make independent food choices will lead to healthier eating	Other school children choose FV

NOTE: FV = fruit and vegetable; NGT = nominal group technique.

a. The 3 family interaction scales.

b. The original statement endorsed from parents via the NGT data collection process.

c. NGT statements revised in the form of a behavioral performance objective.

literature supported our reliance on social cognitive theory (SCT) (Bandura, 1986) for the selection of relevant determinants. Attitudes, preferences, skills, self-efficacy, and outcome expectations were chosen as personal determinants, and norms, reinforcement, cues, and availability were selected as external determinants. The proximal program objective (PO) at each intersection of a determinant with a performance objective is a personal learning objective when it falls under a personal determinant, and an external change objective when it falls under an external determinant. For example, the intersection of the PO *prepare meals together* with the personal determinant *skills* generated the PO *provide child with a task in meal preparation, and teach him/her how to perform that task*. The POs served as the foundation for the further development of the Hi5+ intervention, either as recurring themes (e.g., Handy Helper) or individual components (e.g., game to improve self-monitoring skills). Table 1 illustrates a portion of the matrix that was created via IM Step 1.

► **IM STEP 2: SELECT THEORY-BASED INTERVENTION METHODS AND TRANSLATE INTO PRACTICAL STRATEGIES**

Step 2 in the IM process entails the selection of theory-based intervention methods and strategies for each of the POs. Consistent with our classroom intervention, SCT informed method selection for addressing each of the determinants. For example, to change attitudes related to FV intake, methods such as skill building, direct experience, reinforcement, modeling, and feedback would be advocated within the SCT framework. To address the attitude-based PO that *meal time together is good for the family*, we selected persuasive communication as the method (see Table 2).

We then translated these methods into practical strategies. To identify practical strategies, we consulted fourth-grade parents and teachers as well as curriculum and behavior change experts. We held brainstorming sessions to identify unique ways to implement our methods. The program strategies that resulted from this process were used to develop various components of the intervention. Together they combined to provide the overall intervention motif called Family Fun Nites (FFN), whereby intervention activities were centered around families' evening meal. Because the evening meal provides the largest proportion of daily calorie and nutrient intake for most children and adolescents (Lin, Guthrie, & Blaylock, 1996), family suppers provide an ideal setting for interventions that seek to increase FV intake.

Recognizing the difficulty of getting parents to attend formally structured group sessions, Hi5+ was developed as a take-home intervention with the goals of increasing family interaction and FV intake. FFN unified these two goals with recipes and games that reinforced educational themes. Thus, a general strategy of

the FFN was to provide shared activities to encourage family cohesion while providing a platform for specific strategies to increase FV availability and accessibility. Another general strategy of the FFN was for it to be a stand-alone intervention for families to do at home at their convenience. Formative evaluation told us that families with young children have multiple demands on their time, and if the intervention was going to be adopted, it needed to be simple and part of their ordinary activities. Another important strategy was to make Hi5+ intensive in content (to provide enough substance to enable families to make the desired changes) and flexible in implementation (to be compatible with busy lifestyles). Accordingly, FFNs provided families with virtually everything they needed to have an in-depth, meaningful family experience while having the opportunity to do it at home, at their convenience, and to choose between several options to best meet the needs and preferences of their families. Table 2 lists the methods and strategies, with examples of program components, for each of the POs related to the PO *Eat More Meals Together*.

► **IM STEP 3: PRODUCE PROGRAM COMPONENTS AND MATERIALS**

Step 3 in the IM process involves translating the methods and strategies from Step 2 into program materials. The creation of these materials involved a joint effort by behavioral scientists, trained interventionists, child development experts, parents, fourth-grade teachers, nutritionists, artists, and a pediatrician. Material components were based on one or more POs. An intervention motif involved the "Freggie 5," colorful characters called Broccoli Spears, Indiana Banana, Sammy Salsa, Reggie Veggie (heroes/positive models), Junky Monkey (who transitioned into Spunky Monkey), and Dr. Fry N. Stein (villain/negative model). Positive model characters conveyed the benefits of and strategies for eating FVs by serving as role models to encourage acquisition of specific behaviors. For example, Broccoli Spears (who was a very good planner) performed goal setting to get in shape for the Miss Freggieville Pageant, while Sammy Salsa had to choose what snack to have for energy and stamina to help him perform at his best in his big game that night. These and other situations illustrated the consequences of healthy and unhealthy dietary decision making.

