

Does school health and home economics education influence adults' food knowledge?

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Summary

Home economics and health teachers are to be found in many parts of the world. They teach students about food in relation to its nutritional, safety and environmental properties. The effects of such teaching might be expected to be reflected in the food knowledge of adults who have undertaken school education in these areas. This study examined the food knowledge associations of school home economics and health education among Australian adults. Two separate online surveys were conducted nationwide among 2022 (November 2011) and 2146 Australian adults (November–December 2012). True/false and multiple choice questions in both surveys were used to assess nutrition, food safety and environmental knowledge. Knowledge scores were constructed and compared against respondents' experience of school health or home economics education via multiple regression analyses. The results from both studies showed that home economics (and similar) education was associated with higher levels of food knowledge among several age groups. The associations of home economics education with food knowledge differed across several Australian states and recall of home economics themes differed across the age groups. These findings suggest that home economics education may bring about long-lasting learning of food knowledge. Further research is required, however, to confirm the findings and to test the causal influence of home economics education on adults' food knowledge.

Key words: survey, food knowledge, home economics, education, Australia

INTRODUCTION

Food in all its forms plays a central role in all cultures of the world. It is central to the global debates relating to human health such as the prevention and amelioration of obesity and metabolic disease ([Moodie *et al.*, 2013](#)) and environmental sustainability ([Khan *et al.*, 2009](#)). As part of these debates, there have been calls for greater education of the population about food matters ([Lichtenstein and Ludwig, 2010](#)), especially about the dissemination of food preparation skills ([Weaver-Hightower, 2011](#); [Department for Education, 2013](#)). This is associated

with growing interest in food literacy education ([Vidgen and Gallegos, 2014](#)) and includes the knowledge required by citizens to lead active healthy lives.

Although for the past three or four decades food education has not been at the forefront of educational activity, it has demonstrable utility. For example, [Wardle *et al.*](#) showed that people with high levels of nutrition knowledge were 23 times more likely to consume the recommended amounts of fruit and vegetables on a daily basis ([Wardle *et al.*, 2000](#)). Other research has shown that people who learn cooking skills are more likely to

consume healthy foods (Brown and Hermann, 2005; Clifford *et al.*, 2009; Bukhari *et al.*, 2011). Nevertheless, home economics, which is the key discipline for the dissemination of food skills and knowledge and is the only subject area that focuses on everyday life and meeting basic needs in the school curriculum (Smith and De Zwart, 2010), disappeared from many educational curricula two or three decades ago or has been replaced by food technology or more 'scientific' subjects (Goldstein, 2012). Some forms of food knowledge have survived in school health courses such as nutrition, though even this has tended to focus on single nutrients (Jacobs and Tapsell, 2007), often completely failing to deal with more relevant forms of nutrition knowledge required to cope with the metabolic disease epidemic.

A report from the UK Cabinet Office in 2008, however, marks a renewal of emphasis on food issues (UK Cabinet Office, 2008). The report noted that food is integral to environmental and agricultural policy, health and safety and social and foreign policy. A key point made in the report is that an integrated approach to food is required in which there is understanding of the multifaceted roles of food in daily life and in national and international affairs. Thorough and wide knowledge of food is usually provided in home economics curricula to enable future citizens to choose safe and healthy foods that do not harm their families, other humans or animals and the environment (Smith and De Zwart, 2010).

Recently, there has been a renewal of interest in school food education. For example, the Department for Education in the UK has recently mandated compulsory cooking education for all children between 8 and 14 years (Department for Education, 2013). For this movement to progress further, several questions need to be answered.

(1) *Which types of food education do citizens require?* We have conducted a series of studies of experts and citizens to answer this question (available from the authors, Worsley *et al.*, 2013). Most consumers suggest a mix of topics involving both the dissemination of skills and declarative knowledge relating to several areas such as nutrition and health, food safety, sustainable environments, marketing, planning and preparation of meals and a number of ethical issues (e.g. the treatment of animals in food production). These topics were reviewed in detail in the Labelling Logic report published by the Australian Government in 2011 (Blewett *et al.*, 2011).

