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Experts' views regarding Australian school-leavers' knowledge of nutrition and food systems

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Experts' views regarding Australian school-leavers' knowledge of nutrition and food systems

Abstract

Objective: To explore Australian experts' views regarding strengths and gaps in school-leavers' knowledge of nutrition and food systems (N & FS) and factors that influence that knowledge. **Method:** Semi-structured interviews were conducted with 21 highly experienced food-related experts in Australia. Qualitative data were analysed thematically using Attride-Stirling's thematic network framework. **Results:** Two global themes and several organising themes were identified. The first global theme, 'structural curriculum-based problems', emerged from three organising themes of: inconsistencies in provided food education programs at schools in Australia; insufficient coverage of food-related skills and food systems topics in school curricula; and the lack of trained school teachers. The second global theme, 'insufficient levels of school-leavers' knowledge of N & FS', was generated from four organising themes, which together described Australian school-leavers' poor knowledge of N & FS more broadly and knowledge translation problem for everyday practices. **Conclusion:** Study findings identified key problems relating to current school-based N & FS education programs in Australia and reported knowledge gaps in relation to N & FS among Australian school-leavers. **Implications:** These findings provide important guidance for N & FS curriculum development, to clearly articulate broadly-based N & FS knowledge acquisition in curriculum policy and education documents for Australian schools.

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Experts' views regarding Australian school-leavers' knowledge of nutrition and food systems

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The Australian government has identified chronic diseases and conditions as a National Health Priority Area (NHPA) that requires particular attention because of the substantial burden they impose on the Australian population.¹ At least four of the nine NHPAs,¹ cardiovascular disease, obesity, diabetes mellitus, and cancers, are affected by dietary intakes.² Weight gain and diabetes mellitus can occur due to over consumption of foods high in sugar, fat, salt and low in micronutrients.³ Risk of cardiovascular diseases increases with high intake of salt, saturated fats, trans fats and low intake of fruits and vegetables.² Low intakes of fruit and vegetables increase the risk of some types of cancers.² In Australia and globally, low consumption of fruit and vegetables together with high consumption of poor nutrient, energy-dense foods have generated major public health concerns.³ To support appropriate dietary intake, nutrition education programs have been developed for particular population groups or entire communities.⁴ "Nutrition education in schools offers a unique opportunity to integrate the nutrition education and the application of that knowledge to achieve behavior change."^{5(p.47)} Nutrition education in schools should not only provide nutrition information, but should also develop food-related skills and behaviour in relation to: food preparation, food storage, socio-cultural aspects of consumption, and to improve positive body image and self-esteem.⁶ Studies in both Western^{6,7} and non-Western⁸ societies report that food and nutrition education programs need to be reinforced in schools. While school-based nutrition

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Results: Two global themes and several organising themes were identified. The first global theme, 'structural curriculum-based problems', emerged from three organising themes of: inconsistencies in provided food education programs at schools in Australia; insufficient coverage of food-related skills and food systems topics in school curricula; and the lack of trained school teachers. The second global theme, 'insufficient levels of school-leavers knowledge of N&FS', was generated from four organising themes, which together described Australian school-leavers' poor knowledge of N&FS more broadly and knowledge translation problem for everyday practices.

Conclusion: Study findings identified key problems relating to current school-based N&FS education programs in Australia and reported knowledge gaps in relation to N&FS among Australian school-leavers.

Implications: These findings provide important guidance for N&FS curriculum development, to clearly articulate broadly-based N&FS knowledge acquisition in curriculum policy and education documents for Australian schools.

Key words: Australian experts, school-leavers, nutrition and food systems (N&FS), knowledge

education interventions have been explored in Australia,^{9,10} gaps in school-based N&FS education programs and its association with current student knowledge of N&FS issues have not been explored more broadly.

Australian literature shows a broad assessment of Australians' knowledge of different aspects of food and nutrition to promote better health outcomes. For example: knowledge relating to understanding food labels in relation to health food choices;¹¹ knowledge of food safety to prevent food-borne illnesses;¹² knowledge of foods and nutrients in relation

to the risk of metabolic diseases;¹³ and general nutrition knowledge as one of several factors influencing dietary behaviour.¹⁴

While the focus of the majority of existing studies has been on nutrition knowledge to improve health conditions, more recently the Australian literature introduced the notion of environmental sustainability relating to dietary intake.¹⁵⁻¹⁷ In 2015, the Public Health Association of Australia published a document on ecologically sustainable diets, which supported integrating principles of ecological sustainability into Australian Dietary Guidelines.¹⁶ It stated that