The FFNs theme was converted into a set of weekly sessions that integrated a series of components into every session. The materials were presented in a binder that was attractive, inviting, self-contained, and well organized, with components clearly and consistently identified. Attention was paid to make the materials as appealing and engaging as possible by providing adequate white space, mixtures of colorful diagrams and print, large and varied type faces, brief, discrete phrases, sidebars, clear headings, and four-color

**TABLE 2**  
**Conversion of Proximal Program Objectives to Intervention Activities Using SCT Methods**  
**and Strategies Specifically for the Performance Objective (PO): Eat More Meals Together**

<i>Proximal Program Objective</i>	<i>Theory-Based Method</i>	<i>Specific Strategy</i>	<i>Program Activity</i>
<b>Personal</b>			
Attitudes/Beliefs: Believe that time together is good for family; meals	Persuasive communication	Authoritative messages	Food for thought (FFT)
Skills: Arrange family schedule to allow for meals and time together; Have meals prepared	Skill building; Planning coping responses; Goal setting	Completing a planning form; Prepare family meal using recipes; Problem solving steps/game; Goal-setting message/game	Plum Good Planning; Recipes & Extra Menu Ideas; Family Challenge - FFT/game; Go For the Goal - FFT/game
Self-efficacy: Believe they are capable of preparing and serving meals to family	Direct experience	Start with simple recipes to gain confidence; Meals together part of program	First few recipes; Family fun nite setup
Outcome expectations: Expect that meal and activity time together will be fun, make them closer, and increase family communication	Direct experience; Anticipated regret; Modeling	Testimonials of other families expressing benefits from eating together (video and program staff); Program messages	Kick-off nite; video testimonials; guide phone calls
<b>External</b>			
Norms: Other families from the school eat meals together and support the practice of shared family meals	Group experience; Modeling	Have families together for a meal; Model a family eating meals together	Kick-off nite dinner; Video
Reinforcement: Program staff will provide rewards	Feedback; Reinforcements	Calls from program staff; Entry into raffles for completing program components	Praise; Raffle rewards - \$\$\$
Cues: Program cues will remind parents to plan for and eat meals together	Cues	Refrigerator magnet - reminder of date and time and food to make, shop for	Plum Good Planning
Availability: Program will provide a structure and resources for planning family meals	Facilitation	Recipes; cookbook	The Freggie 5 Guide Cookbook Recipes in Sessions - Extra Menu Ideas

NOTE: SCT = social cognitive theory.

graphics. Enclosed in their FFN materials was a tailored letter to each family, stressing the fun and ease of the program while reflecting some information about their family that they had previously reported in a survey. Materials for each FFN session contained the same format and components, as described below.

**Recipes**—At the heart of each FFN was a healthy dish that the family prepared and enjoyed together. This component supported our goal of engaging the family in a group activity. It also enhanced the parent's self-efficacy for creating a meal that was quick, easy, healthy, and tasty. To address families' variations in preferences, at least two recipes were provided each session. The family could choose which one they preferred or, if neither one was appealing, they could pick an alternate recipe from the program cookbook, *Freggie 5 Food Guide*, a collection of healthy FV recipes that was pro-

vided as an additional resource. Hi5+ recipes were often variations of dishes that children typically eat (e.g., Southern Chicken Pot Pie, Spinach and Spaghetti Casserole). Veggie pizza, a favorite, called for pureeing squash, onions, tomatoes, and peppers into the tomato sauce, addressing some children's reluctance to eat visible vegetables. Nutritionists reviewed the recipes to ensure that they were healthy and appealing to our diverse priority population of Southern White (68%) and African American (32%) families.

**Handy Helper**—Tips for involving children in the preparation of the recipe were listed on each recipe provided. These tips required age-appropriate skills held by our fourth-grade population.

