



Can addressing food literacy across the life cycle improve the health of vulnerable populations? A case study approach

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Abstract

Issue addressed: Food literacy programs aim to improve an individual's knowledge and skills in the planning, management, selection, preparation and eating of healthy foods. Unhealthy dietary patterns across the life cycle are associated with an increased risk of chronic disease. Foodbank WA's *Healthy Food for All*[®] (HFFA) team has made addressing health inequity a priority, by enhancing food literacy skills of vulnerable people across the lifespan.

Methods: A case study approach was utilised to explore HFFA's suite of evidence-based food literacy programs: *Food Sensations*[®] (FS) for Parents (of 0-5 year olds), FS for Schools (kindergarten to Year 12), Fuel Your Future (adolescents 12-18 years), and FS for Adults (FSA) (18 years and over). These programs are contextualised to meet the needs of vulnerable groups at all life stages.

Results: In the last decade the HFFA team have delivered 5047 food literacy sessions to over 62 000 vulnerable Western Australians. Evaluation results demonstrate the FS programs are successful at improving vulnerable people's food literacy skills and dietary behaviours. For example, over 70% of participants make at least one positive food behaviour change after attending FSA.

Conclusions: By targeting vulnerable people of all ages, HFFA's food literacy programs provide multiple opportunities for intervention, to enhance health behaviours, and therefore reduce risk of chronic disease.

So What? Food literacy programs are one effective strategy that is complementary in helping to address the health inequities in Australia. Government and broader community investment in food literacy initiatives is vital to improving the health outcomes of vulnerable populations.

KEYWORDS

food literacy, health equity, life cycle, nutrition education, vulnerable groups

1 | INTRODUCTION

In developed countries, a person's health is significantly influenced by the social determinants of health, which the World Health

Organisation defines as "the circumstances in which people grow, live, work and age, and the systems put in place to deal with illness."¹ Within the Australian context, individuals residing in regional and remote areas,²⁻⁴ and those who identify as Aboriginal,^{5,6} are more

likely to experience social and economic disadvantage, discrimination, and may be geographically or socially isolated; all which can ultimately impact their access to health care and nutritious foods.^{4,6-8} These factors may contribute to more frequent engagement in poor health behaviours (such as smoking, inactivity and suboptimal dietary intake),^{5,9} which lead to a higher risk of illness, chronic disease and other health problems.¹⁰

Health inequity is evident across the life course, from birth to old age,¹¹ therefore, it is important for health professionals to consider socioeconomic status and other determinants when designing health promotion interventions.¹² In an effort to reduce health inequities across the population, governments have invested in programs and initiatives that address health literacy. To have a good level of health literacy requires an individual to be able to “access, understand, appraise, and apply health information” for the purpose to manage their health care, to prevent disease and to maintain or increase quality of life.¹³

As an element of health literacy, food literacy as a term describes a collection of inter-related knowledge, skills and behaviours (components) essential to achieving a healthy diet, captured within the four domains of plan and manage, select, prepare, and eat.¹⁴ Programs designed to improve food literacy can vary extensively in intervention type, strategies employed, target group, setting, duration, evaluation methods, theoretical model and food literacy domains addressed.¹⁴ Programs that address one or two domains of food literacy, such as preparation and eating as is the case in *Jamie Oliver's Ministry of Food* (Australia),¹⁵ *Cook It Up!* (Canada),¹⁶ and *Good Grubbin'* (US),¹⁷ have been shown to improve cooking skills and confidence. However, interventions that incorporate all four domains defined by the Australian Food Literacy and Context Model, provide to participants the full set of inter-related food literacy knowledge, skills and behaviours required to strengthen an individual's relationship with food and respond to change.¹⁴ Notable examples include *Cooking Matters for Adults & Families* (US),¹⁸ *Expanded Food and Nutrition Education Program* (U.S.),^{19,20} and *Stephanie Alexander's Kitchen Garden Foundation* that operates in schools across Australia.²¹ While several food literacy programs are in operation both in Australia and internationally, to the author's knowledge no other program is tailored to the needs of all age groups, and few address all four domains of food literacy.

For such interventions to be effective and translate to behaviour change, it is essential for programs to be tailored to the specific population group to account for the cultural, social and economic factors that influence diet and food choices.^{22,23} Furthermore, each age and development stage throughout a person's lifespan has different dietary needs for optimal growth and development,^{24,25} therefore, food literacy programs that cater for all ages provide multiple opportunities for intervention across the life cycle.