(2) *What are the influences on people's food knowledge?* There has been relatively little examination of this question. Most of the evidence to date focuses on demographic associations of various forms of nutrition knowledge. Six studies suggest that women know more about

nutrition than men (Hendrie *et al.*, 2008; Ozcelik and Ucar, 2008; Grimes *et al.*, 2009; Lin and Yen, 2010; Lin *et al.*, 2011; Choui *et al.*, 2012). The relationship of nutrition knowledge with age is more uncertain: five studies have shown them to be positively related (Berg *et al.*, 2002; Hendrie *et al.*, 2008; Grimes *et al.*, 2009; Kresic *et al.*, 2009; Lin and Yen, 2010), two found negative associations (Hendrie *et al.*, 2008; Dickson-Spillman and Siergrist, 2010), Bakhomah (Bakhomah, 2012) and Charlton *et al.* (Charlton *et al.*, 2010) found no associations, and Wardle *et al.* (Wardle *et al.*, 2000) found that middle-aged people had the highest level of knowledge. Four studies have shown that duration of education is positively related to nutrition knowledge (Hendrie *et al.*, 2008; Dickson-Spillman and Siergrist, 2010; Lin and Yen, 2010); however, Grimes *et al.* found no association (Grimes *et al.*, 2009).

There has been little examination of other areas of food knowledge though it might be expected that similar demographic trends might apply. One recent study we conducted of Australians' basic knowledge of Australian agriculture revealed generally low levels of knowledge and few gender, educational differences, although knowledge did increase with age (Worsley *et al.*, 2014). If similar weak demographic associations are shown to apply to other areas of food knowledge, then it would be possible, for example, to focus communication efforts on demographic groups that have lower levels of knowledge.

(3) *Does school education influence adults' food knowledge?* The little amount of research into this question mirrors the generally low priority given to food education, despite the major physical, temporal and human resources expended in school education in health and related curricula. To date, we have identified only one report, from Ireland, which showed that home economics education was associated with higher food safety knowledge in adulthood (McCarthy *et al.*, 2007). Probably most people assume that school education imparts long-lasting knowledge, but does it do so when it comes to food knowledge? A closely related question is: *Do the different food-related curricula directed by different regional education authorities result in higher levels and different types of food knowledge among adults?*

The main aims of this article, therefore, are to investigate the last two questions above, specifically:

- (i) The influences on various forms of food knowledge in adults, including likely demographic influences, as well as the possible influence of health or home economics education at school. Based on the literature cited above, we expected that age, female gender, duration of education and the presence of children under

18 years of age in the household will be associated with higher levels of knowledge. We also expected that health or home economics education would also be associated with greater levels of food knowledge since these are the main subjects in the school curriculum that communicate about food issues.

- (ii) Whether the different curricula taught in the States of Australia bring about different types and levels of knowledge in adults. For many decades, the Australian States have designed and taught their own health- and food-related curricula, though there appears to have been a shift about 20 years ago towards food technology (Henry, 1990; Williams, 1994). Nevertheless, we expected that State differences might be associated with different types and levels of knowledge.

METHODS

Sampling and administration

Two studies were conducted in Australia as part of two online surveys of the adult population. The first survey was conducted in November 2011 ($n = 2022$) and the second in November and December in 2012 ($n = 2146$). Both surveys were based on quota samples in which the gender, age and education groups were represented to match their proportions in the Australian population (Australian Bureau of Statistics, 2012; Table 1). The participants in each survey were selected from the Global Market Insights (GMI) research database and invited to participate via email. The GMI research database includes individuals who have voluntarily enrolled themselves

to take part in surveys in return for reward points. Participants who agreed to be involved in the research were emailed a link to an online Food and Health Concerns Survey. Both surveys used cross-sectional designs and were part of a larger project examining the predictors of Australian consumers' food knowledge.

GMI recruits its panels by using a mixture of methods including opt-in email, co-registration, e-newsletter campaigns, search engine marketing and traditional banner placements. A variety of checks are used to ensure the quality of the survey data. These include confirmation of email addresses and locations, various fraud-screening measures and the barring of previously rejected respondents.

