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## **Results of a long-term follow-up evaluation of an Australian adult nutrition education program**

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**Running title:** Long-term results of an adult nutrition education

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## ABSTRACT

**Background and Objectives:** To assess persistence of improvements in nutrition-related attitudes and behaviours 2-4 years after attending an adult nutrition education program (FOODcents). **Methods and Study Design:** A link to an online survey was sent to 407 past FOODcents participants. The survey replicated items included in previous FOODcents evaluation surveys. In total, 87 responses were received (response rate 21%). Analyses were conducted on matched responses across 3 time points: pre, post, and follow-up. **Results:** Improvements since baseline were maintained in confidence to buy healthy foods on a budget and a range of dietary behaviours (e.g., increased consumption of vegetables, legumes, and wholegrain products; greater use of the nutrition information available on food packages; and decreased consumption of soft drinks). There were two primary areas in which improvements were not maintained over time: reported intake of fruit and frequency of consumption of fast food. **Conclusions:** The results suggest that adult nutrition education can be effective in encouraging individuals to alter their food shopping processes and modify their diets. The tendency for some behavioural outcomes to be worse at follow-up than at baseline indicates that marketplace factors such as food promotion and availability may be influencing these specific dietary behaviours. This rare longitudinal study of the effects of adult nutrition education shows that this form of intervention has the potential to produce lasting improvements in attitudes and behaviours. However, such programs cannot be expected to produce large and lasting effects without support from population-level nutrition policies and programs that address macro-environmental factors that influence dietary behaviours.

**Key Words:** Australia, nutrition education, adults, longitudinal, evaluation

## INTRODUCTION

Adult nutrition education is recognised as an important element of public health approaches to addressing obesity and reducing health inequalities resulting from suboptimal nutrition.<sup>1-3</sup> The World Health Organization's *Global Action Plan for the Prevention and Control of NCDs [non-communicable diseases] 2013–2020* nominates nutrition education as a component of the health-promoting environments that are needed to enhance health at the population level.<sup>4</sup> However, longitudinal evaluation data on the effectiveness of adult nutrition education interventions are lacking, especially in terms of outcomes for those from disadvantaged backgrounds.<sup>5,6</sup> Such evaluations are critical for informing government decisions relating to policy priorities within the broader area of diet and nutrition.<sup>7-9</sup> To provide insights of

relevance to this issue, the present study reports longitudinal outcome data on a Western Australian adult nutrition education program (FOODcents) that focused on improving nutrition literacy and healthy eating behaviours among those from disadvantaged backgrounds.

### ***FOODcents***

The FOODcents program involved face-to-face information and cooking sessions and was designed to (i) increase consumption of fruit, vegetables, and cereals; (ii) reduce consumption of foods high in salt, sugar, and fat; and (iii) better align food expenditure with the healthy diet pyramid.<sup>10</sup> FOODcents was developed by the Western Australian Health Department as a pilot project in 1992, with state-wide implementation commencing in 1995.<sup>11</sup> Different FOODcents courses were available to cater for varying levels of nutrition knowledge and specific areas of interest for program participants. Three course types were offered: individual (one-off workshops of 1-2 hours duration), comprehensive (2-3 sessions over 2-6 hours in total), and intensive (4-8 sessions over 4-16 hours in total). It is estimated that approximately 2,500 Western Australians attended FOODcents courses each year.

A comprehensive evaluation of the FOODcents program comprising multiple quantitative and qualitative components was undertaken between June 2012 and May 2014. The results demonstrated significant improvements in participants' nutrition-related confidence, knowledge, and purchasing behaviours, along with high levels of satisfaction with the pedagogical approach adopted in the delivery of course content.<sup>12-14</sup> Despite these results, the FOODcents program was terminated in mid-2016, with the Health Department redirecting funding to other community nutrition programs.

The impressive short-term evaluation results of the FOODcents program raise the question of whether improvements can be maintained over time. The aims of the present study were therefore to (i) assess whether the attitudinal and behavioural changes resulting from FOODcents course attendance persist over time and (ii) identify any curriculum areas that could benefit from booster sessions to reinforce learning and prevent deterioration in attitudinal and behavioural outcomes among those attending adult nutrition education programs.

## **MATERIALS AND METHODS**

Approval was obtained from Curtin University Human Research Ethics Committee (approval number RDHS 33-16) to recontact FOODcents participants who had provided contact details during the original evaluation. These participants were those responding to the pre-and post

in-session surveys, and as such there were two sets of data points already existing for each potential respondent. In total, 528 of the original 927 FOODcents attendees participating in the initial evaluation provided their contact details and gave their permission to be contacted for further research. At the time of the follow-up evaluation (April-May 2016), the time since attending a FOODcents course ranged from two to four years. This long period of elapsed time resulted in many of the provided contact details being no longer viable. In addition, a small number of those providing contact information did not have access to the Internet, which was necessary to complete the online survey.