Foodbank in Western Australia (WA) has developed a strong global reputation for broadening its focus from its core business of food relief, to the incorporation of food literacy programs.²⁶ While this focus on food literacy can be seen as early as 1997, the

commitment to addressing health inequity and enhancing the healthy eating behaviours of individuals and groups at risk of experiencing social and economic disadvantage was formalised in 2007 with the establishment of the *Healthy Food for All*[®] (HFFA) team.²⁶ Currently, the HFFA team consists of 19 university qualified nutritionists, dietitians and health promotion officers dedicated to improving the nutrition knowledge, cooking skills and attitudes of vulnerable people of all ages. This is done by the development and implementation of a suite of evidence-based food literacy education programs called *Food Sensations*[®] (FS). Alongside FS, the School Breakfast Program has provided healthy breakfast products to nearly 500 schools for almost 20 years as previously described by Butcher et al.²⁶ A strong network of partners have also been trained to deliver FS programs on behalf of the HFFA team to extend the reach and sustainability of the programs across the state. The School Breakfast Program and Professional Training are outside the scope of this paper, and therefore will not be discussed.

FS programs currently include FS for Parents (FSP) of 0-5 year olds, FS for Schools (FSS) in Kindergarten to Year 12, Fuel Your Future (FYF) with adolescents 12-18 years of age, and FS for Adults (FSA) 18 years and over. The HFFA team of professionals are highly skilled in tailoring to participants' life stages, literacy levels and cultural backgrounds.

Food literacy programs are generally designed to meet community needs rather than the rigorous requirements of a scientific study, and as such there is a dearth in the literature outlining the delivery and evaluation of these programs. With a growing body of demonstrated success, the FS programs act as an evidence-based model for health professionals, with a similar goal of improving health outcomes of vulnerable populations, to build upon and to shape their own interventions. The purpose of this article is to provide a comprehensive overview of the FS tailored food literacy education programs across the life cycle and demonstrate how each contributes to reducing the health inequities of people at risk of social and economic disadvantage.

1.1 | Background information: food sensations program descriptions

FS is an interactive nutrition education and cooking initiative, developed to promote healthy lifestyles and build food literacy. FS programs are tailored to the requirements of low literacy groups across all ages. FS engages a wide range of individuals including school children, adolescents, parents, people experiencing mental illness, seniors, prisoners, culturally and linguistically diverse groups, Aboriginal and Torres Strait Islander people, disability groups, refugees, and those living in regional and remote areas. Most of these groups are recognised as being vulnerable to food insecurity and health inequity.²⁷

The content in FS programs has been informed by the Australian Dietary Guidelines,²⁸ and includes topics such as the

Australian Guide to Healthy Eating; fat, sugar and salt investigation in food and drinks; meal planning; budgeting; food safety and basic cooking skills. The FS curriculums have been mapped to the Australian Food Literacy and Context Model's eleven components (descriptors of food literacy including knowledge, skills and behaviours). Described components are grouped into four domains (plan and manage, select, prepare, and eat) and all domains are necessary for a person to be considered food literate.¹⁴ FSA and FSP programs (see Figure 1) aim to improve skills within the four domains of food literacy across multiple workshops, thus ensuring all components are addressed. While FSP Pilbara, FSS and FYF are stand-alone workshops, skills from all food literacy domains may be not taught in a single session; however, program lesson plans collectively cover the four domains. Frequent visits to the Pilbara region ensure participants have several opportunities to improve skills in all the domains. The inclusion of this model in the curriculum development process guarantees all important Australian contextual factors have been recognised, and ensures the provision of the necessary technical skills for participants to attempt behaviour change.¹⁴ Figure 1 illustrates an overview of the HFFA team's FS program structure.

FSP engages parents of children aged zero to five living in areas of social disadvantage, to improve parents' knowledge, skills and attitudes around providing nutritious meals for themselves and their families. Initially established for the Pilbara region of WA, FSP Pilbara consists of four, 2-hour stand-alone workshops tailored to address the challenges faced by parents in regional and remote areas in the Pilbara. During 2019, rigorous formative research was undertaken by Foodbank WA to expand the reach of FSP to the rest of Western Australia. The resulting program, FSP statewide, comprises of a series of five, two and a half hour workshops. Tailored to address the challenges faced by parents, the program provides realistic information to drive meaningful behaviour change. FSP has a similar format and guiding principles to the other FS programs, but also incorporates topics specific to the needs of parents with

young children such as introducing solids and child development stages. Further, FSP aims is to increase the confidence of parents to apply positive parenting practices to support healthy eating for their whole family. FSP is guided by the Health Belief Model and Social Learning Theory.²⁹

FSS is a stand-alone, 1- to 2- hour session of hands-on nutrition education and cooking. The program is tailored to suit the needs of school children aged between four and 18 years (Kindergarten to Year 12) in schools throughout WA. Complementing the Australian National Health and Physical Education Curriculum,³⁰ FSS is delivered throughout WA (FSS statewide) and with increased intensity to the Pilbara region through the Pilbara Strategy (FSS Pilbara). The FSS program is based on the Social Learning Theory; a theory that people learn from one another via observation, imitation and modelling.³¹

