

# Children's knowledge about the origins of food in early childhood education and care institutions (ECEC) in Norway

Kathrine Bjørgen, Børge Moe, Per-Arvid Wold & Claudia Melis

To cite this article: Kathrine Bjørgen, Børge Moe, Per-Arvid Wold & Claudia Melis (2022): Children's knowledge about the origins of food in early childhood education and care institutions (ECEC) in Norway, *Education 3-13*, DOI: [10.1080/03004279.2022.2049839](https://doi.org/10.1080/03004279.2022.2049839)

To link to this article: <https://doi.org/10.1080/03004279.2022.2049839>



© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 17 Mar 2022.



Submit your article to this journal [↗](#)



Article views: 34



View related articles [↗](#)



View Crossmark data [↗](#)

# Children's knowledge about the origins of food in early childhood education and care institutions (ECEC) in Norway

Kathrine Bjørgen<sup>a</sup>, Børge Moe<sup>a</sup>, Per-Arvid Wold<sup>ib</sup> and Claudia Melis<sup>ib</sup>

<sup>a</sup>Section of Physical Activity and Health, Queen Maud University College for Early childhood Education, Trondheim, Norway; <sup>b</sup>Section of Natural Science, Environment and Health, Queen Maud University College for Early Childhood Education, Trondheim, Norway

## ABSTRACT

The purpose of the present study was to examine Norwegian kindergarten children's knowledge about the origins of commonly consumed food items. Data were collected by conducting semi-structured interviews of 56 children (aged five to six years old) from nine different kindergartens based on open-ended questions and with the use of pictures showing eight different food items. Parents and kindergarten staff completed a questionnaire about how often they discuss the origins of food with the children.

Most of the children could tell us exactly where milk, caviar, bread, meat, and wheat flour come from, but they were less aware of the origins of cheese, pasta, and sausages. The children's level of knowledge was not associated with kindergarten profile or gender or with respect to how often parents and staff members reported discussing the origins of food with the children. This study highlights the importance of various educational activities in increasing children's knowledge.

## ARTICLE HISTORY

Received 2 December 2021  
Accepted 24 February 2022

## KEYWORDS

Kindergarten children; knowledge; ordinary and farm ECEC institutions; origin of food

## Introduction

Today's food system needs to become much more sustainable (Willett et al. 2019). A complementary approach to changing the system is to increase consumers' awareness of sustainable food choices and enable informed decision-making with regard to dietary behaviour (Camilleri et al. 2019). Our daily food choices have a huge impact on the environment, and most consumers are not aware of the environmental impact of food production and consumption (Hartmann et al. 2021). However, consumers with higher knowledge of food items are better able to compose food menus with a lower environmental footprint (Hartmann et al. 2021). The World Commission on Environment and Development (1987) gave the first definition of sustainable development as 'a development strategy that meets the needs of the present without compromising the ability of future generations to meet their own needs'. The term 'sustainability' refers to the conditions that must be met in order for an ecosystem to sustain itself over the long term (Holden, Linnerud, and Banister 2014). With an ever-expanding variety of food products from all over the world in diverse sales locations, it becomes necessary and, at the same time, more difficult for consumers to evaluate products – for instance, in terms of healthiness and environmental friendliness (Hartmann et al. 2021). Children's understanding of the origins of food can help them make environmental

**CONTACT** Kathrine Bjørgen  kbj@dmmh.no

© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group  
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

friendliness food choices that are positive for the sustainable development. Even though the framework plan for Norwegian kindergartens emphasises that early childhood education and care (ECEC) institutions shall help children gain insight into food sources and the origin of food, children's level of knowledge on the topic is infrequently studied.

Louv (2008) describes how American children are alienated and distant from nature and discusses the human and societal costs of estrangement from the natural world, such as diminished use of the senses, attention difficulties, and higher rates of physical and emotional illnesses. He illustrates, e.g. how lack of awareness of where food comes from creates a nature deficit, which harms society as a whole and the rising generation of children in particular (Louv 2008). Contact with local nature seems to promote positive effects on children's physical and mental health, cognitive performance, and knowledge about living organisms (Chawla 2020; Kuo, Barnes, and Jordan 2019). In earlier times, a large part of the population had close contact with the production and harvesting of food in the form of plants, fish, and meat. Today, fewer people are involved in food production, which may lead to less knowledge about the origins of food.

However, harvesting from nature is still a part of the Norwegian tradition. Government Report no. 18 (Government 2007) points out that harvesting berries, plants, and other edible resources should be included as part of the education of the young generation to create knowledge about food, nature, and sustainable development. Although many of the Norwegian ECEC institutions do use local nature for play, discovery, and harvesting, children's knowledge about the origins of food served at home and in kindergarten is less documented.