Ethics permission was granted by the Deakin University Faculty of Health Human Ethics Committee (HEAG-H127: 2011 and HEAG-H137 2012).

Study 1 questionnaire

The Food Knowledge Survey 2011 was designed to examine how much Australian adults know about the components of a healthy diet, the nutrient content and health consequences of foods, safe food practices and a variety of environmental and ethical food issues such as animal welfare and climate change. The questionnaire included the following items.

Nutrition knowledge

Twenty-six items were arranged in four broad sets relating to knowledge of nutrition recommendations, nutrition composition, nutrition function and food label knowledge. Four choice and true/false response formats were used. The responses were recoded as true or false (1, 0) answers through reference to a previous validation study conducted by us (available from the corresponding author) as well as previous published studies. *Nutrition recommendation, nutrition composition, nutrition function and food label knowledge* scores were derived by summing the totals of correct answers for each section and then dividing by the number of items in each section. A *total nutrition knowledge score* was then derived by summing the *nutrition recommendations, nutrition composition, nutrition function and food label knowledge scores* (Table 2).

Food safety knowledge

Similar to the nutrition knowledge scores above, a *food safety knowledge score* was derived by summing the correct/false recoded responses across the seven food safety items (Worsley *et al.*, 2013; Table 2).

Table 1: The demographic and education characteristics of the respondents in Studies 1 and 2

	Food survey 2011 total $n = 2022$	Food survey 2012 total $n = 2146$
Age (years)	43.6 (14.2)	45.9 (16.1)
Male (%)	1019 (50.4%)	1008 (47%)
Female (%)	1003 (49.6%)	1138 (53%)
Percentage who studied health or home economics at school (%)	1088 (53.8%)	898 (41.8%)
Presence of children under 18 years of age in the household (%)	678 (33.5%)	672 (31.3%)
Percentage with university education (%)	639 (31.6%)	769 (35.8%)

All values are presented as percentages except for mean (s.d.) for age.

Table 2: Summary of regression analyses of the food knowledge scores in Studies 1 and 2

	Nutrition function knowledge score Standardized β	Nutrition recommendation knowledge score Standardized β	Nutrition composition knowledge score Standardized β	Total nutrition knowledge score Standardized β	Food label knowledge score Standardized β	Food safety knowledge score Standardized β	Environment and ethics knowledge score Standardized β
Study 1, 2011							
R^2	11.4%	15%	12.8%	15.4%	3.5%	5.3%	7.2%
Age	0.205****	0.273****	0.289****	0.288****	0.083****	0.212****	0.168****
Gender	0.178****	0.201****	0.140****	0.174****	–	–	–0.84****
Education level	0.099****	0.109****	0.146****	0.142****	0.101****	0.065****	0.217****
Children	0.118****	–	–	0.048**	–	–	–
School health or home ec.	0.134****	0.165****	0.143****	0.185****	0.163****	0.130****	0.111****
Study 2, 2012							
R^2	3.4%	10.5%	12.8%	11.7%	–	11.5%	3.8%
Age	0.111****	0.240****	0.268****	0.235****	–	0.281****	0.73****
Gender	0.064****	0.207****	0.221****	0.215****	–	0.175****	–
Education level	0.115****	0.077****	0.140****	0.137****	–	–	0.152****
Children	–	–	–	–	–	–	–0.056**
School home ec.	108****	0.101****	0.095****	0.115****	–	0.106****	0.123****

Notes: R^2 = the proportion of variance in the knowledge scores accounted for by the predictor variables. Children: Presence of children under 18 years in the household; School home ec.: School home economics or a similar subject. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$.

Environmental and ethical knowledge

Again as for the previous forms of knowledge, the responses to the 31 items in this section were recoded and summed to yield an *environmental and ethical knowledge* score (Table 2). Full details of all the food knowledge items used in Studies 1 and 2 are available from the authors.