**Talk Time**—For some families, the experience of eating meals together or eating without television was unusual and suggested that some conversation starters

would be helpful. To enhance the experience of their time together, this component was added that provided two questions, one to get the families talking in general (e.g., “What would you like to be when you grow up?”), and one to stimulate conversation about FV (e.g., “If you were to describe yourself as a piece of fruit, what would it be and why?”).

**Game**—Another core element of each FFN was an activity that required the family to play a fun game together. Each game addressed one or more of the POs in a family fun format. Hi5+ games were often variations of traditional games (e.g. Clue(r), Bingo(r)). These games were used to influence the determinants (e.g., to increase awareness, enhance outcome expectations, and strengthen self-efficacy related to FV intake). A popular game, Freggie Bingo attempted to increase positive outcome expectations for eating FVs by having boxes on players’ bingo cards contain a fruit or vegetable under categories that represented the benefits of eating FV (e.g., keeps you fit and trim; contributes to healthy skin and hair; good wound healing, energy for sports, keeps muscles working, and quick and easy tasty snack). For fun, family members competed to be the first to complete their Bingo cards. Goals of some of the other popular games included goal setting and achievement via reaching minigoals; problem-solving practice, and identifying family preferences. Although some games involved a small degree of skill, winning was primarily based on chance, providing all family members an equal probability of winning. The most highly rated FFN games had the following fundamental features: (a) resemblance to familiar games, (b) simple directions, (c) all materials provided, (d) short to accommodate busy families, (e) rewards for the winner (e.g., they got out of cleanup that night), and (f) fun and humorous.

**The Final Word**—This brief and succinctly worded summary message conveyed the core PO addressed in the game activity. This component was designed to reinforce the primary message of the activity as well as to provide the message for parents unable to engage in that week’s FFN. Although it was highly desirable to have all family members participate in each week’s FFN, it was understood that this was not always feasible, so packaging each session’s essential theme into a brief sentence or two was thought to be helpful.

**Food For Thought**—This component for parents addressed a number of POs via messages that expressed empathy about common family experiences or addressed specific problem areas (e.g., tips on how menu planning and a shopping list can save time and money, increase availability of healthy foods, and prevent impulse junk food buying). Messages related to either of two major themes: (a) eating a meal together as a family or (b) engaging in fun family activities through things to do at home or in their community (e.g., pack a picnic lunch and head to a local state park with the whole family).

**Plum Good Planning**—The PO for planning ahead, *Plan meals in advance*, suggested that a planning tool

was needed to help the family prepare for the next week’s session. This component accomplished this with a tear-out section of a page that was to be completed as they planned their next FFN and then posted on the refrigerator to serve as a reminder (environmental cue) for all family members.

**Shopping List**—The other side of the tear-out Plum Good Planning page was a shopping list of items to purchase for the next FFN recipe. Food items were listed in a check-off style for each of the recipe choices, and additional space was provided for listing other needed household grocery items.

**Tasty Tips**—Parents were provided with hints on purchasing, storing, and preparing fruits and vegetables (e.g., have fresh FV cut up and at eye level in the refrigerator for quick and easy snacking). This arose from POs addressing ways to make consumption of FV easy and enjoyable for families.

**Just for Kids**—This page targeted children’s FV-related attitudes and behaviors (e.g., planning for FV snacks on the run). Strategies were converted into developmentally appropriate materials, including action-oriented stories about the Freggie heroes who modeled first planning, and later eating healthy snacks. Additional strategies included puzzles (e.g., word search for FV names) and jokes (e.g., “How do vegetables trace their family history? They go back to their roots”). In addition, the Be an Explorer section provided fun ideas to encourage children to try new foods (e.g., directions for making a fruit-yogurt shake or a 100% juice popsicle).