## Origins of food

### *Kindergarten children's knowledge*

Kindergarten children understand that humans need food to maintain health and vitality and are generally accurate in distinguishing foods from nonfoods and healthy foods from unhealthy foods (Bjørgen 2009). They also have a good grasp of what foods we normally eat, in what combinations, and at what times of day (Birch, Fisher, and Grimm-Thomas 1999; Rozin 1990). Barrett and Short (1992) found that children (aged five to seven years old) had limited factual knowledge about countries but did have some idea of countries' respective diets. For example, they associated the French with snails, garlic, and French bread and the Italians with spaghetti, pasta, seafood, and pizza. However, a survey by the British Nutrition Foundation showed that children (aged four to 11 years old) know little about the origins of food (Grey 2013). Almost 30% of the children thought that cheese comes from plants, and 25% believed fish fingers came from chicken or pig, while 34% thought pasta came from animal sources. The survey highlighted that only 21% of primary school children and 18% of secondary pupils reported that they have never visited a farm.

Kos and Jerman (2012) showed in an experiment conducted with a control and an experimental group of 32 children each that before experiencing farms, many of the children had no idea where food comes from. Afterwards, children in the experimental group showed a statistically significant improvement in their knowledge about the origins of food: they could say exactly where milk (84%), eggs (84%), juice (69%), and beans (84%) come from. Several studies have shown that visiting farms and attending gardening programmes improves children's knowledge about the origins of food (Kos and Jerman 2012; Somerset and Markwell 2009; Davis and Brann 2017). It has also been shown that children who actively help in vegetable gardening tend to eat fruit and vegetables more often than children not engaged in such activities (McAleese and Rankin 2007; Parmer et al. 2009).

Another study found that children attending a seafood intervention used more cognitive associations in describing seafood as being healthy than children not attending (Alm and Olsen 2015). Compared to the children not attending, they also expressed more positive attitudes towards seafood. The intervention comprised serving seafood for lunch twice per week in addition to various educational activities designed to increase children's knowledge of seafood.

Findings concerning gender differences regarding food are mixed. Perez-Rodrigo et al. (2003) reported few gender differences in the food preferences of Spanish young people aged two to 24. Other studies found that girls liked and consumed vegetables and fruits more than boys did, but there were no gender differences in preferences in other food groups (Le Bigot Macaux 2001; Lien, Lytle, and Klepp 2001; Wardle et al. 2001). Also, a larger study of 1291 British schoolchildren (aged four to 16 years old) showed differences in gender in that girls liked fruit and vegetables more than boys did, and boys tended to like fatty and sugary foods, meat, processed meat products, and eggs more than girls did (Cooke and Wardle 2005). Cultural and gender differences in children's food preferences should be further investigated and considered and, at the same time, interventions and marketing strategies should be created to promote healthy and sustainable eating among young consumers (Ragelienė 2021).

It is assumed that eating behaviours are shaped by intrinsic factors (e.g. genetics, age, and sex) and environmental factors (e.g. family, friends, and neighbourhood) (De Cosmi, Scaglioni, and Agostoni 2017). Parents and caregivers create food environments and play a key role in structuring their children's first experiences with food and eating through their own beliefs, food practices, perspectives, eating attitudes, and knowledge (Zarnowiecki et al. 2012).

Throughout our lifespans, we encounter different environments that contribute to our individual behaviour and knowledge in varying degrees. Ecological systems theory (Bronfenbrenner 2009) explains how different types of environmental systems influence human development on different levels. Bronfenbrenner describes human development within a holistic perspective in which the analytical premise is that the individual is always in an environment or a context. Sallis et al. (2006) argue for multilevel interventions in health-related issues based on ecological models to achieve population change. However, an ecological approach, which considers individual behaviour in the context of multiple environments, can explain people's health knowledge and habits (Sallis et al. 2006).

Reisch, Eberle, and Lorek (2013) show that interactions with social, physical, and media environments influence people's knowledge, attitudes, and healthy life choices. For children, the social environments are the family, peer groups, kindergarten, and others who influence, e.g. knowledge and attitudes about food and diet habits. The physical environment includes the availability of opportunities in the children's neighbourhoods and kindergartens to visit food gardens, natural areas, and farms. Media environments and commercial communication (e.g. food advertising and marketing) can shape food-related knowledge, attitudes, and preferences, both directly and indirectly (Reisch, Eberle, and Lorek 2013). Children's learning takes place in parallel ways, and several different environments that affect each other are also relevant in understanding children's perceptions of the origins of food. According to Hartmann et al. (2021) are consumers with higher knowledge of food items better able to choose food with a lower environmental footprint.

### **Early Childhood Education and care institutions (ECEC) in Norway**

In Norway, about 91% of children (aged one to six years old) attend kindergarten (ECEC institutions). The Norwegian ECEC institutions include public (47%) and private (53%) kindergartens with different profiles (Statistics Norway 2020). There are fewer kindergartens with a nature profile (28%) than ordinary kindergartens (72%). Children attending kindergartens with nature or farm profiles are expected to spend more time outdoors engaging with nature and/or with farm animals and should therefore have more opportunities to learn about the origins of food. However, time spent outside in nature and engaged in environmental-related activities is not only determined by kindergarten profile but also varies according to the competence and interests of the staff. Harvesting activities are anchored in the Norwegian Framework Plan for kindergarten (Ministry of Education 2017), which states that children should become familiar with nature's diversity and experience a sense of belonging with nature.