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"ecologically sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable, nutritionally adequate, safe and healthy, while optimising natural and human resources"^{16(p.1)} However, the current Australian diet is not consistent with healthy dietary recommendations and does not support environmental sustainability.¹⁶

There is a lack of research addressing Australians' knowledge of a wide range of issues associated with food production from farm to fork in conjunction with sustainability of food production and environment. However, within both international and domestic literature there is reference to the effects of environment,¹⁸ natural resources¹⁸⁻¹⁹ and sustainability of food production.¹⁹

This study explored knowledge of traditional nutrition in conjunction with food systems to take a broader view of food-related issues. At present, specific aspects of food systems knowledge have been explored or incorporated into Australian literature. For example Worsley and colleagues explored Australian adults' knowledge of agriculture²⁰ and Taylor and Signal explored Australian consumers' self-reported knowledge of animal welfare and their willingness to pay for animal welfare friendly food products.²¹ However, to the best of our knowledge, literature assessing Australians' knowledge of a wide range of food systems issues is not available. Very limited studies world-wide have examined populations' knowledge of food systems. One exception is the study by Harmon and Maretzki who explored high school students' knowledge of food systems in relation to food systems sectors, sustainability, agriculture, food origins, local foods and hunger.²²

To address some of these gaps in the literature, particularly from Australia, this qualitative study aimed to explore the perspectives of experienced food-related experts in Australia regarding the strengths and weaknesses of school-leavers knowledge in relation to N&FS more broadly. This study also aimed to identify experts' views of the key determinants of current knowledge (and gaps in knowledge) of Australian school-leavers.

Method

To assess the broader aspects of nutrition and food systems, this study aimed to interview 20 prominent experts from various food-

related fields including public health nutrition, dietetics, nutrition science, food sciences, home economics, veterinary science and environmental sciences. Purposive sampling was used to recruit a group of acknowledged academics from top-ranked Australian universities,²³ and highly experienced experts from government and non-government organisations in Australia. Experts' years of experience and of their contributions to N&FS education programs and food-related research were determining for selection of participants. To identify the most appropriate participants from different groups of nutritionists, food scientists, environmental scientists, and other food-related experts, the first and second investigators of this study performed a thorough web-based investigation of staff profiles of all relevant schools or departments from top ranking Australian universities. Potential participants needed to be involved in food-related knowledge and/or education research in Australia and/or active in young Australians' education programs. Some of the participants were Heads of the schools and chairs. Overall, the positions of the majority of participants were at the top of the career hierarchy within their organisations. A similar web-based investigation was performed in relation to various Australian organisations that were active in nutrition education, health promotion, welfare of consumers, welfare of farm-animal and suitability of environment, aimed to identify proper participants. Afterward some of the potential participants were searched through research gate and LinkedIn for further assessment of their contributions to N&FS issues (e.g. their publications). The experts were selected from four States (New South Wales, Queensland, Victoria, Western Australia) and one Territory (Australian Capital Territory) of Australia.

Semi-structured interviews were conducted to explore experts' views regarding nutrition and food systems knowledge of Australian school-leavers and to identify key factors affecting their current knowledge. The interviews were conducted over an extended period, August 2012 to March 2014, due to constraints on availabilities of the lead researcher and of the research participants, all prominent experts in their field. The interviews were not conducted evenly over this time. The first and second authors invited the selected experts to participate by email. The dates and time for the interviews were then arranged by email. About 10 days prior to each interview the participant's

information sheet, interview questions and consent form were emailed to the participants. In addition, participants were asked to give their consent at the beginning of each interview, which was audio-recorded. Eight interviews were conducted face-to-face and 13 were telephone-based. The format of the interview was determined by participants' preference and/or the geographical location of the participants. The venues for face-to-face interviews were chosen based on interviewees' preferences. The first author undertook all interviews. Some of the participants were known to her through professional events or co-location at the same institution, but there was no prior professional relationship with any of the participants. Each interview lasted between 15 and 50 minutes. Recorded interviews were transcribed verbatim for analysis.

