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The impact of Internet vs. traditional Special Supplemental Nutrition program for Women, Infants, and Children nutrition education on fruit and vegetable intake

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## 1 **Impact of Internet vs. Traditional WIC Nutrition Education on Fruit and Vegetable Intake**

### 3 **ABSTRACT**

4 The purpose of this project was to compare the impact of Internet nutrition education to  
5 traditional nutrition education on WIC participant fruit and vegetable consumption. Interventions  
6 were delivered at 15 WIC clinics following normal WIC clinic operations or delivered online. A  
7 total of 692 and 872 participants from eight WIC agencies self-enrolled into two phases. A quasi-  
8 experimental design using an interrupted time series to determine the impact of two methods of  
9 nutrition education and follow-up nutrition counseling was used. Data were collected online and  
10 at Michigan WIC clinics during 2005-2007, at three-month intervals over a nine-month period  
11 (per phase). Two Internet nutrition education modules were compared to WIC traditional  
12 nutrition education that included either group classes or a self-guided nutrition education  
13 information mall. All interventions were based on the same program learning objectives.  
14 Optional motivational negotiation counseling followed three months post-intervention. Stage of  
15 change progression, belief in ability to change, and fruit and vegetable consumption were  
16 measured at baseline, immediately following the intervention, and three and six months post-  
17 intervention. Significance ( $p < 0.05$ ) was analyzed using independent samples t-tests, chi-square  
18 distribution, and sample tests for differences in binomial proportions. The Internet group  
19 experienced significant positive differences in stage of change progression, perception that the  
20 intervention was helpfulness and easy to use, and fruit and vegetable consumption. Traditional  
21 nutrition education required follow-up counseling to achieve similar fruit and vegetable  
22 consumption levels as the Internet nutrition education group. Based on these findings, this study

- 23 supports Internet nutrition education as a viable alternative to traditional nutrition education for
- 24 increasing fruit and vegetable consumption in some WIC clients.

## INTRODUCTION

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Half of all infants and one-fourth of all children in the U.S., aged one through four years, participate in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). The number of WIC clients receiving benefits each month reached approximately 9.3 million during the final quarter of 2009 (1). WIC is the largest and most visible program providing services to improve the nutritional status of pregnant women and young children, and thereby, has the greatest potential to influence the health and well being of a portion of the U.S. population.

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Nutrition education is central to the core mission of WIC. Many approaches for offering nutrition education exist, with the most successful being client-centered with feedback mechanisms (2-5). At the same time, there is greater support for the need for behavior change education, using models such as the Transtheoretical Model (6-7). This model is based on the premise that long-term behavior change may be achieved by identifying clients' current stage of readiness to change and then helping them progress along the stage of change continuum. This educational approach helps clients start where they are behaviorally, avoid boredom and failure by providing lessons that are tailored to their interest and needs, and avoid setbacks that may cause them to slip into a previous stage (8-9).

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Nester and colleagues reported that WIC participants are not always satisfied with the nutrition education they receive (10). In addition, there has been growing concern over the inability to provide effective nutrition counseling in the current WIC program structure. Numerous challenges include the infrequency of clinic attendance by working WIC clients, increasing use of paraprofessionals and limited resources for training them, absence of outcome measures to assess program effects, and extra demands placed on programs for other non-WIC

48 related services (e.g., screening for immunizations, educating about substance abuse, and  
49 registering voters) (11). WIC staff reported nutrition education was further compromised by lack  
50 of time, human resources, client tailored information, diversity of staff, and ability to make  
51 nutrition education available outside of normal clinic operating hours (11).

52         The increased use of the Internet over the past decade has opened the door for a variety of  
53 ways for addressing public health issues, including behaviorally-based nutrition education (12-  
54 14). In particular, nutrition related issues, such as improving fruit and vegetable consumption and  
55 reducing cardiovascular risk factors, have become a growing focus (15-16). Furthermore, WIC  
56 clinics in numerous states are currently using the Internet to provide nutrition education to  
57 promote healthy food choices and eating behavior (17-19).

