Food4toddlers

Fostering healthy dietary habits through targeting toddlers' food and eating environment: The Food4toddlers study

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My interest in the Food4toddlers project is connected to my years as a teacher of children at primary schools and students at the University of Agder. I have always wondered how it is possible to change behaviors and how to do so in a positive manner. This project merged my interest in behavioral change and in working with digital pedagogical tools and also provided me with the possibility of developing something useful together with students and staff in a co-creation process.

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Kristiansand, January 2021

Margrethe Røed

Summary

Introduction

The World Health Organization highlights the importance of adequate nutrition in the early years of life to lay the foundation for health, wellbeing, and productivity throughout the life-course. A healthy diet in infancy and toddlerhood is essential for day-to-day health and growth and lowers the risk of overweight and obesity, non-communicable diseases, and certain cancers later in life. However, poor adherence to dietary guidelines is seen worldwide, including among the youngest children. Dietary preferences and food habits established in the early years, to a large extent, reflect parental feeding practices. In addition, parents' motives for selecting food, such as health or price, will reflect the food they provide for their children. Targeting environmental-related determinants of diet through interventions has led to improvements in young children's diets. These factors can be divided into *food environment*, which relates to how food is provided and presented, and *eating environment*, which comprises ambient factors not directly dependent on food, as atmosphere and parental food choice motives. Electronic health (eHealth) approaches are increasingly used to promote healthy dietary habits in children and have shown some positive intervention effects on children's diet, though few of the eHealth interventions are solely digital or target young children specifically.

Aims and objectives

The aim of this thesis is twofold: 1) to develop, implement, and evaluate an eHealth intervention, aiming to promote healthy dietary habits in toddlers by targeting parents' awareness of their child's food and eating environments, and 2) to examine associations between parental food choice motives, parental feeding practices, and children's fruit and vegetable intake.

Method and materials

The study employed a randomized controlled trial design to evaluate the Food4toddlers intervention, and applied baseline data to explore cross-sectional association for the second aim.

Using tailored advertisement on Facebook, in 2017/2018 we recruited parents of 10-month-old children for participation in the study. After answering baseline questionnaires, the participants were randomized into intervention and control groups, and the intervention participants received access to the Food4toddlers website for six months, the control group did not.

The content of the website was related to creating a healthy food and eating environment for the toddlers, and the information given was based on national guidelines and recent research. During the period the intervention parents had access to the website, the website's content was gradually expanding. The study was carried out using a socio-ecological approach, and Social Cognitive Theory was used to guide the development of the website's content. The intervention was developed in co-creation with health care nurses, parents of young children, and staff and students at the university.

This thesis comprises four papers based on three online self-reported data collections: baseline data at child age 11 months, and post-test data at child age 18 and 24 months. In addition, user data from the website was assessed.
To assess intervention effects on child fruit, vegetable and discretionary food intake from baseline to follow-up 1 and from baseline to follow-up 2 (paper III), we used generalized estimating equations (GEE) and a time by group interaction term. Between-group differences in changes over time for fruit, vegetables (frequency and variety), and discretionary foods (frequency) were assessed. An overview of other dietary intakes at all timepoints made exclusively for this thesis used t-tests and Mann-Whitney-U tests for between-group comparison. Chi-square and t-tests were used to examine differences in usage and satisfaction of the website between education and family composition groups (paper IV). For the second aim of this dissertation (paper II), we used the product-of-coefficients method to investigate five parental food choice motives (*health, convenience, sensory appeal, price, and familiarity*) and their associations with child fruit and vegetable intake. In addition, we assessed how and if three health-promoting feeding practices (*shaping a healthy environment, encouraging balance and variety, and healthy modeling)* mediated these associations.

Results

The study's rationale and development were described in a protocol paper, along with a presentation of the baseline characteristics of the included participants. In total, 404 parents signed up for participation, and 298 answered baseline questionnaires and were randomized into either the control (n=150) or intervention (n=148) group. Most of the parents were highly educated mothers.