The provisions of the Kindergarten Act (Government 2005) and a general curriculum, the Framework Plan for the Content and Tasks of Kindergartens (Department of Education 2017), bind all Norwegian kindergartens. According to the Norwegian Framework plan, the kindergartens shall:

- Help children to gain insight into food sources, the origins of food, food production, and the path from ingredient to meal.
- Along with parents, help children acquire good habits, attitudes, and knowledge.
- Give children knowledge about food and help them to develop good habits.

Kindergarten staff and parents are important agents in the promotion of the health, behaviour, and education of young children. Still, whether children's knowledge of food origins is influenced by their teachers and parents has been only sparsely studied. In addition, documentation about Norwegian kindergarten children's knowledge of the origins of foods is limited. We conclude there is a need for more research with conversations and interviews as a method for understanding children's knowledge of the origin of food.

### **Purpose of the study**

The purpose of the present study was to examine Norwegian kindergarten children's knowledge about the origins of commonly consumed food items. More specifically, this study attempts to answer the following research questions:

1. What do children know about the origins of eight commonly consumed food items?
2. Is there an association between children's knowledge and (1) parents and staff conversations with them about these topics, (2) the kindergarten's profile, and (3) gender?

### **Materials and methods**

The methodological approach is a mixed methods research by combinations of qualitative and quantitative data. A semi-structured interview based on open-ended questions using pictures to the children, and a questionnaire to the staff in the kindergartens and to the parents of the participating children were used. Mixed methods research are an approach to research in the social, behavioural, and health-related sciences in which the investigator gathers both quantitative and qualitative data, integrates the two, and then draws interpretations based on the combined strengths of both sets of data to understand research problems (Creswell 2014).

### **Participants**

Between January and May 2019, we invited 33 kindergartens from the same county in the central region of Norway to participate in this study. Nine of the kindergartens (27%) accepted the invitation, seven (21%) declined, and 17 (52%) did not respond. Three of the nine kindergartens had a farm profile; the rest did not have any specific profile, a status referred to as 'ordinary profile'. They were eco-certified with a 'Green Flag'. The purpose of the Green Flag is to strengthen sustainable development through environmental education. This resulted in 56 participating children (28 girls and 28 boys) between five and six years old who were in their final year of kindergarten. [Table 1](#) shows an overview of the participating children and kindergartens.

**Table 1.** Overview of children and kindergartens participating in the study.

	Ordinary profile	Farm profile	Total
Kindergartens	5	3	8
Children	37	19	56
Boys	18	10	28
Girls	19	9	28

### Data collection

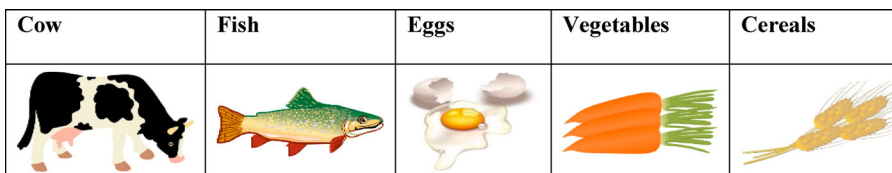
Data were collected by conducting semi-structured interviews based on open-ended questions using pictures showing different foods. The strengths of the semi-structured interviews allow the researcher to follow up most the time with questions, all verbal and non-verbal response and to reveal hidden information that may turn out to be helpful in the final data analysis (Agee 2009). In a pre-study, we tested the interview technique and duration and standardised our methods on four children, aged five to six years old, in an ordinary kindergarten that was not included in the main dataset. We interviewed the children individually and the interviews were audio-recorded. Each interview took about 15–20 min; all interviews were conducted by two researchers in June 2019. The interviews also included questions about sustainability and species identification skills. Results from the topics of sustainability and species are published in two papers (Melis, Wold, Billing, Bjørgen, and Moe 2020; Melis, Wold, Bjørgen, and Moe 2020).

### Semi-structured interviews with pictures of food

During the interviews, we showed the children pictures of eight food items: milk, caviar, bread, wheat flour, cheese, macaroni/pasta, sausage, and meat. These food items were chosen because they are ‘normal and known’ daily food items served both at kindergarten and at home. First, we asked whether the children could name the food, and then we asked where the food originated from, giving them a choice of five alternative pictures depicting a cow, fish, eggs, vegetables, and cereals (Figure 1). We specified that there were no right answers and that we were interested in the children’s ideas and suggestions.

### Questionnaire to kindergartens staff and parents

A questionnaire was given to one staff member at each kindergarten in order to collect information about the frequency of discussing the origins of food with the children. Another questionnaire was given to the parents of the participating children, asking about both their education and the frequency of discussing the origins of food with their children. For the questions to the staff members and parents, we used a five-point Likert scale with the response options *never*, *seldom*, *sometimes*, *often*, and *very often*.



**Figure 1.** Set of five pictures shown to 56 kindergarten children in Norway in the context of semi-structured interviews to explore their knowledge about the origin of common food.

## Ethical considerations

The study was approved by the Norwegian Centre for Research Data. The kindergarten staff and the children's parents filled out a written informed consent form upon participation. We interviewed the children individually and the interviews were audio-recorded with written permission of the parents and verbal permission from the children. All data were anonymized. The children's participation was voluntary and could be discontinued at any time without providing a reason. During the interview, we were careful not to give the children the impression that they had answered 'wrong' or that we expected them to know more if they could not answer. We tried to establishing a safe atmosphere with gradual habituation to something familiar to the child, which is an advantage in interviewing children (Eide and Winger 2005; Punch 2002).