58         The project described in this paper studied the relative effectiveness of Internet nutrition  
59 education compared to traditional nutrition education methods (i.e., group education, self-guided  
60 nutrition education information malls) normally provided in WIC clinics. Two fruit and  
61 vegetable Internet modules were developed based on [wichealth.org](http://wichealth.org), a nutrition education system  
62 shown to be a highly popular and viable method for impacting movement in stage of change with  
63 a number of parent-child feeding issues (17-18). This website is currently used to provide stage  
64 of change-based nutrition education to WIC clinics in 15 states (18). It uses the model of client-  
65 centered nutrition education by first determining where participants are behaviorally, and then  
66 allowing them to choose lessons tailored to their interests and needs. This system further  
67 facilitates participants' movement along the stage of change continuum by helping them to  
68 identify barriers to change. Through feedback mechanisms that include empowering statements,  
69 clients remain engaged in the educational process, further aiding in the prevention of setbacks  
70 and minimizing the chance of reverting to a previous stage (20). Extensive evaluation found this



94 were existing WIC clients who had not yet received formal nutrition education associated with  
95 fruit and vegetable consumption. Participants self-selected to be part of either an Internet  
96 nutrition education group or a traditional nutrition education group. Internet nutrition education  
97 followed the established models and practices currently being implemented in the behavior-  
98 based wichealth.org Internet nutrition education system (18). Traditional nutrition education was  
99 either in the form of group nutrition education classes at the WIC clinic, using a standard fruit  
100 and vegetable education lesson, or a self-guided nutrition education information mall consisting  
101 of applicable educational material displayed on a bulletin board. As the focus of the study was to  
102 compare an Internet nutrition education approach to the standard practice currently being used in  
103 WIC clinics, agencies had the choice of using their own nutrition education materials, as long as  
104 the lessons met the learning objectives used for both methods of intervention. All participants  
105 were given the option to receive follow-up nutrition counseling provided by WIC clinic staff  
106 using motivational negotiation counseling techniques. WIC staff received training on  
107 motivational negotiation available via a CD-ROM or Internet-based self-tutorial (21). This self-  
108 study training program was approved for two hours (CPEU level 2) continuing education credit  
109 by the Commission on Dietetic Registration.

110 Data were collected online and at Michigan WIC clinics during 2005-2007. Two nine-  
111 month intervention phases were used to determine overall impact. Phase I focused on adult  
112 (caregiver) fruit, vegetable, and fruit juice consumption, while phase II focused on child  
113 consumption of the same. Each phase consisted of baseline data collection (obtained at the initial  
114 WIC certification visit) and three posttest surveys. Identical protocols for data collection were  
115 implemented and monitored by WIC staff in all study agencies.

116           The surveys consisted of up to 12 items, using a mix of “mark all that apply,” “select the  
117 best answer,” and categorical data type questions. All participants completed a baseline survey at  
118 enrollment. A posttest survey was administered immediately following each educational  
119 intervention (occurring up to three months after the baseline survey). The Internet group  
120 completed the survey online at the end of the educational session, while the traditional nutrition  
121 education group completed the same survey in a paper/pencil format following their intervention.  
122 Follow-up surveys were also administered during the participants’ next two WIC clinic visits  
123 (approximately three and six months post-intervention). Follow-up nutrition counseling was  
124 offered to all participants three months post-intervention. Attendance at follow-up counseling  
125 was voluntary and not all clients chose to attend.

126           Included in the first posttest were six Likert-scale items relating to the usefulness and  
127 helpfulness of the information, degree of learning that took place during the educational  
128 intervention, and beliefs about ability to make change based on what was learned. These items  
129 were adopted directly from existing wichealth.org survey methodology, which have previously  
130 undergone extensive psychometric testing, resulting in consistent factor analysis driven subscales  
131 (“usefulness” and “use”) and Cronbach alpha coefficients (between 0.82 and 0.90). A single  
132 staging item with five possible responses was used on all paper/pencil surveys to determine the  
133 impact on stage of readiness to change. Staging was automatically determined for the Internet  
134 nutrition education group based on user progression through web pages containing the same  
135 staging questions. Fruit and vegetable consumption was measured using three items adopted  
136 from the CDC Behavioral Risk Factor Surveillance System (22). Questions focused on how  
137 many times per day juice was consumed and fruits and vegetables were eaten.

### 138 **Statistical Analysis**

139 All quantitative data were analyzed using the Statistical Analysis Software (version 9.1.3, 2006,  
140 SAS Institute Inc, Cary, NC). Two sample tests for differences in binomial proportions were  
141 used to determine significance ( $p < 0.05$ ) associated with items related to “usefulness” and “use.”  
142 For change in stage movement, the significance ( $p < 0.05$ ) in relative risk of change was  
143 determined using the chi-square distribution. Independent samples t-tests were used to evaluate  
144 the mean difference ( $p < 0.05$ ) between groups in both fruit and vegetable consumption and the  
145 impact of follow-up counseling on consumption.

146 The Western Michigan University and Michigan Department of Community Health  
147 Institutional Review Boards approved the study protocol and all participants provided written  
148 informed consent during enrollment.