From baseline to the first follow-up there was a significant time by group interaction for the frequency of vegetable intake (p = 0.02), showing a higher change in intake in the intervention group compared with the control group

(paper III). A borderline significant between-group difference in the variety of vegetable intake in favor of the intervention group was seen from baseline to both follow-ups. No significant differences were observed for other food groups.

The process evaluation of the study (paper IV) revealed that 86.5% of the participants in the intervention group visited the website. Most parents found the website appropriate to the child's age as well as self-explanatory (86–95%) and appreciated the layout and interface (55–63%). The recipes were valued as the most appreciated element included in the website. Highly educated participants (> 4 years of university/college) reported that they used end learned more from the website than participants with ≤ 4 years of education.

Regarding the second aim (paper II), the results showed that higher parental scores on health motives were associated with a higher child intake of vegetables (τ = 0.394 (SE = 0.098), p < 0.001). No associations with fruit or vegetables were found for other parental food choice motives. Some associations between food choice motives and child vegetable or fruit intakes were mediated by the feeding practices assessed, though solely for health and sensory appeal motives. Effect sizes of the observed associations were generally small.

Conclusions

Our findings support the use of eHealth interventions for supporting parents in their children's dietary upbringing. Through making the parents aware of dietary determinants and encouraging them to create a healthy food and eating environment, child diet was slightly improved, i.e., higher vegetable intake in the intervention group was observed. The intervention was well received by the parents, although especially by highly educated parents. Still, we did not manage to engage 13% of the participants, who did not enter the website at all.

Health motives were associated with child vegetable intake, and health-promoting feeding practices had some mediation effect. Our findings contribute to a better understanding of the relations affecting toddler's eating habits. However, more research is needed to examine the prospective and experimental evidence of interventions to enhance toddlers' diet and to clarify interactions between elements in the child's food and eating environment that affect the diet.

Content

Appendixes

List of papers

Paper I
Røed M, Hillesund ER, Vik FN, Van Lippevelde W, Øverby NC.
The Food4toddlers study – study protocol for a web-based intervention to promote healthy diets for toddlers: a randomized controlled trial.
BMC Public Health 19, 563 (2019) doi: 10.1186/s12889-019-6915-x

Paper II
Røed M, Vik FN, Hillesund ER, Van Lippevelde W, Øverby NC.
Associations between parental food choice motives, health-promoting feeding practices, and infants' fruit and vegetable intakes: the Food4toddlers study
Food & Nutrition Research 64, (2020) doi:10.29219/fnr.v64.3730

Paper III
Røed M, Medin AC, Vik FN, Hillesund ER, Van Lippevelde W, Campbell K, Øverby NC.
Effect of a parent-focused eHealth intervention on child's fruit, vegetable and discretionary food intake: The Food4toddlers RCT study
JMIR Journal of Medical Internet Research, 2021; Jan 17. doi:10.2196/18311 (in press)

Paper IV
Røed M, Vik FN, Hillesund ER, Van Lippevelde W, Medin AC, Øverby NC.
Process Evaluation of an eHealth Intervention (Food4toddlers) to Improve Toddler's Diet: Randomized Controlled Trial.
JMIR Human Factors 2020;7(2):e18171 doi: 10.2196/18171

Abbreviations

app	Mobile application/mobile app
BMI	Body Mass Index (kg/m^2)
CFPQ	Comprehensive Feeding Practices Questionnaire
eHealth	electronic Health
FCQ	Food Choice Questionnaire
GEE	Generalized Estimating Equation
ITT	Intention-to-treat
LMS	Learning Management System
NCDs	Non-communicable Diseases
RCT	Randomized Controlled Trial
SCT	Social Cognitive Theory
SES	Socioeconomic Status
SSB	Sugar-Sweetened Beverages
WHO	World Health Organization