## Data analysis

The data analysis involves both quantitative and qualitative data, and the integrations of the two. The interpretations are based on the combined strengths of both sets of data to understand research problems (Creswell 2014). For each of the eight pictures, we noted whether the children recognised the food in the picture, whether they recognised the origin of the food, and the explanations they provided with their answers. After removing results from two children who did not answer, we had answers from 54 children left for analyses. To obtain a measure of the overall knowledge, we categorised the answers into 'correct' and 'wrong'. We present the findings as a percentage of the proportion of children who answered correctly and incorrectly about the various food items. We also refer to descriptions of the children's alternative answers and how many answered *don't know*. We explored the data distribution by plotting a histogram and observed that the score followed a Poisson distribution. We then fitted a Generalised Linear Model (GLM) with a Poisson distribution to the data to test whether gender, kindergarten profile (profile), and time spent discussing origins of food issues with kindergarten staff and parents associated with the number of correct answers. We also did a logistic regression to explore whether any of the selected variables had an effect on the probability of the children answering correctly for some of the food items, such as sausage, cheese, and pasta, which had the lowest average scores.

## Results

The number of correct answers given by the children (henceforth called 'score') could range from zero to eight. The average score per child (out of eight food items) was 4.6 (SD,  $\pm 1.50$ ). The final model explaining scores as selected by model reduction included only the intercept, since none of the selected variables had a significant effect on the score.

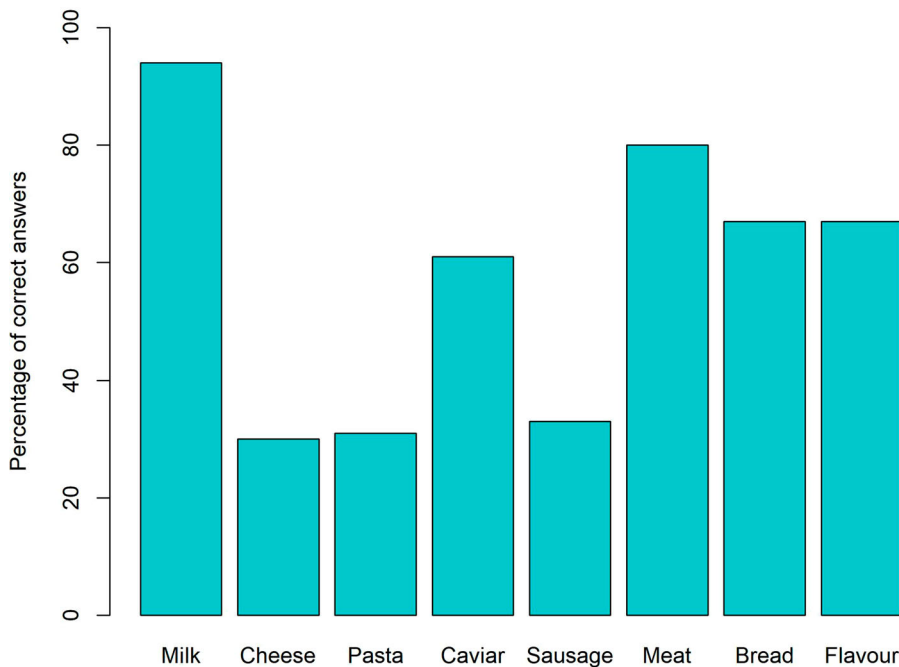
### Children's knowledge about the origins of food

Figure 2 shows the percentage of correct answers for each of the eight pictures of food.

The findings revealed that most of the children could tell us exactly where milk (94%), caviar (61%), meat (79%), bread (67%), and wheat flour (67%) come from. They had less knowledge of the origins of cheese (30%), macaroni/pasta (30%), and sausage (33%).

Most of the children could tell us that milk comes from the cow. Three of the children chose another option (egg), and three of the children answered *don't know*. Some of the children mentioned that 'milk is healthy' and 'I'm drinking milk every day'. The findings revealed that most of the children correctly identified fish as the source of caviar (61%), some of the children said *don't know* (22%), and the rest gave other options as cow and vegetables. The children were concerned with confirming what they like and dislike about the foods presented in the picture. One child replied, 'I do not like caviar, but caviar comes from fish, and fish is healthy for the body'.





**Figure 2.** Percentage of correct answers given by 54 children interviewed in May 2019 about the origins of eight food items.

The picture of a piece of meat prompted different associations from the children. Most stated that meat comes from cows (42%), and many stated that it comes from fish (37%). Some children stated *don't know* (11%), and the rest of the children chose the alternative answers (10%). The picture of a piece of meat inspired different associations, and both fish and cow are correct answer options. One child said, 'Meat comes from all animals and not just from cows'. We confirmed his statement and placed his answer in the correct category of knowledge.