Ethics approval was obtained from the Human Research Ethics Committee at the University of Wollongong. The participants' identities were de-identified using numbers to preserve anonymity. Four broad open-ended questions were designed by investigators of this study and were reviewed by a panel of four acknowledged academics with strong food and nutrition background from University of Wollongong. Open-ended questions used for the interviewees were:

- What aspects of nutrition and food systems knowledge do you think school-leavers are well informed about?
- Why do you think their knowledge is good in these areas?
- What aspects of nutrition and food system knowledge do you think school-leavers are not well informed about?
- Why do you think their knowledge is poor in these areas?

Data analysis

Interview transcripts were analysed using the Attride-Stirling thematic network analysis framework.²⁴ This method provides a step-by-step guide for thematic analysis of qualitative data.²⁴ The first step involves reading and re-reading the interview transcripts to become familiar with the data and to identify lowest order codes (basic themes). The first author coded the data set and selected all of the basic themes after several reviews of the interview manuscripts. The second step was to identify the connected basic themes and group them together as middle-order themes (organising themes). The first and

the second authors reviewed the basic themes and agreed on the arrangement of organising themes and labels for them. The third step was related to the generation of the global themes. At this stage the main claims or the higher order themes were formed by appropriately grouping the organising themes. After generating all levels of themes, the transcripts were reviewed several times to check the thoroughness of the generated organising and global themes. Final agreement was reached in relation to the levels of themes, and labels for the organising and global themes.²⁴ Two global themes were generated in this study.

Results

Characteristics of the participants

Twenty-one experts were interviewed, at which point data saturation was achieved. The experts included: four home economists, three public health nutritionists, four nutritionists, four dietitians, two food scientists, one environmental scientist, two veterinary physicians (experts in animal farm food production systems and animal welfare issues) and one expert in population health. They were all, in some way, engaged in N&FS education programs in Australia, were regularly in contact with youth in Australia or were active in food-related issues associated with young adults. Their connections with young population groups were mainly through: teaching at universities and schools; engagement with food-related issues as food educators or informants in governmental and non-governmental organisations; or involvement in food knowledge research projects.

Thematic network

The experts' views of the current knowledge of Australian school-leavers about nutrition and food systems issues centred on two global themes and several organising themes. The first global theme was 'structural curriculum-based problems in current N&FS education programs at schools'. The second global theme was 'insufficient levels of school-leavers knowledge of N&FS'. These two global themes emerged from several organising themes. One of the emergent organising themes did not directly align with either of the formed global themes; 'competing roles of media and marketing and of schools in N&FS education'. All global and organising themes are explored below.

Global Theme 1. Structural curriculum-based problems in current N&FS education programs at schools

The interviewees believed that there are some 'inconsistencies in food education programs in Australian schools' (organising theme 1). They reported that students from different schools and students within different educational levels or years do not have the same exposure to nutrition-related education programs. For example, students have varying opportunities to experience: skill-based food education programs (e.g. cooking and gardening); educational excursions to visit the process of food production 'from farm to fork'; and preparation and analysis of food records. A structural issue that was not directly curriculum-based was identified relating to the role of school canteens. Some participants expressed a view that school canteens should promote healthy food and drink choices, which would be a mechanism to send nutritional health messages, however healthy canteens are not equally provided across all the Australian schools

"Kids in New South Wales could be in a school where there is no cooking involved, and if they do have cooking there's no specific area to do the food preparation, it might just be a converted classroom, it might just be for a couple of recipes only for one term." (Participant 2)

Some experts reported 'insufficient coverage of school-curricula of food-related skills and food systems topics' (Organising theme 2) due to crowded curriculum and lack of interest by curriculum developers and schools.

"Um, I don't think they learn about the food system at all. If they're lucky they might do some history sort of related to it but I don't think they learn anything about the food systems, and I think that's because it's not core curriculum." (Participant 10)

"We have a very crowded curriculum and often the food skills component is, is not really considered a priority in our schools today it's a life skill that's really important but many schools don't actually incorporate food skills as an important life skill because they're more focussed on academic." (Participant 3)

Interestingly, some participants commented on the lack of interest of food manufacturers to improve students' knowledge and concerns regarding particular foods, and their lack of involvements in school-based education. They considered it could be useful for some food manufacturers to engage in nutrition education initiatives so that young

people have a better understanding of the manufacturing and food processes.

"I don't think it's [food systems] considered important as part of school and I don't think there's a lot of reason for manufacturers themselves to promote that knowledge. So it's in nobody's interest to do it so it doesn't get done." (Participant 12)

'Lack of schoolteachers trained in N&FS' (Organising theme 3) was reported as a critical problem by home economists, public health nutritionists, dietitians and nutritionists. These experts believed that not all N&FS information provided by schoolteachers in Australia is thorough, accurate and updated enough to ensure school-leavers' knowledge of N&FS is at an appropriate level. Some of these interviewees related this problem to the lack of attention from the departments of education to monitor schoolteachers' knowledge of N&FS.