## 149 RESULTS

150 A total of 1,564 WIC clients elected to participate in this project, with 692 and 872 enrolled in  
151 phases I and II, respectively. Regardless of the addition of numerous retention strategies,  
152 approximately half (51.6%) either dropped out or were lost to follow-up. An oversampling  
153 process was used, as the anticipated dropout rate that was observed is consistent with previously  
154 reported research (23). Internet nutrition education group sizes for phases I and II were 139 and  
155 104, while 216 (phase I) and 318 (phase II) participants completed traditional nutrition  
156 education.

157 Demographic data were available for participants who completed the education  
158 interventions. Racial representation was similar to that found both within the study agencies and  
159 across the state WIC system. The majority of participants for each group across both phases were  
160 white. The greatest racial difference was observed in the phase II traditional education group.  
161 Traditional nutrition education participants tended to be younger in age on average across both

162 phases. Both intervention groups were similar in their relationship to the child and varied slightly  
163 in age of child enrolled in WIC. Participant prior exposure to other fruit and vegetable oriented  
164 education was similar for groups across both phases. Exposure to fruit and vegetable websites  
165 was similar for both groups in phase I but differed in phase II (see Table 1).

166 Internet nutrition education participants reported having easier access to computers from  
167 home, work, parent's home, or friend's home (72.5% and 72.2% for phases I and II,  
168 respectively) than the traditional nutrition education group (51% and 54%). Self-reported  
169 frequency of Internet use was also found to be higher among the Internet group for both phase I  
170 (60.8%) and phase II (75%) compared to those enrolled in the traditional nutrition education  
171 group (30.6% and 32.4%).

172 Over 95% of all participants found both intervention methods easy to use, easy to  
173 understand, and helpful, with the phase I Internet nutrition education group reporting  
174 significantly ( $p<0.05$ ) more positive results than the phase I traditional nutrition education  
175 group. Both intervention groups were highly positive, but not significantly different, in reported  
176 "usefulness" (i.e., learned something, belief in ability to make changes) of the education  
177 interventions. Also, the majority of participants in the Internet nutrition education group (82%  
178 of phase I and 74% of phase II) reported they liked to learn from the Internet better than other  
179 educational activities offered at the WIC agency.

180 The Internet nutrition education group differed significantly ( $p<0.05$ ) from the traditional  
181 nutrition education group in terms of progressing from preparation to action stages of change in  
182 relation to fruit and vegetable consumption over time. In both phases combined, 96.7% of  
183 Internet nutrition education participants beginning in earlier stages of change progressed to the

184 action stage by the end of the study, compared to 60.9% of the traditional nutrition education  
185 group.

186 At the phase I initial follow-up visit, the Internet nutrition education group demonstrated  
187 retention of positive behaviors over time by showing a significant ( $p<0.05$ ) increase in self-  
188 reported vegetable and fruit juice consumption compared to the traditional nutrition education  
189 group. Although longer-term behavior retention at six months was still positive for the Internet  
190 nutrition education group in phase II, it was not significantly ( $p<0.05$ ) different than the  
191 traditional nutrition education group's behaviors (see Table 2).

192 Phase I participants who chose Internet nutrition education without follow-up counseling  
193 had significantly ( $p<0.05$ ) greater consumption of vegetables, fruit, and fruit juice post-  
194 intervention as compared to the traditional nutrition education group without follow-up  
195 counseling. The addition of motivational negotiation counseling as a follow-up to traditional  
196 nutrition education resulted in a significant ( $p<0.05$ ) increase in fruit and fruit juice  
197 consumption equal to what was observed in the Internet nutrition education group that did not  
198 receive follow-up counseling. Phase II again demonstrated those who selected Internet nutrition  
199 education consumed more vegetables, fruits, and fruit juice than those who selected traditional  
200 nutrition education, although no significant statistical difference was observed. As previously  
201 found with phase I adult consumption patterns, the addition of follow-up motivational  
202 negotiation counseling to traditional nutrition education significantly ( $p<0.05$ ) improved child  
203 vegetable and fruit juice consumption in phase II (see Table 3).

## 204 DISCUSSION

205 Results of this study demonstrated the Internet nutrition education intervention to be a  
206 viable education method for many WIC clients who chose it. It employed the key concepts of

207 WIC's initiative for Revitalizing Quality Nutrition Services (RQNS) and its Value Enhanced  
208 Nutrition Assessment (VENA) project in that it was behaviorally focused and client-centered  
209 (24-25). The Internet nutrition education modules provided information clients found relevant  
210 and useful, it moved clients along the stages of change continuum in both adult and child fruit  
211 and vegetable consumption, and it demonstrated that WIC clients maintained the nutrition  
212 education and behavior they learned. These findings also demonstrated the Internet nutrition  
213 education group was highly satisfied with their experience. Regardless of advancement in stages  
214 of change, participants found the education helpful and easy to use and established their intent to  
215 improve on or continue healthy management of fruit and vegetable consumption behaviors.