FYF is designed as four, 1- to 2- hour stand-alone workshops to improve the cooking and food literacy of young people aged 12-18 years. Originally designed for implementation predominantly in the Perth metropolitan area (FYF statewide), a change in funding priorities led to the re-design of FYF to suit regional and remote delivery in the Pilbara region (FYF Pilbara). FYF engages with adolescents to provide practical skills and curriculum-linked knowledge relating to cooking and nutrition topics. The delivery of the program is guided by the Social Learning Theory and Socio Ecological Theory of behaviour change. The program content has been developed to influence behaviour change at individual, interpersonal, organisational and policy level by incorporating capacity building among students and health professionals.³¹

FSA is a statewide program consisting of a series of four, two and a half hour sessions. FSA provides a safe, social and interactive environment for participants over the age of 18 to increase their food literacy. The Health Belief Model³² and Social Learning Theory²⁹ guide the delivery of FSA, to predict, influence and build self-efficacy in behaviour change. A more detailed description of the development process and comprehensive findings from this program have previously been published.³³⁻³⁶

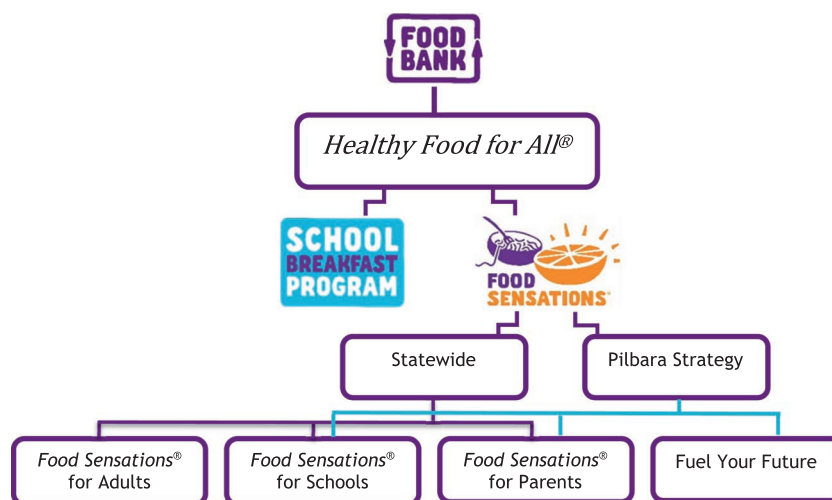


FIGURE 1 Food Sensations program structure

2 | METHODS

2.1 | Study design

A mixed-methods, retrospective, collective case study approach was used in this research.³⁷ The use of a case study design allows an in-depth exploration of how the FS food literacy programs (FSP, FSS, FYF and FSA) collectively contribute to reducing the health inequities of vulnerable people across the life cycle. The FS programs utilise a combination of qualitative and quantitative evaluation methods within a wide range of evaluation tools. This case study draws upon evaluation data captured from January 2010 to December 2019. In addition to program outputs, such as session numbers and participant demographics, this case study focuses on three key outcomes of the FS programs, which include: improvement of knowledge, skills and attitudes; translation of food literacy into improved food behaviours; and flow on effects to family and community.

2.2 | Data collection

A range of evaluation tools and data collection methods are utilised for each FS food literacy program, tailored to suit the needs of the target group (see Table 1). Process and impact data were collected by the FS programs' individual teams of two to six university qualified nutritionists and dietitians, and outcome data were collected by external evaluators at Curtin University of Technology and Edith Cowan University. For this case study, process data were collected from 2011 to 2019 cumulative FS statistics spreadsheets, 2010-2019 Pilbara programs' statistic spreadsheets, and 2010 FSS statistics spreadsheets; equalling to a total of 21 documents. All process data were recorded in Microsoft Excel. Quantitative impact and outcome data were derived from the each program's most recent annual evaluation reports (2019 for all but statewide FYF, which was 2015). This included four reports, as all Pilbara-based program evaluation was in one report. Qualitative data for this case study were collected from open-ended questions on evaluation surveys, feedback emails, case studies and program participant and stakeholder interviews from 2010 to 2019. Due to piloting of FSP statewide in 2019, evaluation tools, program outputs and comprehensive evaluation results are not included in this study.

2.2.1 | Process data

Program output data are reported monthly by each team, and recorded using Microsoft Excel. This process evaluation data include total number of organisations (hosting FS programs), sessions and participants.