An important part of IM Step 3 is to developmentally test program materials with the priority population. All FFN intervention materials were piloted with 98 families from six classrooms, along with the classroom curriculum, to assess whether the strategies were feasible and appropriate and whether the materials were appealing. On pilot completion, structured focus groups were held with parents to identify their likes and dislikes about the program for content, appearance, and delivery. Information gathered from the parents informed the revision of Hi5+. Overall, the feedback from the pilot was very positive but did suggest that the materials required too much reading; hence, the materials were streamlined to be less text dense, more visual, while also being sharpened and more focused on the essential intervention content. Lengthy stories on the Just for Kids page were also converted to comic book style, using pictures to convey the message. Other suggestions led to the simplification of several games and the addition of prep and cooking time to recipes.

Table 3 lists each FFN’s session activity name and its primary objective and shows how the intervention was tailored to address the issues of each family group. For example, Family Group 3 needed special attention to issues related to eating junk food, while Group 2 needed more assistance with meal planning and problem solving. Each group received a total of seven sessions, including a set of four core sessions that addressed FV-

**TABLE 3**  
**Session Activity Name, Objective, and Tailoring to Family Group**

<i>Session Activity: Name and Primary Objective</i>	<i>Family Group - Sessions Assigned</i>			
	<i>I: High Competency and Interaction</i>	<i>II: Low Competency and Interaction</i>	<i>III: Lower Competency and Moderate Interaction</i>	<i>IV: Moderate Competency but lowest Interaction</i>
Freggie Bingo: To increase positive outcome expectations for eating FV (e.g., fast, tasty, and healthy)	1	1	1	1
Freggie Favorites Card: To identify the variety of FV that family members prefer; to discuss them and plan to serve them	2	2	2	2
Goal: Survival!: To provide opportunities to practice the steps of goal setting	3	3	3	3
Family Challenge: To identify problems related to FV intake and practice appropriate problem-solving skills		4		4
Plan-It Broccoli!: To identify meal planning issues and practice meal planning strategies		5	4	
Southern Fried Goose Tales: To increase awareness of and practice selection of healthy alternatives to junk food; to plan purchasing and eating a healthy snack alternative	4		5	
Same Old Junk: To identify cues for eating junk food and modify responses to these cues with healthy substitutions			6	
Mealtime Madness: To identify strategies for overcoming barriers for eating meals together as a family		6		
Freggie Clue: To reinforce steps in problem solving; to provide opportunities to practice problem solving	5			
Name that Freggie: To reinforce awareness of the variety of FV and fun of shared family activities	6			6
To the Top!: To self-monitor and reward current FV intake; to continue meals together and shared family activities	7	7	7	7

NOTE: FV = fruit and vegetable.

related issues common to all families, plus three additional sessions that were created to meet their family group's identified issues.

#### ► **IM STEP 4: PLAN PROGRAM ADOPTION, IMPLEMENTATION, AND SUSTAINABILITY**

This step entailed developing plans for program adoption and implementation by the priority population. Given that the project's experimental design created significant challenges for program adoption and implementation (e.g., families having little information on the specifics of the program when consenting the previous year), considerable attention needed to be given to encourage program uptake by families.

The characteristics that make programs readily adoptable were considered throughout the develop-

ment of the program format and materials. In keeping with Rogers' (1995) diffusion of innovations theory, we were particularly attentive to issues of compatibility, complexity, relative advantage, trialability, and observability. We sought to make Hi5+ compatible with the priority population's value system and lifestyle, particularly eating and spending family time together at home. We reduced the complexity of specific intervention components based on feedback from pilot families (e.g., some recipes and games were simplified). Hi5+'s relative advantage was that it was superior to what it replaced (e.g., scrambling to put dinner on the table without a plan, without easy, healthy, child-friendly recipes, and without the means to engage family members in positive, enjoyable activities). Trialability was facilitated in that the decision to adopt and implement Hi5+ did not involve a significant investment of time or money (all program materials were free). Finally, Hi5+

aimed to bring about results that were immediately observable: fun with their family, better eating, and spending time together. Feedback from pilot families indicated that they did, in fact, reap such rewards from participating in Hi5+.