1. Introduction

1.1. Child diet and health

The recently published WHO-UNICEF-Lancet commission report: *A future for the world's children*? [1] states that investing in young children's health, education, and development lays the foundation for the individual's lifelong health and development, and even for their future children's health, an investment which is beneficial for society in general. This report highlights the importance of good health and nutrition in the prenatal period and early years to lay the foundation for a healthy life course [1]. A healthy diet in infancy and toddlerhood lowers the risk of overweight and obesity, non-communicable deceases (NCDs), and certain cancers later in life [2-5]. Obesity and overweight are defined by the World Health Organization (WHO) as one of the greatest threats to public health, and worldwide 40 million children below five years of age were overweight or obese in 2018 [6]. The imbalance between calories consumed and calories expended caused by a too high intake of energy-dense food and inactivity is stated by the WHO as the fundamental cause of overweight and obesity [6]. A low energy density diet is needed to lower the prevalence of overweight and obesity at the individual level [2, 6]. Such a diet includes fruit and vegetables as well as legumes, whole grains, and a low intake of fat and sugar [6]. Overweight and obesity increase the risk of NCDs, such as cardiovascular diseases, diabetes, and breast, colon, and liver cancer [6]. Diet can also directly influence NCDs and cancer, not just through overweight and obesity [7, 8]. NCDs (including some cancers) are the most significant cause of death worldwide, and particularly a reduction of the intake of salt and saturated fat and a higher intake of fruit and vegetables is recommended to reduce this mortality risk [7-9]. The Norwegian food-based dietary guidelines are in line with the World Health Organization's recommendations, which include recommendations for a varied diet with a high intake of vegetables, fruit and berries, whole grains and fish, and limited amounts of processed meat, red meat, salt, and sugar [10, 11]. These recommendations are based on international research and target the general public from one year of age. However, poor adherence to dietary guidelines is seen worldwide [12-14], including among the youngest children [15, 16]. Toddlers' diets are essential for their health and growth, and in the Western world there are some major challenges regarding in toddlers' diets: fruit

and vegetable consumption is too low, and the intake of unhealthy snacks and sweetened beverages is too high [17, 18]. In Norway, toddlers tend to have a low intake of fruit, vegetables, and fish [19, 20]. However, a positive tendency of a higher intake of fruit and vegetables is seen in the latest Norwegian nationwide surveys [21, 22].

Differences in diet are also seen among pre-schoolers of parents with different education levels. Those with low educated parents usually eat food with a lower diet quality than other children [23]. Studies have shown that their diet tends to consist of more fat, sugar, and soft drinks, and fewer fruit and vegetables than the diet of children of highly educated parents [24, 25].

The first 1,000 days of development, from conception to two years of age, represent a window of opportunity in health promotion and prevention of chronic diseases [26-29]. This period is a critical period for a child's growth and development, because in this time children adapt metabolically and behaviorally to their nutritional environment through epigenetic mechanisms and gene expression [27, 30]. The habitual traits developed in infancy and toddlerhood tend to track into later childhood and youth, and even into adulthood [1, 18, 31-33], which is an important reason why a healthy diet is essential in these early years.

1.2. Determinants of child's diet

In order to shift toddlers' food intake to be more in line with dietary recommendations, an understanding of the determinants of their food intake is required [34]. Socio-ecological models (also named ecological models) provide a comprehensive picture of what influences behaviors on various levels and what might be necessary to alter these behaviors [35, 36]. Ecology refers to the interrelationship between organisms and their environment [35]. A socio-ecological model can be divided into intrapersonal factors, interpersonal factors, community settings, and policies, as shown in Figure 1 [36].

Intrapersonal factors are characteristics of an individual, such as age, taste preferences, self-control, and motivations [37, 38]. In general, diet is seldom