Demographic and background information

The demographic characteristics of the respondents were assessed by questions about gender (coded as 1 = male and female = 2), age (a continuous variable but also coded into age bands 1 = 18–29, 2 = 30 = 39, 3 = 40–49, 4 = 50–59, 5 = 60 and above), educational background (1 = Year 11 or less, 2 = Completed Year 12, 3 = TAFE or trade qualification, 4 = University qualification), home economics/health studies completed at school (1 = no, 2 = yes) and presence of children under 18 years of age in the respondent's household (coded as 1 = no, 2 = yes; Table 1).

Study 2 questionnaire

The Food Knowledge Survey 2012 was similar to that of Study 1. The knowledge scores were calculated and coded using the same procedures as those of the Study 1; however, because other predictive variables were included in this study (Farragher, unpublished, available from the authors), the number of knowledge items was reduced though those included were the same as in Study 1. Thus, there were 19 items about nutritional knowledge, 5 items relating to food safety and 6 environmental knowledge items. The scores derived from the 2012 survey included *nutrition recommendation*, *nutrition composition*, *nutrition function*, *food safety* and *environmental knowledge* scores. A *total nutrition knowledge* score was then derived by summing the *nutrition recommendations*, *nutrition composition* and *nutrition function* scores (Table 2).

No *food label knowledge* scores were calculated for the 2012 survey. Demographic and background information was also coded in a similar manner to Study 1 with the exception of three new questions: *Did you study home economics or a similar subject at secondary school (e.g. domestic science, food technology, etc.)?* (no = 2, yes = 1, I can't remember = 3), and, *what do you remember most about this subject in school?* Recipes (coded as 1), cooking techniques, e.g. how to simmer or sauté (coded as 2), safety in the kitchen (coded as 3), preparation techniques, e.g. measuring, dicing (coded as 4), budgeting (coded as 5), something else (coded as 6) and *did you learn about food-related topics (e.g. nutrition, diet and health relationships, environmental impact of food production) in any other subjects at school?* (no = 2, yes = 1).

Data analysis

All statistical procedures were conducted via SPSS version 21 (SPSS, 2012). The demographic and home economics study characteristics of the respondents to both surveys were summarized by frequency counts (Table 1). The percentages of respondents who answered each item correctly were also calculated (available from the corresponding author). Stepwise multiple regressions were carried out on each of the knowledge scores in Studies 1 and 2 with age, gender, educational level, presence/absence of children under 18 years of age in the household, and school health or home economics as predictor variables (Table 2). These were repeated within each age band (18–29, 30–39, 40–49, 50–59, 60 years and over) and State (Tables 3 and 4). Finally, Study 2 respondents' recall of the topics they had learned from their home economics education was compared in a cross-tabulation analysis (Table 5).

RESULTS

Participants in both surveys were of similar ages (Table 1), but fewer nominated that they had studied home economics or a similar subject in the 2012 survey. About one-third of the respondents in both surveys had one or more children under 18 living with them. Similarly, approximately one-third of the respondents were university graduates. The genders were approximately equally represented in both surveys.

The results of the multiple regression analyses of the knowledge scores across the two studies were similar, allowing for the smaller number of items and the narrower definition of home economics (which did not include health) in Study 2. The amounts of variance explained by the predictors in Study 1 were generally higher than that in Study 2. Age was positively associated with all of the knowledge scores in both studies. Gender was positively associated with all the scores except Food Label knowledge and Food Safety knowledge and negatively with Environmental and Ethics knowledge in Study 2, and Food Label knowledge in Study 2. Overall, women tended to know more about nutrition and safety issues than men. General education was also positively linked to most scores in both studies except for Food Label knowledge and Environmental and Ethics knowledge in Study 2.