In an effort to improve adoption rates among consenters, a Kick-Off Nite was planned at each school. The goals of Kick-Off Nite included (a) to introduce the program and its benefits to families; (b) to give families an initial positive and fun experience; (c) to provide an opportunity to directly experience some program components; (d) to promote social norms for participating in the program; and (e) to provide an efficient means to disseminate the materials. Kick-Off Nite consisted of having a veggie pizza dinner, playing Freggie Bingo, and watching a brief, entertaining video introduction to Hi5+. The video contained elements intended to persuade viewers to adopt the program, increase positive outcome expectations for engaging in Hi5+ activities, and model participation in an FFN. Families missing this event were contacted separately to view the video and receive their FFN materials.

Implementing Hi5+ required the families to set up a time to have an FFN each week, purchase and prepare the food, and gather family members together. Among the schools randomized to Hi5+, we recruited parents to work for the program in the role of Hi5 Guides. This network of peer facilitators, who would also be doing the program, served as program champions within the school. Their job was to promote and facilitate adoption and monitor implementation through weekly phone contacts with the families that provided reinforcement and cues. These Hi5 Guides met weekly with program staff to discuss progress, share experiences and problem solve. When necessary, or when requested by an Hi5 Guide, program staff would contact families directly to offer assistance and guidance. Although consistent reinforcement and support from the Hi5 Guides were the primary methods for bolstering program implementation and maintenance, it was believed that when the families began doing the program, they would have increased motivation and self-efficacy to continue the FFNs through their direct experience with the program. Further efforts to facilitate implementation and enhance adoption of Hi5+ are described in Harrington et al. (in press).

### ► IM STEP 5: PLAN FOR EVALUATION

The fifth and final step of IM is to generate an evaluation plan. Evaluation of Hi5+ includes process and impact measures that were based on information derived from the NGTs, empirical literature, theoretical literature, demographics of our sample, and program objectives. Our data collection procedures involve a three-staged approach: Hi5 Guides collect process data on family utilization and satisfaction with intervention components; intervention coordinators supervise the

Hi5 Guides and perform quality checks on the process measures with a random sample of the families; and assessment teams collect survey data on the parents and the children at baseline and follow-up. Process evaluation procedures assessed the feasibility and appropriateness of our theoretical methods, practical strategies, and implementation plan via measures to examine the rate of program dissemination, adoption and implementation, extent of participant use, and attitudes toward program components. Weekly utilization was determined by completion of two essential FFN components: eating a meal that included an Hi5+ FV recipe and participating in the game.

Outcome evaluation included assessment of behavioral and environmental determinants and dietary intake of the parent and the child. The matrix from IM Step 1 served as the foundation for our data collection instruments. Specific POs framed the content of psychosocial scale items for measuring change in behavioral determinants. For example, an item to assess self-efficacy for serving vegetables was “How sure are you that you can regularly serve vegetables at dinner?” with four response options ranging from *I think I cannot* to *very sure I can*. An item to assess outcome expectations for the family eating FVs served was “How much do you believe your family will eat fruits and vegetables if you serve them?” with four response options ranging from *strongly don't believe* to *strongly believe*. Similar items were developed for other POs.

## ► RESULTS

The intervention developed through this process has been implemented in 11 schools in the greater Birmingham, Alabama, area as part of a randomized trial to evaluate the efficacy of an FV promotion program through the recruitment of 1,650 families from 33 schools. Families were randomly assigned to receive a school-only intervention, a school plus enhanced family intervention (Hi5+), or a delayed intervention. The overall participation rate for the study was 66.5%. Among parents participating in the study, the mean age was 36.8 years, 93.6% were women, 68% were White, 32% were African American, and 74% were married or living with a partner. Of parents, 38% were college graduates, 25% had some college credits, and 29% were high school graduates. The majority (73.5%) was employed full-time, with 6.6% employed part-time, 11% unemployed, and 9% full-time homemakers. The median household income for the sample was between U.S.\$40,000 and \$59,000, with 15% earning less than \$20,000, 18% earning between \$20,000 and \$39,900, 18.3% earning between \$40,000 and \$59,000, 28.2% earning \$60,000 or more, and 20.5% not responding. According to the most recent census data (U.S. Bureau of the Census, 2000), these demographics are identical to the entire Birmingham metropolitan area (MSA) from which the sample was drawn.