2.2.2 | Impact and outcome data

Impact evaluation of the FS programs is measured using pre-post and post-evaluation surveys, to identify changes to food literacy

knowledge, skills and attitudes of the primary target group. For some programs, these surveys also capture demographic data including the location of participants, their age, level of food security and whether they identify as an Aboriginal or Torres Strait Islander person. In addition to this impact evaluation data, the FSA pre-post survey also measures quantitative outcome evaluation through participant behaviour change three months post-program. Behaviour change is only measured in multi-session program's post evaluation (FSP statewide and FSA). Following a single session (FSP Pilbara, FSS and FYF) insufficient time has elapsed to allow for behaviour change to occur between delivery of lesson content and the administration of the post evaluation forms. Qualitative outcome evaluation data are collected in the FSS and FSA programs by case study interviews of the primary and secondary target groups. Annual reviews and updates of evaluation tools occur based on participant and stakeholder feedback and evolution of the programs' content, ensuring the maintenance of high-quality data collected.

All FS programs utilise a combination of paper-based and online questionnaires to capture evaluation data of primary (participant) and secondary (stakeholder) target groups. The survey tools vary between each program due to differences in funding allocation to evaluation, as well as being tailored to meet the needs of the target groups. For example, school students complete a paper-based pre-post program evaluation survey for FSS statewide. All teachers (both primary and secondary) are emailed an online post-evaluation survey following a FSS session. In order to minimise the need for literacy requirements, FSP Pilbara participants are evaluated using a practitioner-led discussion group that is audio-recorded and later transcribed.

2.3 | Data analysis

The case study methodology allows for the corroboration of multiple data sources and collection methods from the HFFA team's FS programs. This methodology has been utilised to highlight overall changes to participants' food literacy knowledge, skills, attitudes and behaviour, as well as illustrate the flow on effects to their families and communities. Data analysis for this case study occurred in December 2019 and January 2020. Quantitative data for all paper-based pre-post evaluation surveys were analysed using SPSS (IBM) version 25. Across every program, differences in pre-post evaluation survey responses were measured using paired t-tests, Wilcoxon signed ranks test, McNemar's and McNemar-Bowker tests. For each program test, the $P < .05$ was considered statistically significant. For qualitative data, semi-structured focus groups or interviews were fully transcribed and subjected to thematic analysis based on the key research questions and program objectives. Responses to open-ended questions and comments provided in the various surveys were analysed in the same way. Direct quotations from interview transcripts and survey responses have been used in this article to illustrate key themes and issues. Qualitative and quantitative evaluation results have been

TABLE 1 Impact and outcome evaluation tools and methods of primary and secondary target groups of the *Food Sensations*[®] programs

	Quantitative		Qualitative	
	Primary target group (participants)	Secondary target group (stakeholders)	Primary target group (participants)	Secondary target group (stakeholders)
<i>Food Sensations</i> for Parents (Pilbara)	N/A	Paper-based pre-post program survey	Practitioner-led group discussion (PLGD)	Paper-based pre-post program survey (stakeholders) ^a
<i>Food Sensations</i> for Parents (statewide)	N/A	N/A	N/A	N/A
<i>Food Sensations</i> for Schools (statewide)	Paper-based pre-post program survey	Electronic post-program survey (teachers)	1. Paper-based pre-post program survey ^a 2. Participant case study interviews ^b	1. Electronic post-program survey (teachers) ^a 2. Paper-based post-program survey
<i>Food Sensations</i> for Schools (Pilbara)	Paper-based pre-post program survey	N/A	N/A	Electronic post-program survey (teachers) ^a
Fuel Your Future (statewide)	Paper-based pre-post program survey	Paper-based post program survey	1. Paper-based pre-post program survey ^a 2. Post-program interviews	1. Paper-based post-program survey ^a 2. Post-program Interviews
Fuel Your Future (Pilbara)	Paper-based pre-post program survey	Paper-based post-program survey	N/A	1. Paper-based post-program survey ^a 2. Electronic post-program survey
<i>Food Sensations</i> for Adults	1. Paper-based pre-post program survey 2. 3-month post-program survey	Online surveys to partners, on an as-needs basis	1. Paper-based pre-post program survey ^a 2. Participant case study interviews 3. Participant focus groups	1. Stakeholder case study interviews 2. Online surveys to partners, on an as-needs basis ^a

^aOpen ended questions included.^bBefore 2018 only.

triangulated³⁸ to analyse the reach and impact of FS programs in addressing food literacy in Western Australians experiencing disadvantage.

2.4 | Ethics approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee, and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all adult individual participants included in the study, and approval for evaluation on school sites was attained from the Department of Education. Pictorial evaluation forms were used to assist those with limited literacy or questions were read to participants with very low literacy by teachers, evaluation assistants or care workers. Ethics approval has been granted by Edith Cowan University and Curtin University Human Research Ethics Committees for involvement of both children and adults.