In both studies, respondents who had undertaken home economics at school recalled more about food issues than those who had not (Table 2). The findings in Study 2, which focused on school home economics education, were similar to those in Study 1, which focused on school health or home economics education. The size of the regression

Table 3. Study 2: differences between respondents who had undertaken or not undertaken home economics (or a similar subject) at school by age group

Age groups	Nutrition function knowledge score Standardized β	Nutrition recommendation knowledge score Standardized β	Nutrition composition knowledge score Standardized β	Total nutrition knowledge score Standardized β	Food label knowledge score Standardized β	Food safety knowledge score Standardized β	Environment and ethics knowledge score Standardized β
Study 1, 2011							
18–29 <i>n</i> = 467	0.216***	0.195***	0.153***	0.213***	0.122**	0.098*	0.133**
30–39 <i>n</i> = 417	–	0.175***	0.183***	0.206***	0.207***	0.141***	0.111**
40–49 <i>n</i> = 418	0.219***	0.189***	0.173***	0.229***	0.240***	0.172***	0.128**
50–59 <i>n</i> = 400	–	–	–	0.138**	0.181***	–	–
60 and over <i>n</i> = 320	–	–	–	–	–	0.158**	0.133*
Study 2, 2012							
18–29 <i>n</i> = 239	0.198***	0.215***	0.193***	0.233***	–	0.334***	0.201***
30–39 <i>n</i> = 392	0.154***	0.101*	0.126**	0.133**	–	0.145***	0.218***
40–49 <i>n</i> = 416	0.128**	0.141***	–	0.123**	–	–	0.124**
50–59 <i>n</i> = 419	0.148***	–	–	–	–	–	0.105*
60 + years <i>n</i> = 680	–	–	–	–	–	–	–

Notes: The coefficients in the columns are the standardized regression coefficients (β) between each knowledge score and the school health or home economics variable across age groups in the 2012 Food Knowledge Survey; positive regression coefficients indicate higher scores among those who had undertaken home economics or a similar subject at school. –, not significant.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.000$.

Table 4: The associations of food knowledge scores with school health or home economics across the States of Australia in Studies 1 and 2

	Nutrition function knowledge score Standardized β (P)	Nutrition recommendation knowledge score Standardized β (P)	Nutrition composition knowledge score Standardized β (P)	Total nutrition knowledge score Standardized β (P)	Food label knowledge score Standardized β (P)	Food safety knowledge score Standardized β (P)	Environment and ethics knowledge score Standardized β (P)	10 items total nutrition knowledge score Standardized β (P)
Study 1, 2011								
NSW <i>n</i> = 640	0.191***	0.168***	0.117***	0.156***	0.186***	0.134***	0.142***	
VIC <i>n</i> = 482	0.176***	0.173***	0.124**	0.098*	0.175***	0.116**	0.090*	
QLD <i>n</i> = 406	–	–	–	0.103*	0.113**	–	–	
SA <i>n</i> = 157	–	0.281***	0.287***	0.390***	0.343***	0.222**	–	
WA <i>n</i> = 206	0.221***	0.406***	0.307***	0.347***	0.436***	0.232***	0.230***	
Study 2, 2012								
NSW <i>n</i> = 587	0.094*	0.110**	0.100**	0.107**	–	–	0.100**	0.085*
VIC <i>n</i> = 561	0.130***	–	0.102**	0.111**	–	0.154***	0.146***	–
QLD <i>n</i> = 409	0.140***	0.113*	–	0.117**	–	–	107*	0.111**
SA <i>n</i> = 208	–	–	–	–	–	0.184***	–	–
WA <i>n</i> = 199	–	0.223**	0.151*	0.201***	–	0.145*	–	–

Notes: The coefficients in the columns are the standardized regression coefficients (β) from univariate analysis between each knowledge score and the school health or home economics variable. The results for the Northern Territory and Australian Capital Territory and Tasmania are not shown due to insufficient samples sizes. Standardized regression coefficient; –, not significant.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.000$.

Table 5: Percentages of respondents across age groups who remembered aspects of their home economics education in Study 2 (2012)