216 WIC program staff also benefited from this online educational approach. Internet  
217 nutrition education, as modeled by [wichealth.org](http://wichealth.org), demonstrated both efficiency and effectiveness  
218 as a means for enhancing WIC nutrition education services to achieve positive health outcomes.  
219 The Internet nutrition education provided WIC staff with: (1) an effective means of providing  
220 nutrition education with less staff time used per client, (2) more time to address clients with high  
221 risk needs, and (3) more choices for providing nutrition education to clients; all of which support  
222 RQNS and VENA.

223 The finding that nearly all Internet nutrition education participants who began in earlier  
224 stages of change (pre-contemplation, contemplation, preparation) moved to the action stage  
225 following the intervention demonstrated solid intent to progress toward improving consumption  
226 of fruits and vegetables. Being that [wichealth.org](http://wichealth.org) provides an avenue for clients to meet their  
227 secondary nutrition education contact requirement, the behavioral intent associated with  
228 progressing in stage of change can provide WIC nutrition counselors with a starting point for the  
229 client's next clinic visit. As a result, WIC staff may be able to focus more directly on clients'

230 needs rather than having to re-establish where clients are in relation to their behavior change  
231 process.

232 An impressive finding was the Internet nutrition education group did not need follow-up  
233 nutrition counseling to have significant impact on consumption of fruits and vegetables. This  
234 finding has major implications for WIC staff who struggle with having enough time and  
235 resources needed to provide effective nutrition education (11). While it is not the intent for  
236 wichealth.org educational modules to be suitable for all WIC clients, participants who can and do  
237 use this educational mode free up critical WIC staff resources that can be used to provide  
238 individual counseling to high-risk and other WIC clients. Practically speaking, the Internet  
239 education program is one more tool in the nutrition practitioners' tool box for providing effective  
240 and efficient quality nutrition education. WIC clients who do not have access to or interest in  
241 Internet nutrition education can receive other forms of traditional nutrition education options,  
242 such as group classes, nutrition education information malls, or facilitated group discussions.

243 Review of recent literature concerning educational programs to increase fruit and  
244 vegetable consumption supports the results of this study. Stage of change based interventions  
245 incorporating some aspects of tailoring or motivational counseling have demonstrated significant  
246 increases in fruit and vegetable consumption (0.2 to 1.3 servings per day) compared to  
247 comparison or control groups (26-29). The increases observed in this study are impressive  
248 considering it is reported that only 28% of the U.S. population consumes the minimum  
249 recommendations of fruit servings per day and only 3% consume the minimum daily  
250 recommendations of vegetable servings, and close to 30% of older infants and toddlers in WIC  
251 are still not consuming a single serving of fruits or vegetables on a given day (30-31).

252 From the perspective of dietetic practice, findings emphasize the benefits of client-  
253 educator partnerships to help clients have more control of their educational experience, which is  
254 a benefit of the wichealth.org educational program. Since inception in 2002, clients have  
255 consistently identified time and convenience as being benefits associated with completing  
256 nutrition education online (32). The Internet nutrition education component of this intervention  
257 reinforces the ability of nutrition counselors to determine the stage of change of their clients and  
258 provide education that is truly client centered. The didactic nature of wichealth.org makes it a  
259 seamless process to stage client readiness to change. This enhances the possibility of actual  
260 behavior change in this population by reinforcing small steps toward change.

261 The ability to retain participants beyond the initial posttest survey was a limitation that  
262 may have impacted the study results. There were no marked differences between study  
263 participants and those lost to follow-up with regard to client age, child age, relationship to child,  
264 clinic, computer access, or race. The percentage of initial project enrollees that completed at least  
265 one posttest is consistent with findings reported elsewhere (23).

266 It was impractical to implement a randomized control study for this project while using  
267 operating WIC clinics, due to client nutrition education selection freedom and inability to control  
268 client time. The practicality of being able to actually study comparisons of nutrition education  
269 intervention modalities in a typical clinic setting overcompensated for the lack in ability to  
270 develop a randomized design. Comparisons within group (intervention and added counseling  
271 impact) have great value and are relevant. Comparison patterns between groups (Internet vs.  
272 traditional nutrition education) can be reported but need to consider that group differences may  
273 or may not have existed. Group size was ultimately influenced by the non-randomized study  
274 design. The project allowed participants to choose their preferred form of nutrition education,



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