3 | RESULTS

3.1 | Target group reach

Table 2 outlines the FS program output data for the past decade and demonstrates the expansion of the programs across the life cycle and WA. In the last decade the HFFA team has delivered 5047 food literacy sessions to over 62 000 vulnerable Western Australians. In 2019, FS programs' number of participants ($n = 8449$) was six times larger than that of 2010 ($n = 1411$). In those 9 years there has also been a recorded increase in the number of FS sessions by more than nine fold, and the number of schools and organisations engaged in the programs increased approximately six fold.

All of the FS programs' target groups are at risk of experiencing economic and social disadvantage, while the age groups and specific locations vary. In 2019, 47% ($n = 3992$) of all program participants resided in regional or remote areas in WA. Of the FSA participants completing evaluation, over three quarters resided in low or middle income areas as determined by the Australian Bureau of Statistics Socio-Economic Indexes for Areas (SEIFA).³⁹ Over a third (41%) of FSA participants indicated some level of food insecurity at program commencement.³⁵ Aboriginal people made up 9% of the FSA participants in 2019; more than double the state's population average of 3%.⁴⁰

The school based programs operate where there is an identified population, or the school is determined as disadvantaged by the Index of Community Socio-Educational Advantage (ICSEA) rank. A rank of 10 represents the most disadvantaged 10% of the school communities. The mean decile rank for participating schools was 7.9 and almost half had decile ranks of 9 or 10.⁴¹ Approximately 80% ($n = 450$) of participating schools indicated their students experienced poverty, food insecurity and family dysfunction.⁴¹

3.2 | Improvement of knowledge, skills and attitudes

A review of program evaluation data collected over the past decade reveals consistency in measuring for change in food literacy knowledge, skills and attitudes. Although evaluation tools differ between programs and between years, an overall increase within-subjects in knowledge, skills and attitudes was consistently attained from pre- to post-program for each FS program over the last 10 years. Knowledge indicators measured include concepts such as the Australian Guide to Healthy Eating, Australian Dietary Guidelines, nutrition information panel reading, food safety, meal planning and budgeting. In 2019, the majority of FSS Pilbara student evaluation results measuring knowledge concepts indicated a statistically significant improvement ($n = 459$ – 470 , $P < .001$) from pre- to post-FSS session. An example of this is the ability to correctly identify healthy breakfast foods increasing by 15% ($n = 467$, $P < .001$).⁴² This is a reflection of results since 2016, with an overall significant increase in student identification of most knowledge concepts of $P < .01$. Similarly, since 2016, the FYF Pilbara program has achieved significant increases ($P < .05$) in youths' ability to correctly identify key knowledge concepts, such as label reading where knowledge increased by 48% ($n = 23$), and by 38% for knowledge of safe knife skills ($n = 24$) in 2019.⁴² This common theme was also reported in 2019 FSP Pilbara qualitative findings with parents reporting a consistent knowledge improvement through attending the FSP Pilbara program every year.

"I love learning about this kind of stuff. I don't think your knowledge ever ends. Like, there is always something you can learn. I would even do something like this every year, cause things change, don't they? Something you do regularly."—FSP Pilbara participant, 2019

Food literacy skills measured included knife skills, healthy food preparation, hand washing, reading and cooking new recipes. Qualitative data collated from 2019 FSS statewide secondary student responses measured learnings post-session, with 45% ($n = 129/288$) of responses attributed to skills gained; the two highest being learning how to cook a new recipe (23%, $n = 67/288$) followed by knife skills and safety (10%, $n = 29/288$).⁴³ Quantitative data from 2019 FSS Pilbara student evaluation results indicated significant increases in key skills pre- to post-session, including self-reported cooking ability (23% increase, $n = 464$, $P < .001$) and correct knife holding techniques (21% increase, $n = 462$, $P < .001$).⁴² A significant 10% increase in youth participants' skills to prepare a healthy meal at home from pre- to post-workshop was also recorded in 2019 FYF Pilbara data ($n = 127$, $P < .05$).

Food literacy attitudes are measured through the intention for positive behaviour change, improvements in food literacy confidence and the importance placed on good nutrition and cooking self-efficacy. Student attitudes significantly increased from pre- to