Study 2, 2012	Age groups				
	18–29, % (N)	30–39, % (N)	40–49, % (N)	50–59, % (N)	60 and over, % (N)
What do you remember most about home economics at school?					
Recipes	22.9 (24)	18.7 (36)	18.4 (38)	17.3 (32)	11.5 (24)
Cooking techniques	10.5 (11)	23.3 (45)	28.0 (58)	37.3 (69)	39.4 (82)
Preparation techniques	21.9 (23)	21.2 (41)	24.6 (51)	19.5 (36)	24.5 (51)
Cooking and preparation	32.4 (34)	44.5 (86)	52.6 (109)	66.8 (105)	63.9 (133)
Safety in the kitchen	34.3 (36)	20.2 (39)	11.6 (24)	8.1 (15)	10.1 (21)
Budgeting	1 (1)	6.7 (13)	4.8 (10)	3.2 (6)	4.3 (9)
Something else	9.5 (10)	9.8 (19)	12.6 (26)	14.6 (27)	10.1 (21)
χ^2 (P)	83.343 (0.001)				

coefficients associated with school health or home economics education in Study 1 was similar to those associated with gender, greater than those associated with general education or the presence of children but less than the relationships between age and food knowledge. In Study 2, similar relationships were observed though the size of the associations of home economics was smaller than those associated with demographic variables (Table 2).

The regression analyses of the home economics/health studies associations with the various scores by age group were similar between the two studies, with the relationships generally being smaller in Study 2 (Table 3). Overall, the findings suggest that people up to age 50 who had undertaken home economics education tended to have higher scores on most of the scales. Total nutrition knowledge and environmental and ethical knowledge appeared to extend to the age of 60 ('over sixties').

The comparisons across the larger States of Australia showed some distinct differences, especially in Study 1 with regard to the higher regression coefficients observed among respondents who had been educated in Western Australia (Table 4). This trend was not repeated for South Australia in Study 2, but the Western Australian regression coefficients appear to be larger than those associated with the other States as in Study 1. Within the findings for each State, it is clear that some regression coefficients were larger than others. For example, in Study 1 the Victorian results show that nutrition function knowledge, nutrition recommendations knowledge and food label knowledge were associated with bigger differences between home economics educated and non-home economics educated respondents than the other scores (Table 4). In Study 2, however, these differences were attenuated.

In Study 2, an additional question was included: *What do you remember most about home economics at school?*

The greatest number of respondents chose cooking techniques (39.4%, Table 5) followed by preparation techniques (24.5%), with budgeting being the least recalled (4.3%). There were major differences in the age groups' recall of cooking techniques. Almost four times as many respondents aged 60 and over recalled cooking techniques compared with those aged 18–29 years (Table 5). In contrast, over three times as many 18–29-year olds compared with the over sixties recalled safety in the kitchen (Table 1). No statistically significant differences in recalls were associated with either State of residence or the presence of absence of children under 18 years in the household. Ninety respondents mentioned other things they remembered about their HE courses. Sixteen remembered all the listed topics, 28 reported they could not remember anything, 13 mentioned cooking or sewing, 4 recalled food manufacturing or farming, 17 had negative memories either being bored or disliking the teacher and 12 mentioned miscellaneous topics.

DISCUSSION

The demographic characteristics of the two samples were similar. The findings of greater nutrition and safety knowledge among women and the generally greater knowledge of older and higher educated people are consistent with those from previous studies (gender: 18, 19, 20, 21, 22, 23; age: 19, 20, 21, 24, 25; education: 20, 21, 27, 28). These findings support the external validity of the two studies. The lower standardized regression coefficients observed in Study 2 may be a consequence of the lesser number of items making up the knowledge scores in that study.

The findings from both studies strongly suggest that health or home economics education is related to the various forms of food knowledge. The replication of the findings from Study 1 by the shorter scores from Study 2

suggests that these relationships are fairly stable between samples, and the size of the relationships appears similar to those associated with general education and the presence of children in the household. The interpretation of these findings, however, requires caution. At face value, the results suggest that home economics (or similar) education may result in people having food knowledge than those who have not undergone such education. Given the content of home economics education, this is an entirely reasonable explanation. However, other explanations of these correlations may be equally plausible. For example, respondents who were more interested in food and health matters may have selected to undertake these forms of education or may have been more attentive to the information provided in the various courses they undertook.

Furthermore, the respondents may have continued to learn about food and health interests throughout life because of their interest in these areas. Longitudinal or experimental approaches are required to clarify the direction of the home economics–food knowledge relationships observed in these studies. Nevertheless, the findings do suggest that home economics education may have effects on people's food knowledge long after their schooling has been completed. To our knowledge, only McCarthy *et al.*'s study of Irish students' food safety knowledge has shown similar links with home economics education (McCarthy *et al.*, 2007).