"This whole problem about food and nutrition is because they don't have a specialist teacher teaching it... On paper it looks right but in reality they're not getting the right people to deliver this message." (Participant 2)

Global Theme 2. Insufficient level of School-leavers knowledge of N&FS

The participants from different groups of experts believed that Australian school-leavers have 'generally, poor knowledge of N&FS' (organising theme 1). It was commonly assumed that school-leavers have some knowledge of very basic nutrition issues such as: healthy versus unhealthy foods; the food pyramid or the food plate; and dietary sources of vitamin D & C; but it was not sufficient overall.

"They are pretty informed about good and bad foods... things like fruit and vegetable are good for you." (Participant 16)

Informants believed that school-leavers lacked knowledge in relation to important nutrition issues such as: glycemic index; added sugar; added salt; nutrition during pregnancy; nutrition for early childhood; micronutrients deficiency especially in relation to iodine, iron and folic acid; and food storage, food hygiene and cross contamination. Interviewees reported they believed that Australian school-leavers had particularly poor knowledge in relation to food skills and food systems (particularly food production from farm to fork in conjunction with environmental sustainability and animal welfare).

"They don't necessarily know how to prepare and plan core foods." (Participant 7)

"I don't think they're very well informed about how food is produced – and it's not just school leavers it's general public – the processes that all food goes through... as it's grown and then as it's provided to the retailer. I don't think people know very much about at all." (Participant 12)

The issue of 'Knowledge translation for everyday food practices' (organising theme 2) was reported by some experts, particularly nutritionists, home economists and public health nutritionists. These interviewees noted that although school-leavers might be aware of some nutrition basics, their knowledge is not sufficient or useful enough to be translated into everyday practices.

"Look they get taught the basics of what's a carbohydrate; what's a protein; what's a fat – I mean I think most children would understand that but it becomes not so clear when they're eating mixed meals So it's about how to combine, I think that's what they don't necessarily get. It tends to be very focused on 'lets talk about calcium' or 'lets talk about fruit and veggies and what's good about that' so it's not sort of brought together for the kids that are in a comprehensive manner." (Participant 6)

Many of the participants reported they thought there was a 'variable level of students' knowledge due to environmental factors' (organising theme 3), which is overall skewed toward poor knowledge of N&FS. They believed that schools, families and geographical location affected the level of N&FS knowledge across Australian school-leavers. For example it was noted that parents who have more appropriate knowledge and practices regarding food-related issues could positively affect their kids' knowledge and behaviour. Also some experts expected better knowledge and skills of food production (e.g. growing and harvesting food products) among those who are living in rural regions and belong to farmers' families. In addition some interviewees believed there were gender differences in relation to levels of nutrition knowledge (e.g. "generally on some issues females have better knowledge than males." (Participant 8)).

"I think it's variable depending on their experiences throughout school and it really struck me from doing my own research that potentially in some of the lower income areas kids may in fact have actually more skills because they might have been more likely to do home economics." (Participant 4)

"Now it's not just about teachers of course... what do their parents really know about it because parents are their teachers as well." (Participant 7)

Some of the nutritionists, dietitians and public health nutritionists had a view that 'students have poor knowledge and perception of weight management' (organising theme four). The interviewees' main concerns were when a student focused on body image issues and inappropriate methods for weight loss.

"Many of them want to lose weight – either they don't need to, or they have completely the wrong ideas." (Participant 21)

Competing roles of media and marketing and of schools in N&FS education

In this study some of the experts with stronger nutrition backgrounds (nutritionists, public health nutritionists, dietitians and home economists) referred to the important role of informative and misleading advertisements in affecting food-related awareness of Australian children and young adults. Some of the informants believed that schools are not sufficiently using their potential to educate students about food marketing.

"I think almost every kid knows that milk has calcium and I think they know them [sic] because people selling those products use it in their advertising information." (Participant 1)

Some interviewees reported that media have substantial influence over the nutrition awareness of students, perhaps to a larger extent than school education. However 'education by media' is not always appropriate since the media may present "extreme" and sometimes incorrect nutrition messages.