TABLE 2 Food sensations program output data from 2010 to 2019

Program outputs									
Year	Food sensations for parents (Pilbara)	Food sensations for parents (statewide)	Food sensations for schools (statewide)	Food sensations for schools (Pilbara)	Fuel your future (statewide)	Fuel your future (Pilbara)	Food sensations for adults	Total	
Number of schools/organisations									
2019	8	Pilot	71	13	—	10	108	210	
2018	9	—	70	12	—	8	99	198	
2017	7	—	71	13	—	9	108	208	
2016	4	—	73	14	—	10	78	179	
2015	—	—	73	12	19	—	101	205	
2014	—	—	57	14	13	—	123	207	
2013	—	—	64	15	Pilot	—	121	200	
2012	—	—	81	14	—	—	104	199	
2011	—	—	65	13	—	—	13	91	
2010	—	—	33	3	—	—	—	36	
Total	28	0	658	123	32	37	855	1733	
Number of sessions									
2019	19	Pilot	178	75	—	20	415	707	
2018	24	—	149	80	—	28	391	672	
2017	24	—	163	74	—	24	425	710	
2016	10	—	165	75	—	20	298	568	
2015	—	—	153	49	110	—	221	533	
2014	—	—	164	55	50	—	337	606	
2013	—	—	183	62	Pilot	—	288	533	
2012	—	—	163	33	—	—	266	462	
2011	—	—	128	26	—	—	27	181	
2010	—	—	71	4	—	—	—	75	
Total	77	0	1517	533	160	92	2668	5047	
Number of participants									
2019	107	Pilot	3760	1132	—	187	3263	8449	
2018	144	—	3065	1151	—	330	3065	7755	
2017	106	—	3219	996	—	243	3311	7875	
2016	37	—	3236	1199	—	153	2573	7198	
2015	—	—	3500	748	238	—	1731	6217	

(Continues)

TABLE 2 (Continued)

Program outputs									
Year	Food sensations for parents (Pilbara)	Food sensations for parents (statewide)	Food sensations for schools (statewide)	Food sensations for schools (Pilbara)	Fuel your future (statewide)	Fuel your future (Pilbara)	Food sensations for adults	Total	
2014	—	—	3742	772	104	—	2638	7256	
2013	—	—	3935	858	Pilot	—	2182	6975	
2012	—	—	3521	567	—	—	1907	5995	
2011	—	—	2459	502	—	—	232	3193	
2010	—	—	1369	42	—	—	—	1411	
Total	394	0	31 806	7967	342	913	20 902	62 324	

post-session in 2019 FSS statewide data, indicating a high level of agreement for questions such as “Making healthy food choices is important to me” ($n = 278$, $P < .001$) and “I think healthy food is easy to cook” ($n = 277$, $P < .001$).⁴³ In 2019 FSA data, adult participants indicated significant increases in seeking low cost healthy foods (43% improved, $n = 660$, $P < .0001$), making changes in food choices ((42% improved, $n = 650$, $P < .0001$), cooking a variety of healthy meals (41% improved, $n = 654$, $P < .0001$) and confidence in budgeting for food (37% improved, $n = 659$, $P < .0001$) from pre- to post-program.³⁶ Similarly, 2019 FSP Pilbara qualitative evaluation of parent participants demonstrated a change in attitude post-session, with parents expressing intention for behaviour change in cooking healthier foods and new recipes at home, involving children in cooking activities, introducing new foods, and reported on an improved food literacy confidence.⁴²

“... it's so good to have something like this where you're really getting accurate information and you can go home feeling confident.”—FSP Pilbara participant, 2019

3.3 | Translation of food literacy into improved food behaviours

In the FSA program, where behaviour change is assessed as part of the pre- post-evaluation, 74% ($n = 971$) of participants over a two and half year period of program implementation, made positive behaviour change in three domains (plan and manage, select, and prepare) of food literacy as a result of attendance.³⁶ These participants also reported an average increased consumption of 0.25 ($n = 1013$, $P < .001$) serves of fruit and 0.5 ($n = 1009$, $P < .001$) serves of vegetables.³⁶ These outlined behaviour changes in improved food literacy skills, as well as fruit and vegetable consumption, have been consistent since the current program's commencement in 2016.

Likewise, qualitative findings from the programs also indicate participation has the potential to translate into positive food behaviour change. Behaviour changes reported ranged from decreased consumption of sugar to altered dietary patterns resulting in weight loss.

“I don't put as much sugar in my drinks now, like milo. We have lots of Coke in our fridge but now I just get my water bottle instead” – Male, FYF statewide participant, 2015

“Full time carer, of a friend & live in same house. I completed the Food [Sensations for Adults] program approx 2 yrs ago and still use some of the recipes. I am looking for more. Since doing the program I have made many changes and even though slow, I have just clocked up a goodbye to 20 kgs of weight. Thank you :).”—Female, FSA participant, 2019

3.4 | Flow on effects to family and community

Evidence over the last decade indicates the benefits of the FS programs often extend beyond the attendees to their families and communities. In 2019, the majority of FSA participants had shared the program materials with others at the time of the post-questionnaire administration, with 72% sharing and an additional 22% intending to share. Qualitative findings across the programs support the concept of sharing food literacy messages and changing family cooking practices. Additional supporting materials can be provided upon request.