In total, 407 individuals were able to be sent a link to the survey, with an AUD\$10 supermarket voucher offered as remuneration. The survey replicated items included in the previous pre- and post-session surveys (see Authors 2016a<sup>13</sup> for instrument and protocol details). Of particular interest in the follow-up survey were behavioural outcomes in the form of consumption of specific foods (e.g., fruit, vegetables, wholemeal products, beans, and legumes) and the use of recommended food selection techniques when grocery shopping (e.g., reading nutrition information on product packages and comparing prices using the price per kg method).

Respondents' follow-up survey data were matched to the data they provided in the pre- and post-course surveys. Changes over time were assessed using paired samples t-tests (for continuous variables) and Wilcoxon signed rank tests (for categorical variables).

## RESULTS

Of the 407 previous FOODcents participants sent the link to the online survey, 87 responded representing an effective response rate of 21%. Of these, 92% were female and 54% were 50 years of age or older. Initial analyses were undertaken to identify any systematic differences between those who responded to the follow-up survey invitation and those who did not according to their responses to the previous survey. There were no significant differences on the attitudinal variables of perceived course usefulness and understandability and the behavioural variables of pre-post changes in fruit, vegetable, and fast food consumption. There was one demographic variation between the two groups - females were more likely than males to respond to the invitation to participate in the follow-up survey ( $\chi^2(1) = 8.21, p = 0.004$ ). The results below are presented according to the following outcome variables: nutrition-related confidence and behaviours, utilisation of FOODcents resources, desire to attend future courses, and engagement in positive word-of-mouth communications about FOODcents.

In terms of confidence to buy healthy foods on a budget, 73% of the respondents indicated in their pre-attendance responses that they were confident or very confident, which increased to 89% in their post-session attendance responses ( $p=0.005$ ) and 91% in their follow-up evaluation responses ( $p=0.003$ ). There was therefore no deterioration from course completion to follow-up.

Dietary behaviour outcomes were assessed in two ways. First, fruit and vegetable intake and frequency of consumption of fast food were collected at pre, post, and follow-up (results shown in Table 1). Second, at follow-up respondents were asked to report whether their engagement in a broad range of dietary practices had changed since course attendance (results shown in Table 2). Table 1 shows that while the significant pre-to post improvement in vegetable intake was maintained at follow-up, the gain may be eroding over time. Counterintuitively, the results for fruit and fast food were worse at follow-up than at both the pre- and post-time points. This indicates that these respondents' diets had deteriorated in terms of consumption of these food products since the period prior to course commencement.

Of the other dietary behaviours assessed, the most substantial changes appeared to have occurred in relation to food shopping. As shown in Table 2, since attending a FOODcents course respondents reported more frequently (i) reading the nutrition information panel, (ii) reading the ingredients list, and (iii) comparing food prices using the price per kilo method. In terms of foods consumed, respondents reported eating wholemeal/rye bread products and beans/legumes more frequently and consuming soft drinks and pre-packaged biscuits and cakes less frequently compared to before attending the course.

When asked about the take-home resources provided during FOODcents courses, almost three-quarters (73%) of respondents reported having used the resources (43% 'a little' and 30% 'a lot'). A subsequent open-ended question asked respondents to nominate the specific resources they had used most often. The most commonly mentioned materials were recipes and nutrition guides, especially the wallet-sized reference cards.

Two-thirds (76%) of respondents reported they would be 'definitely' (33%) or 'possibly' (43%) interested in attending a face-to-face FOODcents refresher course, and 72% reported 'definitely' (26%) or 'possibly' (46%) being interested in accessing an online refresher course. More than two-thirds (70%) of respondents reported that they had recommended FOODcents to friends and family since completing the course.

## DISCUSSION

The results of this follow-up evaluation show areas in which the FOODcents nutrition program appears to have produced favourable long-term changes in participants' attitudes and behaviours. Improvements since baseline were maintained in confidence to buy healthy foods on a budget and vegetable consumption. In addition, respondents reported adopting healthier food shopping behaviours, such as consulting the mandated nutrition information on product packaging. This is important in light of previous research indicating that consumers tend to have low levels of utilisation of this information,<sup>15</sup> especially those from disadvantaged backgrounds.<sup>16</sup> Further, high levels of satisfaction with and use of the FOODcents resources were reported, and more than two-thirds of the respondents had recommended FOODcents to family and friends. Overall, these results are noteworthy given the short-term nature of the intervention and the long elapsed period since exposure.

There were two areas in which behavioural improvements were not only unsustainable, but had deteriorated over time: respondents reported reduced fruit intake and more frequent consumption of fast food. In both cases, the follow-up results were worse than pre-course baseline levels, indicating larger social forces are at play that may be influencing certain dietary behaviours. For example, in recent years there has been heavy media coverage of fad diets that involve eschewing entire food groups, including carbohydrates.<sup>17</sup> Sugar has been a focus of attention, resulting in increased consumer concerns about this nutrient,<sup>18</sup> which may be dampening fruit consumption. The increase in frequency of fast food consumption is more inexplicable, but may reflect a worsening economic climate and high levels of price discounting by fast food chains.<sup>19</sup> As such, it is likely that interventions such as adult nutrition education programs cannot be expected to produce substantial and ongoing effects in isolation, and instead need to be supported with other population-level efforts that focus on the quality of the food supply, the way in which foods are marketed, and the provision of nutrition information across all stages of the lifespan.