Of those families who initially agreed to participate and were randomized to the enhanced family intervention, 84% started the program, 12% dropped out, and another 4% did not drop out but also did not ever engage in the intervention (e.g., never participated in an FFN). Of families who started the program, 86% of them completed all seven sessions (72% of the total). This told us that when families tried an FFN, they were interested in continuing. Feedback from parents, in response to the question “What was your favorite part of Family Fun Nites?” included the following: “a scheduled night for family time”; “to see who was going to reach their goal first”; “laughing and having fun during dinner”; “spending time talking at the dinner table”; “when the whole family got together and played a game”; “the new recipes and having a ‘handy helper’”; “the togetherness and education we ALL received. Great program! (Hi5+) should be mandatory!”; and “What an awesome program! It has taught my children so much about nutrition.”

Initial feedback and evaluation of Hi5+, via qualitative and quantitative assessment of parent and child attitudes toward the program, and feedback from peer leaders, intervention coordinators, and teachers, suggests that the following strategies were beneficial: (a) using priority population resources as appropriate for each stage of intervention development and implementation (e.g., issue identification, peer networking); (b) delivering the intervention in a lifestyle-compatible format that promotes regular participation; (c) packaging the intervention with a family-held value, such as quality family time; (d) the importance of doing a full-scale pilot study; (e) attending to the feedback from pilot participants and staff, and revamping intervention components accordingly; and (f) having all components attractively and seamlessly presented. Preliminary results indicate that families are very receptive to the Hi5+ format and content, and that a high percentage (72%) of families completed all seven FFN sessions. More important, longitudinal data indicate that the intervention was effective in increasing FV intake in families receiving the enhanced family intervention (Hi5+). After 1-year follow-up, the children and their parents in the enhanced family intervention group had FV intake 0.5 servings higher than a delayed intervention control group ( $p < .05$ ) (data not yet published).

### **Limitations**

In this article, we describe an approach to intervention development and evaluation. However, this approach is not without weaknesses. First, much of our data, including participation rates, completion rates, and FV intake, are based on self-report. It may have been that some families responded (on surveys and on phone calls with their Hi5 Guides) in socially desirable ways. Although this is an inherent limitation in the assessment of psychosocial factors, the data collection methods were designed to maximize families’ valid

responses. Second, our study design would have been stronger had it also included input from fourth graders regarding their perceived barriers and facilitators to eating FVs. However, we elicited input only from their parents because we had serious reservations about fourth graders’ ability to engage in abstract reasoning at this stage in their cognitive development. Lacking the ability to conceptualize issues such as barriers and facilitators to FV intake in a logical manner, we felt that the data derived from fourth graders would be of limited value.

### **Implications for Future Research**

Future directions for this approach are to further refine the intervention development and implementation processes, via cognitive interviewing (to make sure we accurately interpret their perceptions of FV barriers and facilitators) and more rigorous process evaluation and pilot-testing procedures that more directly elicit the family-specific perceptions of FV intake influences. Intervention targeting could also be enhanced by tailoring to parents’ stage of readiness to increase FV intake, as this construct has been shown to relate to intervention completion and efficacy (Prochaska et al., 1994). These refinements may define family groups more accurately on determinants critical for intervention efficacy.

## **CONCLUSIONS**

In Hi5+, we utilized a multistep CM approach that identified and mapped family FV-relevant issues and profiled distinct family groups based on these issues and parent-child interactions to develop an intervention. The integration of CM with IM provides a comprehensive, systematic, and efficient model for intervention development that is theory and consumer based. CM helps ensure inclusion of factors related to FV intake in the priority population. IM offers a straightforward, structured approach to the complex task of assembling an intervention that is feasible and appealing to the priority population. This intervention development methodology could be generalized to other populations given its inherent consumer orientation and cultural sensitivity. Our process data indicates high levels of engagement and satisfaction in using our materials that promote family interaction with minimal effort and maximum convenience. We further demonstrated the efficacy of Hi5+ to increase FV by 0.5 servings/day in fourth-grade children and their parents. Future research is needed to enhance the utility of CM with IM to further increase FV intake in families with children.

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