"Mike, a community builder, has seen countless men transformed by Foodbank WA's Food Sensations® for Adults. In the wake of the education, Mike's own eating patterns have changed, his wife's, children and grandchildren's have changed too. He could happily talk to you all day about the positive changes he has seen in men's lives at his local men's shed. All because of Food Sensations for Adults. Mike saw an opportunity years ago for the need to teach men of all ages about healthy eating and how to cook. Since then, Food Sensations for Adults has been delivering sessions to his men's shed and as a result, countless men have gone from eating takeaway to three course dinners."—Excerpt from an FSA case study interview of a male FSA program organiser, 2019

"Students, parents, staff and community members participate in these programs, which has had inter-generational health and wellbeing impacts. All ages continue to participate in healthy cooking, nutrition information sessions."—Teacher, Pilbara area, 2019

"I didn't really know how to cook before but now I know how to cook things for my family. It's also healthier foods too, not just rubbish."—Female, FYF statewide participant, 2015

"They will go home and tell their parents and grandparents about how many sugars are in something or salt. That information will be shared. They will take that away."—Teacher, regional area, 2017

"The class reassured me, especially to know we're on the right track. Gave me peace of mind that what I'm doing is right and he[r son] is normal."—Female, FSP Pilbara participant, 2018

Foodbank WA's HFFA team. The contribution of these programs to the health and food literacy of individuals and groups at risk of experiencing social and economic disadvantage has also been described. By adopting a life cycle approach, the FS programs provide multiple opportunities for intervention, and are able to tailor content to meet the specific needs of participants. To the authors' knowledge, the HFFA team is the first of its kind, both in Australia and internationally, to demonstrate its commitment to food literacy across the life cycle by developing a suite of food literacy programs consisting of FSP, FSS, FYF and FSA, designed to engage individuals at any age. Several food literacy programs have demonstrated positive nutrition knowledge and behaviour outcomes within an Australian context; however, all focused on specific sub-populations and age groups.⁴⁴⁻⁴⁹ Internationally, whilst *Cooking Matters for Adults and Families*¹⁸ and the *Expanded Food and Nutrition Education Program*^{19,20} in the US cover a wide range of ages, they do not cover the entire life cycle from birth to old age.

Growth in FS service delivery since 2010, and thereby the greater number of participants attending programs, has been primarily driven by funders' recognition of the HFFA team's expertise in the area of food literacy and dedication to delivering evidence-based programs. This increased reach may also be attributed to the lack of other comprehensive food literacy programs on offer for the community (particularly in regional areas) and an increased interest in nutrition and cooking across the population.^{50,51} The expansion of the HFFA team over the years has meant more Western Australians have had the opportunity to increase their food literacy skills and potentially improve food behaviours. Over the past decade, evaluation findings have continued to show an increase in knowledge and skills post-program for participants of all FS programs. Furthermore, FSA has shown a positive shift in behaviours post-program completion and demonstrated an increase in fruit and vegetable consumption consistently since 2016.

The success of FS is driven by many factors, which have ensured a high quality of service and a commitment to continuous improvement. All FS facilitators are university qualified nutritionists or dietitians, undertake ongoing professional development, and are up-skilled in facilitation practice, behavioural management and cultural competence. The employment of suitably qualified and highly skilled facilitators ensures the session content and resources are based on the best available scientific evidence; safeguarding HFFA's reputation as the preferred nutrition education and cooking program provider for vulnerable groups in Western Australia. The HFFA team regularly review program content based on evaluation findings and current research, and ensure all lesson plans and resources are continuously improved to reflect best practice. Participant engagement, enjoyment and retention is maximised by ensuring each program is tailored to the life stage and unique requirements of the target population.

Service provision is extended to regional areas across WA, by the utilisation of video conferencing technology in partnership with Community Resource Centres (CRC's) and health professionals in local communities. Facilitators from each program travel to regional

4 | DISCUSSION

This paper acts as a case study through the provision of a comprehensive overview of the food literacy programs delivered by

and remote areas across WA to deliver their respective programs in person and gain a firsthand knowledge of the unique needs of regional and remote settings. Health professionals, teachers and support staff in regional and remote communities are trained in FS programs to ensure FS is accessible to as many Western Australians as possible and delivery can be sustained across the state. All educators trained in FS have free online access to FS lessons plans, resources, activity kits and ongoing training to ensure the fidelity of FS programs. Participants, host organisations and health professionals are invited to join the HFFA mailing list and Facebook group to reinforce the knowledge, skills and behaviours learnt in FS. Over the past decade, the HFFA team have been committed to creating a sustainable model of delivery by nurturing the wide network of schools, government agencies, youth centres, parenting and community organisations who have hosted or participated in one or more FS programs, and it is this network that has been integral in ensuring the ongoing demand and success of FS. However, whilst Foodbank WA and the HFFA team have demonstrated their commitment to a sustainable model of delivery statewide, this will only be possible with continued ongoing funding and support from third party organisations.