Most of the children answered correctly about the origin of bread (67%), stating that bread is made from wheat and grain. A small proportion of the children said they *don't know* (12%), someone said egg (11%), and the remaining children gave other answer options (10%). Most children could name the origin of wheat flour (67%). Some of the children answered wheat flour comes from the cow (13%), others said *don't know* (9%), and the rest chose the other options (11%). Many also mention were they have seen wheat flour. One child said, 'The flour comes from the field to the farmer', and then the child pointed to the picture of the grain.

The children had less knowledge of the origin of cheese. Most children reported *don't know* or other options (70%), and 30% of the children reported that cheese originates from the cow (milk). Some of the children told us that they often eat cream cheese on crispbread in the kindergarten and that we can eat many different types of cheeses. One child said, 'I like white cheese better than brown cheese (Norwegian options of cheese)'. On the origins of macaroni/pasta, some of the children said *don't know* (26%), some reported fish and vegetables (13%), one child reported eggs (10%), and the rest gave other options (21%). The most frequent answer was that sausage comes from the cow or pig (33%), both correct responses. At the same time, some of the children answered that sausage comes from fish (25%). A proportion of children answered *don't know* (19%), some children answered vegetables (19%), and the rest selected other choices (4%).



## Gender

For most of the food items, there were no significant correlations in association between children's knowledge and gender. The results showed a weak positive effect of gender in the case of one food: boys had a higher probability than girls of knowing the origin of sausages (OR = 3.14. (95% CI: 0.96,10.3)).

## Association between children's knowledge and parents and staff conversations about these topics

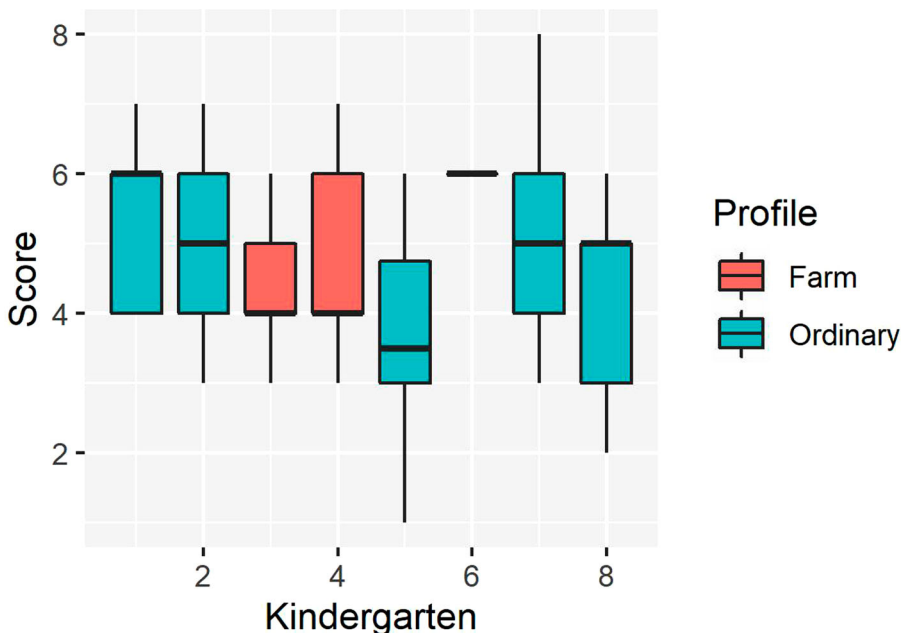
There was no significant correlation between time spent talking about the origin of food with either kindergarten staff ( $r_p = 0.076$ ,  $P > 0.05$ ) or parents ( $r_p = -0.013$ ,  $P > 0.05$ ). The results showed that 63% of the kindergarten staff reported conversing *often*, 25% reported conversing *sometimes*, and 12% reported conversing *very often* with the children about the origin of food. Furthermore, 57% of the parents reported conversing *sometimes*, 36% reported conversing *often*, 5% reported conversing *seldom*, 1% reported conversing *never* and 1% reported conversing *very often* about the origins of food with their child.

## Differences between the kindergartens' profiles

Figure 3 shows the median (with quartiles) scores per kindergarten. The results show no significant differences in the children's knowledge among kindergartens or between profiles.

## Discussion

In this study, most children could tell us the origin of milk (94%), caviar (61%), bread (67%), wheat flour (67%), and meat (79%). The children had less knowledge of the origins of cheese (30%),



**Figure 3.** Number of correct answers (boxplots showing median and quartiles) given by children in different kindergartens (grouped according to profile) interviewed in May 2019 about the origin of eight different food items.

macaroni/pasta (30%), and sausage (33%). Compared with children in studies in England (Grey 2013) and Slovenia (Kos and Jerman 2012), where results showed that the children knew little about the origins of food and had no idea where food comes from, the Norwegian kindergarten children in our sample had relatively high knowledge about the origin of eight food items.