"I think the school leavers [are] probably more influenced by the media than what they are getting in school curriculum. I think the media sensationalises studies, and that sensationalism means that the message is not a moderate message it's an extreme message and that extreme message means that you're going to have ... you're going to have contradictory findings in different studies." (Participant 11)

Discussion

This qualitative study explored the views of experienced Australian food-related experts in relation to strengths and weaknesses of Australian school-leavers' knowledge of nutrition and food systems (N&FS) broadly, which has not yet been explored in the

literature. Lack of understanding of what school-leavers know about the N&FS is an important omission, given that the importance of school-based food education programs designed to enhance healthy eating behaviours of students has been reported.^{25,26} In addition, literature has reported the importance of food systems knowledge and the need for broadening the scope of nutrition education by adding ecological, agricultural, social and economic aspects of food to health-related topics.¹⁹ In the current study, several themes emerged from the experts' views of Australian school-leavers' knowledge of N&FS.

Interviewees identified several problems they believed were associated with current N&FS education programs at schools. Participants believed that N&FS education at schools is not generally sufficient and students from different schools do not receive the same N&FS education. This is at odds with the 2014 Australian Curriculum Assessment and Reporting Authority's report related to the Australian Curriculum Health and Physical Education stating food and nutrition should be taught across the Health and Physical Education curriculum from Foundation to Year 10.²⁷ However it is not surprising as there is a lack of studies that compare the consistency and sufficiency of school-based N&FS education programs as they are provided in Australian schools. Inadequate school-based nutrition education program has been reported in a study of classroom-based fruit and vegetable preparation for primary school students in Australia. This study mentioned a lack of programs that promote fruit and vegetable intake in school setting, and concluded that involvement in the preparation of fruit and vegetables is likely to encourage children to eat and enjoy fruit and vegetables more.¹⁰ However, international studies have undertaken some exploration in relation to the adequacy of school-based nutrition education programs. For example a study of school health programs and policies across all states of the United States in 2006 found that over a one year period teachers provided about four hours of nutrition and dietary behaviours instruction at the elementary and middle school level and nearly six hours at the level of high school.²⁸ No similar study has been reported in Australia.

The lack of trained Australian schoolteachers to implement school-based N&FS education identified by this study's participants may

provide one reason why the teaching of N&FS is not sufficient or consistent. This reported lack of teacher skills is consistent with recent literature related to Australia, which stated that although teachers' preparation to teach food-related issues is critical, "currently in Australia there is no guarantee (or mandate) that pre-service teachers are taught food education within their university degree."^{29(p.87)} At present there is not sufficient evidence of directives by the departments of education or actions by tertiary institutions to support the education of schoolteachers in N&FS issues and provide regular updates of teachers' knowledge. The continuation of the basic need for teacher preparation is surprising, given the rhetoric regarding the importance of tackling childhood obesity. Clearly other topics are privileged within school curricula over the health of children.

Schoolteachers' lack of efficiency in training students about food-related issues is likely to be a worldwide challenge. Stage and colleagues in a recent investigation in the United States highlighted that schoolteachers have the potential to influence eating behaviour of students extensively.³⁰ However, they found that teachers spend limited hours on nutrition education for students and barriers included insufficient professional development and lack of knowledge of complementary materials. These researchers highlighted the need to focus on improving teachers' self efficacy to teach nutrition issues.³⁰

In the current study, insufficient levels of school-leavers' knowledge of N&FS reported by the participants is of concern, especially in relation to basic matters such as food hygiene. This view of the experts in this study is consistent with the findings of a recent study of 475 students from secondary schools and universities in Australia and the UK, which revealed generally low levels of food safety knowledge.³¹ Poor knowledge of school leavers may also translate into poor levels of adult knowledge. A 2011 study of 2,022 Australian consumers reported adults had poor knowledge of food safety.¹² It should thus not be surprising that annually in Australia there are approximately 4.1 million domestically-based cases of foodborne gastroenteritis.³²

In the current study the experts also reported that school-leavers did not have an understanding of nutritional requirements in early childhood. This knowledge was identified necessary as some of the school-

leavers might be parents in the near future. Parents have responsibility for their children's dietary behaviours and parents have been a focus of public health interventions that have aimed to improve children's dietary habits.³³ The perception of participants in this study of a lack of knowledge about nutritional requirements in early childhood is consistent with an investigation of 439 Australian parents of children under five regarding knowledge and acceptance of infant and young children's public health feeding recommendations. That study concluded that "awareness and acceptance of infant feeding recommendations in Australia is poor."^{34(p.31)}

Not all of the identified areas of poor N&FS knowledge in this study have been assessed previously in Australian studies. This study has highlighted a perceived lack of students' knowledge of the process of food production from farm to fork, as well as issues relating to environmental sustainability and animal welfare. The importance of knowledge of these food systems related topics could be defined in the context of the need for citizens to improve their food choices toward more ecologically friendly and sustainably produced food products, which is supportive of a sustainable food supply,³⁵ welfare of farm animals,²¹ and sustainability of the environment.¹⁸ Such knowledge gaps identified in this study could be explored further in future research and suggest neglected areas of N&FS education at schools.