In terms of improving adult nutrition education programs, the results of the present study suggest that booster or refresher sessions may assist individuals to consolidate and reinforce their learning and that such courses are likely to be considered appropriate and desirable by the target group. Given the possible negative consequences of broader societal trends on respondents' diets, such courses may also be beneficial in countering any misinformation disseminated by the media, thereby preventing deterioration in outcomes due to pervasive external forces.

### ***Study limitations and future research***

The primary limitation of this follow-up evaluation is the relatively low response rate that limits the generalisability of the results. This is likely to be at least partially attributable to the inevitable attrition associated with longitudinal research studies covering extended periods of time,<sup>20</sup> and especially those involving disadvantaged populations.<sup>21</sup> A further limitation is that although there did not appear to be attitudinal or behavioural differences between this sample and that of the previous survey, females were more likely than males to respond to the invitation to participate, which may have affected the results. However, the capture of data from the same individuals over multiple time points within a two- to four-year time period is a major strength of the analysis, providing assurance that the identified trends are likely to be valid for this group. Indeed, the very long follow-up period for this kind of intervention indicates that the maintained improvements were highly persistent. Such multi-point, longitudinal evaluations are rare and further work of this kind is required to expand the very small evidence base relating to the long-term effects of adult nutrition education. In particular, it would be advantageous to collect data relating to a wider range of variables to facilitate more detailed analyses of the factors impacting on food choices. For example, monitoring food availability and affordability over the time periods of longitudinal studies could provide insight into the extent to which macro-environmental factors may contribute to the results obtained. In addition, the inclusion of a control group that is not exposed to a nutrition education program could provide greater insight into both the short- and long-term changes in knowledge and behaviour that could be attributed to the intervention as opposed to other changes occurring in the socio-cultural environment.

Overall, the results of the present study suggest that adult nutrition education programs can facilitate lasting changes in participants' food consumption patterns, but without reinforcement at least some improvements will deteriorate in the face of counteracting forces. Future program evaluations may be designed to assess the forces behind any such deterioration and identify effective forms of inoculation that can be applied. A further promising area of future research is in the area of health economics. The benefits of such programs could be quantified in terms of their long-term implications for individuals' diets and health. Economic evaluations of the EFNEP program and other nutrition education programs in the United States have found that the costs associated with program delivery are outweighed by societal-level health improvements,<sup>6,22,23</sup> supporting the proposition that nutrition education programs are likely to represent economically viable approaches to improving health outcomes at the population level.

To conclude, this study contributes to the very small body of work demonstrating the extent to which attitudinal and behavioural improvements achieved in adult nutrition education programs can be maintained. This information should be of value to policy makers in determining future investments in public nutrition education and to practitioners in their efforts to identify those areas requiring subsequent reinforcement to minimise deterioration in outcomes over time.

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## **CONFLICT OF INTEREST AND FUNDING DISCLOSURE**

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**Table 1.** Self-reported fruit, vegetable, and fast food consumption

Reported food consumption	Pre M (SD)	Post M (SD)	Follow-up M (SD)
Serves of fruit	1.75 (0.92)	1.88 <sup>†</sup> (0.73)	1.63 (0.74)
Serves of vegetables	2.77 <sup>‡§</sup> (1.48)	3.65 (1.67)	3.30 (1.61)
Number of days fast food consumed in previous week	0.56 (0.89)	0.49 (1.14)	0.68 (0.78)

<sup>†</sup>Significantly different from follow-up at  $p < 0.05$ .

<sup>‡</sup>Significantly different from post at  $p < 0.001$ .

<sup>§</sup>Significantly different from follow-up at  $p < 0.05$ .

**Table 2.** Self-reported changes in various dietary behaviours

Behaviours	Follow-up	
	M <sup>†</sup> (SD)	% <sup>‡</sup>
Choose wholemeal/rye bread	3.74 (0.84)	65
Eat legumes or beans	3.67 (0.74)	61
Drink cordial or cool drinks (including diet versions)	1.76 (1.04)	79
Eat pre-packaged biscuits or cakes	1.91 (0.90)	78
Look for low-salt varieties	3.57 (1.11)	53
Change recipes to make them healthier	4.04 (0.84)	72
Read the Nutrition Information Panel (NIP)	4.29 (0.80)	84
Read the ingredients list	4.18 (0.88)	80
Look at price per kilo	3.95 (1.01)	68

<sup>†</sup>Response scale: 1 = Much less, 2 = Less, 3 = Same, 4 = More, 5 = Much more.

<sup>‡</sup>% reporting 4 or 5 for favourable positive change or 1 and 2 for favourable negative change.