One possible explanation for the children's knowledge about the origins of milk, bread, wheat flour, and meat could be that they often see cows and fields of grain in the local community or have visited farms. Visiting farms and gardening programmes is significant for children's knowledge about the origins of food (Kos and Jerman 2012; Somerset and Markwell 2009; Davis and Brann 2017). Milk and bread are traditional parts of the Norwegian diet and are often served at breakfast, lunch, and the last meal before going to sleep. Another explanation for children's knowledge about these food items is that children see a picture of a cow on Norwegian milk cartons and a picture of grain on the bread packaging. Through images on food packaging and in media advertising, children can learn about the origins of food. Furthermore, many of the Norwegian fairytales, songs, and stories used in kindergartens feature cows and milking, which may explain why children are aware that milk comes from the cow. Most of the children could tell us the exact origins of caviar. Caviar is the roe of various fish that is eaten uncooked, either fresh, smoked, or salted. Caviar in a tube is a particularly Nordic phenomenon, and in Norway is a tradition at bread meals both in kindergarten and in homes. According to the report 'Meals, physical activity and environmental health care in the kindergarten' (Norwegian Directorate of Health, 2012), caviar is a typical favourite at the kindergarten lunch break, together with liver pate, mackerel in tomato, and cream cheese. Milk and caviar are advertised on Norwegian television. According to the ecological theory, the media environments can shape food-related knowledge, attitudes, and preferences, both directly and indirectly (Reisch, Eberle, and Lorek 2013).

The results indicates that children have less knowledge of the origins of food composed of several different raw materials, such as cheese (30%), macaroni/pasta (30%), and sausage (33%). These foods are made of a variety of ingredients, making it challenging for children to know their origins. Cheese is a dairy product made of milk, rennet, and lactic acid bacteria and produced from milk by cows and goats. Pasta is made of wheat (ordinary wheat or durum wheat), water, salt, and other ingredients that provide colour and flavour, and eggs are commonly added to some pastas, hence one child indicated that pasta originates from eggs (10%). One-third of the children answered that sausage originates from the cow or pig (33%), with both answers being correct. We include not a picture of pig for the children to choose from. That means they gave response that was not one of the options provided. That could indicate that the children are very clear on where the food comes from, rather than taking an educated guess. Sausage is composed of several different ingredients. We do not have a reasonable explanation for why some of the children (25%) related sausage to fish. Fish sausage was produced in the early 2000s in Norway. The manufacturers wanted to market healthy products and produced salmon sausages and several kinds of fish sausages from Norwegian producers. Because fish sausage did not gain sufficient popularity, the production was stopped. Today there is no longer fish sausage in Norwegian grocery stores, and the children in this study are too young to have experiences with fish sausage. One explanation could be that they chose fish as the best option when they did not know the answer. Another explanation could be that kindergarten staff and parents do not discuss the origins of cheese, pasta, and sausage with the children because they are unsure themselves where those foods come from.

The results showed no significant correlations in the association between children's knowledge and gender, except a weak positive effect where boys had a higher probability than girls did to know the origin of sausages. Perez-Rodrigo et al. (2003) reported few gender differences in the food preferences of Spanish young people aged two to 24. Other studies found that boys consumed less fruit and liked raw vegetables less than girls did (Le Bigot Macaux 2001; Lien, Lytle, and Klepp 2001). Boys tended also to like fatty and sugary foods, meat, processed meat products, and eggs more than girls did (Cooke and Wardle 2005). Cultural and gender differences in children's food preferences and knowledge of food should be further investigated (Ragelienė 2021).

We expected that the children attending kindergartens with a farm profile would have more opportunities to learn about the origins of food, as earlier research has shown that outdoor activities on farms, gardening programmes, and seafood interventions are improving children's knowledge of food (Kos and Jerman 2012; Somerset and Markwell 2009; Davis and Brann 2017; Alm and Olsen 2015). However, this was not confirmed in this study. There were no significant differences in the children's knowledge based on kindergarten profiles (ordinary versus farm profile). One possible explanation could be that the ordinary kindergartens in our sample were all certified with a Green Flag, indicating that they promote sustainable development through environmental education. Therefore, there are likely more similarities than differences in the pedagogical content in both ordinary kindergartens and farm profile kindergartens. We also assume that both types of kindergartens follow the goals of the Norwegian framework plan, which states that kindergartens, independent of profile, shall help children to gain insight into food sources, the origins of food, food production, and the path from ingredient to meal.

The results showed no correlations between how often the staff and parents talk with the children about food origin and the children's knowledge. According to Reisch, Eberle, and Lorek (2013) and De Cosmi, Scaglioni, and Agostoni (2017), the social environments (children's family, peer groups, kindergarten, and others) feature important agents who influence children's attitudes and knowledge of food. They play a key role in structuring children's first experiences with food and eating through their own beliefs, eating attitudes, knowledge, and understanding of the benefits of food on health (Zarnowiecki et al. 2012). Lack of time and knowledge on the part of parents and kindergarten staff members to discuss topics relating to the origins of food could be one explanation for the lack of correlation between children's knowledge and the number of such conversations they have with adults at home and at school. It's possible that children are learning about food origins through the media and through images on food packaging.