Some experts also believed there was variability in the level of N&FS knowledge among Australian school-leavers which may be the result of wider socioenvironmental factors including: family (parents' knowledge and practices), food education programs offered within attended schools, and geographical location (urban and rural). These factors may influence the level of knowledge among school-leavers and are reflected separately in Australian and international food-related knowledge studies. An Australian study of consumers' food safety knowledge indicated poor safety knowledge was negatively associated with health education at school.¹² International studies have also reported positive effects of school-based nutrition and food safety education on students' knowledge and behaviour.^{36,37} In addition, the important role of parents' knowledge and behaviour on their children's understanding and practices of N&Fs related issues identified in the current study has also been reported in international studies

on the (positive) influence of parents as role models for healthy eating behaviour among teenagers³⁸ and middle school students.³⁹ This reinforces the need to consider nutrition education in a wider context than just what may or may not occur in schools and the need to explore the potential to promote important N&FS topics within the supportive environment of the family.

Participants in the current study also believed that female school leavers had overall higher levels of nutrition knowledge compared to male school leavers. This is consistent with a quantitative study of demographic variation in levels of nutrition knowledge in the Australian community, which identified overall higher nutrition knowledge scores for female Australian participants.¹⁴ Also international studies have identified higher knowledge scores of nutrition among female participants compared to males.^{40,41} This might suggest the need to explore strategies that effectively engage male students in N&FS education programs at schools.

Several of the participants identified the potentially substantial effects of media on students' and school-leavers' awareness of food and nutrition issues. There were a few experts who believed that media could be even more effective than the school setting. At the same time they expressed their concerns in relation to the media's immoderate food messages. This is consistent with a study of general nutrition knowledge and the demographic variation among Australian community by Hendrie and colleagues that highlighted the mass media are key sources of nutrition information and misinformation in the community.¹⁴ About a decade ago these investigators reported that media in Australia had favoured low-carbohydrate, high-protein diets and acknowledged that such information was likely to be misleading among the public. Media attention in Australia has created doubt about the healthiness of foods rich in carbohydrate, which is not a message consistent with Australian dietary guidelines.¹⁴ At the same time, Australian literature has highlighted that substantial outcomes can be achieved with reasonably small budgets for promotion of nutrition recommendations through mass media.⁴² The successful outcomes of "Go for 2&5" campaign in Australia, which aimed to increase fruit and vegetable consumption, and constructive effects of mass media advertising through television, radio, press, etc, is an appropriate

example.⁴³ Future research of school leavers' knowledge of N&FS issues might address the relative influence of school based education and messages provided by mass media.

Limitations

An identified limitation of this study was that it focused on food-related experts' views regarding current N&FS knowledge of school-leavers and did not assess school-leavers' actual knowledge and skills. Further research is required to assess knowledge of wide range of important nutrition and food systems issues. Another limitation was that pre-selected health teachers did not accept our invitation to participate in this study. Thus, this group, who are in direct contact with students at schools, was not included among our interviewees. In addition, the participants, while expert in their professional field, may have varying familiarity with school-leavers' levels of knowledge.

Conclusion

Study findings indicated that there are major structural and curriculum-based issues impacting current N&FS education programs in Australian schools. The structural problems related to inconsistent and insufficient N&FS educational programs that are currently provided at schools, together with lack of appropriately trained school teachers. The findings have highlighted perceived key gaps in current N&FS knowledge of Australian school-leavers. Overall, participants assumed that Australian school-leavers' knowledge of N&FS is not sufficient and translatable for everyday practices. The findings suggested that current knowledge of school-leavers is affected by some environmental factors, including the home environment and the influence of media and marketing systems. The study results also suggest potential neglected components of N&FS education within current school curricula. These findings provide important insights for N&FS curriculum developers and education policy makers to improve school-based N&FS education programs in Australia.

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