The observation that people who had undertaken home economics education at school had higher levels of various types of food knowledge than others many years afterwards (Table 3) suggests that this form of education may have long-term effects. Again, this may be due, at least in part, to a prior interest in food and health matters, but it is consistent with the notion that home economics, with its high relevance to daily life issues and practices, communicates learning for a lifetime. Again, more investigation is required in future studies to examine, for example, the reasons for some types of knowledge having greater longevity than others (Table 3) and whether home economics education 'primes' people to continue learning about food and health issues after they have left school. Cardemil *et al.*'s work on the skills required to recover from failures in Philadelphia school children suggests that the provision of skills during education enables people to learn from their mistakes and experiences to develop skills (Cardemil *et al.*, 2007). Similar skills development may occur in food transformation processes such as cooking, the provision of basic skills during education, allowing people to continue to develop them during their lives.

The State comparisons shown in Table 4 provide some evidence to suggest that local conditions may affect

respondents' food knowledge. Both Western Australia and South Australia in Study 1 displayed stronger associations of home economics education with several forms of food knowledge. This was only partially replicated in Study 2, where the associations among the Western Australian group of respondents were generally higher than among the other respondents. One possible explanation may be differences in the content of the home economics curricula taught in the States or differences between the ways these curricula were taught, though despite searches of the Australian home economics literature and discussion with experienced home economics educators, these remain elusive. Although these associations were not very stable between the studies (perhaps because of the use of differing knowledge measures), they lend support to the view that home economics education results in higher levels of food knowledge.

Further evidence about the likely effects of home economics education was provided by the respondents in Study 2, who were asked what they remembered from their school home economics subjects (Table 5). The two major age group differences in these reports suggest that over the last 40 years, cooking skills have become less salient and food safety more salient. This appears to mirror the changes which have taken place in home economics curricula during this time (Curriculum Corporation, 1996). This again supports the view that home economics teaching has long-term effects on food knowledge.

Implications for teaching

These findings support the influence of home economics curricula on the general population of consumers over several decades. They provide some evidence to support the maintenance and extension of home economics teaching in Australian schools. The age group differences in recalled learning (Table 5) suggest that the shift towards food technology that occurred in the curriculum 20 years ago may have weakened the emphasis on cooking and preparation in favour of safety issues, though this might also be a result of the drift towards risk aversion in Anglo societies (Furedi, 2005). Overall, the State and age group differences in food knowledge and the differences in the recall of home economics learning between the age groups suggest that home economics teaching has lasting effects.

Limitations and further research

These two studies have several limitations that influence the interpretation of these findings. First, they were cross-sectional studies and, as noted above, causal attributions cannot be made from them alone. Further examination

of the influence of home economics teaching on food knowledge and skills is required. A longitudinal monitoring study of a representative sample of students over 10 or 20 years or longer would help establish the causal role of home economics education. Alternatively, randomized control trials of home economics programmes with long-term follow-ups may provide similar evidence in a shorter time. A second limitation lies in the nature of the food knowledge scores. Although these were composed of validated items, they could be improved. In particular, more environmental knowledge items are required. Further, the relevance of the items to individuals' lives needs to be assessed. For example, several food safety items to do with the cleaning of chopping boards may be redundant with changes in the meat supply, chopped meat being readily available for cooking (Wills *et al.*, 2013). The on-line quota samples might restrict the generalizability of the findings although the replication of the findings across the two studies suggests this was not a serious problem.

CONCLUSIONS

The two studies confirmed the associations of age, gender and general educational status with various forms of food knowledge. They also showed that home economics (and similar) education was associated with higher levels of food knowledge among several age groups. The differential influence of home economics education between States, and the differential recall of home economics themes across age groups, suggests that different curricula have different effects on food knowledge. Overall, substantial evidence suggests that home economics education brings about long-term changes in food knowledge. Further research is required to confirm and extend these findings.

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