## Conclusion and implications

### *Research strength and limitations*

The strengths of our study include the assessment of children's knowledge through semi-structured interviews based on open-ended questions using pictures showing different food items. The fact that most children found this challenge to be both fun and enjoyable increases the likelihood that we have obtained a valid measure of their knowledge. Still, there are some limitations to our study. First, the children who could not give the right answers might have felt unconfident in the presence of strangers or might have been afraid of giving a 'wrong' answer. To minimise such potential bias, we communicated that we were interested in hearing the children's thoughts and ideas and not focusing on 'right' or 'wrong' answers. Second, our choice of food items and sets of pictures may be more familiar to some of the children than others. To avoid this, we tried to use food items common in Norwegian households and kindergartens. Third, parents' and kindergarten staffs' frequency of discussing the origin of food with the children were self-reported, which might result in them answering in a socially desirable way (i.e. overestimating the frequency). However, data were collected anonymously to reduce this potential problem. In addition, since the parents and kindergarten staff were not asked *how they converse* with children about these issues, the learning outcome may vary depending on the pedagogical educational approach used.

### *Conclusions*

The Norwegian kindergarten children in our sample had relatively high knowledge about the origin of common food items, although many of them had less knowledge about the origin of foods composed of different ingredients. Food items packaged with a picture of the origin of the food (such as a picture of a cow on a milk carton) and food advertisements in the media may explain children's

knowledge about these food items. We found no association between children’s level of knowledge and parents’ and staff members’ self-reported frequency of conversations about the origins of food, or with whether the children attended a farm or ordinary kindergarten. It is possible that children’s knowledge is more influenced by what they do and see (practical activities as gardening, cooking, and farm visits and through media environments) than by conversations with adults. According to ecological theory, the contexts of multiple environments in understanding children’s knowledge about the origins of food are relevant. Varied pedagogical approaches in teaching children about the origins of food are of importance. Children’s understanding of where their food comes from can help them make ethical choices and explore food options which are positive for their health and sustainable development. Future research should explore the effectiveness of different pedagogical approaches within this topic.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## ORCID

Per-Arvid Wold  <http://orcid.org/0000-0001-8529-1502>

Claudia Melis  <http://orcid.org/0000-0001-8315-9129>

## References

- Agee, J. 2009. “Developing Qualitative Research Questions: A Reflective Process.” *International Journal of Qualitative Studies in Education* 22 (4): 431–447.
- Alm, S., and S. O. Olsen. 2015. “Exploring Seafood Socialization in the Kindergarten: An Intervention’s Influence on Children’s Attitudes.” *Young Consumers* 16 (1): 36–49.
- Barrett, M., and J. Short. 1992. “Images of European People in a Group of 5–10-Year-Old English School Children.” *British Journal of Developmental Psychology* 10: 339–363.
- Birch, L., J. Fisher, and K. Grimm-Thomas. 1999. “Children and Food.” In *Children’s Understanding of Biology and Health*, edited by M. Siegal and C. Peterson, 161–182. Cambridge: Cambridge University Press.
- Bjørngen, K. 2009. “5 Year Olds About Food, Meal and Participation.” *Norwegian Pedagogical Journal* 1: 9.
- Bronfenbrenner, U. 2009. *The Ecology of Human Development: Experiments by Nature and Design*. Cambridge, MA: Harvard University Press.
- Camilleri, A. R., R. P. Larrick, S. Hossain, and D. Patino-Echeverri. 2019. “Consumers Underestimate the Emissions Associated with Food but are Aided by Labels.” *Nature Climate Change* 9 (1): 53–58.
- Chawla, L. 2020. “Childhood Nature Connection and Constructive Hope: A Review of Research on Connecting with Nature and Coping with Environmental Loss.” *People and Nature* 2: 619–642. doi:10.1002/pan3.10128.
- Cooke, L., and J. Wardle. 2005. “Age and Gender Differences in Children’s Food Preference.” *The British Journal of Nutrition* 93: 741–746. doi:10.1079/BJN20051389.
- Creswell, J. W. 2014. *A Concise Introduction to Mixed Methods Research*. Sage Publication. ISBN 9781483359045.
- Davis, K. L., and L. S. Brann. 2017. “Examining the Benefits and Barriers of Instructional Gardening Programs to Increase Fruit and Vegetable Intake among Preschool-age Children.” *Journal of Environmental and Public Health* 7.
- De Cosmi, V., S. Scaglioni, and C. Agostoni. 2017. “Early Taste Experiences and Later Food Choices.” *Nutrients* 9: 107. doi:10.3390/nu9020107.
- Eide, B. J., and N. Winger. 2005. “From the Children’s Point of View: Methodological and Ethical Challenges.” In *Beyond Listening*, edited by A. Clark, A. T. Kjørholt and P. Moss, 71–91. The Policy Press.
- Government. 2005. Kindergarten Act – Act no.64 of June 2005. Norway, Oslo: Ministry of Education and Research.
- Government. 2007. “Report No. 18 to the Storting (2007–2008) Labour Migration.” Main Contents of Report No. 18. Oslo: Norwegian Ministry of Labour and Social Inclusion.
- Gray, N. 2013. “Cheese from plants and pasta from animals? Survey shows UK children know little about food.” <https://www.foodnavigator.com/Article/2013/06/03/Cheese-plants-and-pasta-from-animals-Children-know-little-about>.
- Hartmann, C., G. Lazzarini, A. Funk, and M. Siegrist. 2021. “Measuring Consumers’ Knowledge of the Environmental Impact of Foods.” *Appetite* 167: 105622. doi:10.1016/j.appet.2021.105622. ISSN: 0195-6663.
- Holden, E., K. Linnerud, and D. Banister. 2014. “Sustainable Development: Our Common Future Revisited.” *Global Environmental Change* 26: 130–139.