As individuals move through different life stages, the knowledge, skills and confidence obtained in one FS program can be shared and transferred across other stages in the life cycle. Alternatively, participants potentially have the opportunity to enrol into a subsequent program suited to their life stage, thus providing a top-up of existing knowledge, in addition to the introduction of new concepts (eg FYF to FSA). Qualitative findings and facilitator observations demonstrate participants are sharing food literacy messages and changing family cooking practices suggesting the programs have a positive intergenerational impact. A child completing FSS and sharing learnings with another family member, or an adult or parent completing FSA or FSP and influencing the food behaviours of their child, are examples of positive knowledge or behaviour exchange. This flow on effect has been seen to extend amongst households, extended families and friends, and to the wider community. This research provides important insight into tailored food literacy programs, and their role in developing knowledge, skills, attitudes and behaviour change in disadvantaged populations, an area that currently has limited attention in the literature.

In addition to age and life stage, tailoring must be considered for demographic factors such as gender, race, religion and locality. The adaptability and skill required by the facilitators to tailor each program ensures each target group receives the relevant information to meet their social, cultural and economic needs. Within the FS programs groups can be diverse, such as an all-male group in a regional area of WA, or disengaged adolescents of different ages at a youth centre.

Two-principle criticisms of existing food literacy interventions are the lack of a theoretical basis and the use of nonvalidated evaluation measures.⁵² Adding to the strength of FS, all aspects of program design are underpinned by an appropriate theoretical framework

(such as the Social Learning Theory), and validated evaluation tools, adapted to suit the needs of the audience, are utilised to measure program effectiveness. The HFFA team have found that adequate resourcing for independent and external evaluation is necessary to achieve quality unbiased program findings. External evaluators have the necessary expertise to guarantee evaluation instruments are reliable and appropriate.⁵³ Additionally, an external evaluator has the capacity to be objective, and participants are more willing to share their opinions of the programs.⁵³ These factors, along with ongoing internal evaluation of the programs, drive a commitment to quality improvement.

Whilst there are limitations to this case study, it is important to highlight that HFFA's FS programs are not designed for scientific rigour and reproducibility, but rather have been developed and tailored to meet the needs of vulnerable groups and communities in WA. The advantage of using a case study methodology to highlight the FS programs is that it allows for a detailed exploration of the programs' impacts using multiple data sources, collection methods and analysis, in the context of addressing health equity in vulnerable populations. The success of FS and other food literacy programs, and evaluation of these interventions, will continue to be limited by funding. Whilst the FS interventions address food literacy across the life cycle, due to funding limitations there are still many disadvantaged groups in WA that HFFA's programs are not tailored for or do not meet the needs of, such as adolescents (statewide) and disability groups. The FS programs are supported by multiple government and nongovernment funding bodies and as such, the evaluation methods and tools differ for each program contract stipulation, making consistency in evaluation results and analysis between programs infeasible.

Whilst data triangulation is most appropriate for this case study, it should be acknowledged that the collaboration of data from multiple sources can lead to potential investigator biases, and conflicts due to each programs' various theoretical frameworks. Other limitations of this case study relate to measurement errors inherent in all self-reporting evaluation processes, such as self-selection and response biases of participants,⁵⁴ and quality of evaluation data obtained due to low literacy levels of the target groups. The majority of the evaluation tools utilised by HFFA's FS programs measure changes in food literacy knowledge and attitudes (impact evaluation) and there is an emphasis within the HFFA team to better capture changes in food literacy behaviour outcomes in the future.

5 | CONCLUSION

The success of HFFA's suite of food literacy programs serves to address health inequity by improving health outcomes in disadvantaged Western Australians across the life cycle. This case study adds to the limited body of research demonstrating the potential impacts of evidence-based food literacy programs for groups at every life stage, who are at risk of experiencing social and economic

disadvantage. The authors want to highlight the importance of publishing health promotion interventions, to ensure the continued growth of the evidence-base, and contribution to the development of best practice criteria in this area in order to improve the health outcomes of vulnerable populations. As health inequity is evident from birth to old age,¹¹ health professionals seeking to reduce inequity and enhance healthy eating behaviours must ensure programs and strategies are addressing the specific needs of each stage across the life cycle.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICS APPROVAL

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all adult individual participants included in the study, and approval for evaluation on school sites was attained from the Department of Education. Ethics approval has been granted by Edith Cowan University and Curtin University Human Research Ethics Committees for involvement of both children and adults.

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