- Kos, M., and J. Jerman. 2012. "Preschool Children Learning About the Origin of Food, on Local Farms and in the Preschool Garden." *Nutrition & Food Science* 42 (5): 324–331. doi:10.1108/00346651211266836.
- Kuo, M., M. Barnes, and C. Jordan. 2019. "Do Experiences with Nature Promote Learning? Converging Evidence of a Cause-and-Effect Relationship." *Frontiers in Psychology* 10, doi:10.3389/fpsyg.2019.00305.
- Le Bigot Macaux, A. 2001. ". "Eat to Live or Live to eat? Do Parents and Children Agree?." *Public Health Nutrition* 4: 141–146.
- Lien, N., L. Lytle, and K. I. Klepp. 2001. "Stability in Consumption of Fruit, Vegetables and Sugary Foods in a Cohort from age 14 to age 21." *Preventive Medicine* 33: 217–226.
- Louv, R. 2008. *Last Child in the Woods: Saving our Children from Nature-Deficit Disorder*. Chapel Hill, NC: Algonquin Books.
- McAleese, J. D., and L. L. Rankin. 2007. "Garden-based Nutrition Education Affects Fruit and Vegetable Consumption in Sixth-Grade Adolescents." *Journal of the American Dietetic Association* 107 (4): 662–665.
- Melis, C., P.-A. Wold, A. M. Billing, K. Bjørgen, and B. Moe. 2020. "Kindergarten Children's Perception About the Ecological Roles of Living Organisms." *Sustainability* 12 (22): 9565. doi:10.3390/su12229565.
- Melis, C., P.-A. Wold, K. Bjørgen, and B. Moe. 2020. "Norwegian Kindergarten Children's Knowledge About the Environmental Component of Sustainable Development." *Sustainability* 12 (19): 8037. doi:10.3390/su12198037.
- Ministry of Education. 2017. *Framework Plan for Kindergartens*. Oslo, Norway.
- Norwegian Directorate of Health. 2012. *Report. Meals, Physical Activity and Environmental Health Care in the Kindergarten*. Oslo.
- Parmer, S. M., J. Salisbury-Glennon, D. Shannon, and B. Struempfer. 2009. "School Gardens: An Experiential Learning Approach for a Nutrition Education Program to Increase Fruit and Vegetable Knowledge, Preference, and Consumption among Second-Grade Students." *Journal of Nutrition Education and Behavior* 41 (3): 212–217.
- Perez-Rodrigo, C., L. Ribas, L. I. Serra-Majem, and J. Aranceta. 2003. "Food Preferences of Spanish Children and Young People: The EnKid Study." *European Journal of Clinical Nutrition* 57: 45–48.
- Punch, S. 2002. "Research with Children: The Same or Different from Research with Adults?" *Childhood: A Global Journal of Child Research* 9 (3): 321–341.
- Ragelienė, T. 2021. "Do Children Favor Snacks and Dislike Vegetables? Exploring Children's Food Preferences Using Drawing as a Projective Technique: A Cross-Cultural Study." *Appetite* 1, doi:10.1016/j.appet.2021.105276.
- Reisch, L., U. Eberle, and S. Lorek. 2013. "Sustainable Food Consumption: An Overview of Contemporary Issues and Policies." *Sustainability: Science, Practice and Policy* 9 (2): 7–25. doi:10.1080/15487733.2013.11908111.
- Rozin, P. 1990. "Development in the Food Domain." *Developmental Psychology* 26: 555–562.
- Sallis, J. F., Robert B. Cervero, W. Ascher, K. A. Henderson, M. K. Kraft, and J. Kerr. 2006. "An Ecological Approach to Creating Active Living Communities." *Annual Review of Public Health* 27 (1): 297–322. doi:10.1146/annurev.publhealth.27.021405.102100.
- Somerset, S., and K. Markwell. 2009. "Impact of a School-Based Food Garden on Attitudes and Identification Skills Regarding Vegetables and Fruit: A 12-Month Intervention Trial." *Public Health Nutrition* 12 (2): 214–221.
- Statistics. 2020, 03.mars. "Number of Kindergartens, employees and children by country in Norway." <https://ssb.no/kindergarten/statistics/>
- Wardle, J., S. Sanderson, E. L. Gibson, and L. Rapoport. 2001. "Factor-analytic Structure of Food Preferences in Four-Year-old Children in the UK." *Appetite* 37: 217–223.
- Willett, W., J. Rockström, B. Loken, M. Springmann, T. Lang, and S. Vermeulen. 2019. "Wood Food in the Anthropocene: The EAT–Lancet Commission on Healthy Diets from Sustainable Food Systems." *The Lancet* 393 (10170): 447–492.
- World Commission on Environment and Development. 1987. *Our Common Future*. Oxford: Oxford University Press.
- Zarnowiecki, D., N. Sinn, J. Petkov, and J. Dollman. 2012. "Parental Nutrition Knowledge and Attitudes as Predictors of 5–6-Year-old Children's Healthy Food Knowledge." *Public Health Nutrition* 15: 1284–1290. doi:10.1017/S1368980011003259.