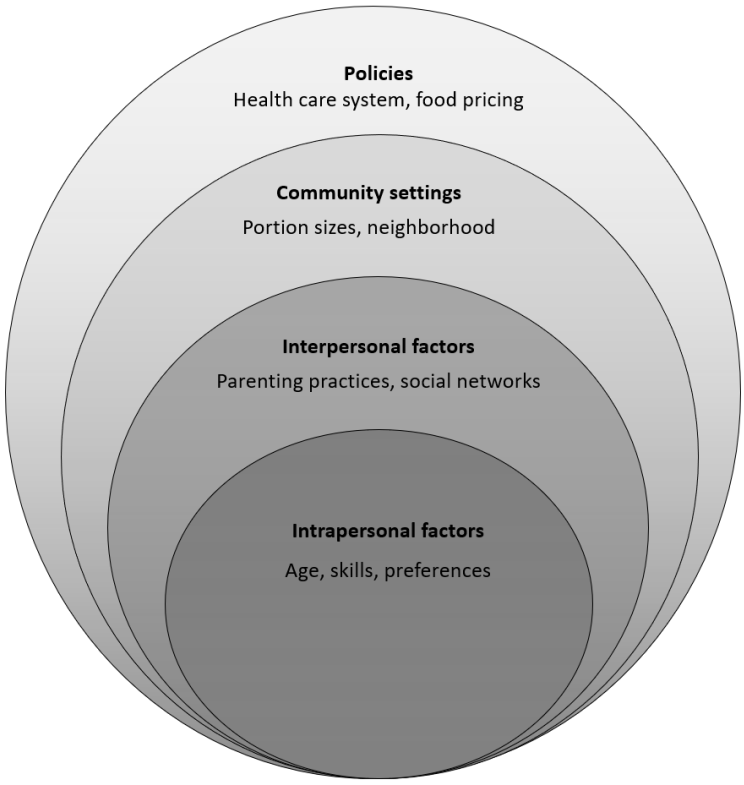

Figure 1. Socio-ecological model of factors influencing child's diet, with examples [35]

directly influenced through interventions; interventions typically influence the choices people make [39]. However, young children are one group out of few, that can be directly influenced on the intrapersonal level, in particular through their parents [39].

Interpersonal factors represent the social relationships surrounding an individual, e.g., home atmosphere and meal pattern [38]. The parents are the primary executor on this level, but other family members (grandparents and siblings) and kindergarten staff can also be influencers [38, 40].

Factors of institutional or organizational character, and the relationship between them, represent community settings. These factors can include the physical environment such as the availability of grocery stores, the type of neighborhood in which the children are brought up, and also factors like portion sizes available in commercially prepared food (e.g., baby food packages) or how food is stored in supermarkets [36, 38].

Policies involve local, state, and federal policies and laws [38]. Some examples are primary health care policies, food labeling, and taxes on specific foods.

The parents' major opportunity to influence their child's diet is on the intra- and interpersonal levels. However, if attention is given to mechanisms at other levels,

parents may also be able to make improved choices on lower levels [35]. If, for instance, parents have knowledge of food labeling, they may choose healthier alternatives for their children. Studies have shown that people are unaware of a number of the food decisions they make during the day, like the tendency to eat more if using a bigger plate or buying more of specific food items if they are more salient [41, 42]. Awareness of unhealthy eating habits has a strong positive correlation to the intention to make dietary changes, as shown in several studies [43-45].

1.2.1. Food and eating environment

With a socio-ecological perspective on health behavior, Sallis et al. [35] highlight that environmental contexts are significant determinants of health behavior. Targeting food-related environmental factors in dietary interventions may, therefore, be appropriate. Wansink and Sobal [42] claim that within an ecological context the environment is often overlooked because it is an intermediate level that lies between the policy arena and personal choice.

Wansink and Sobal [42] investigated how the environment influenced people's food choices and distinguished between the food environment and the eating environment. They defined *food environment* as factors that directly relate to how food is provided or presented, such as its salience, structure, packaging, or portion size, and how it is served [42]. The food environment is divided into two levels, which are out-of-home settings called *macro-scale,* and in-home settings called *micro-scale*. On the other hand, the *eating environment* comprises ambient factors that are not directly dependent on food, such as atmosphere, the effort of obtaining food, meal pattern, and social interactions around meals [42]. Several alternative definitions of food environment in home settings exist [46-49]. A simple definition is the "healthiness of foods available in the home" [50], while another defines the home food environment as "characteristics within the family that influence or shape children's dietary behavior" [51]. Wansink and Sobal's [42] definition includes a more comprehensive range of elements, e.g., shopping alternatives, and is the definition used in this study. Parental feeding practices and parental food choice motives are defined within the child's eating environment.

Parents are the primary “gatekeepers” of a child’s diet and can influence a child’s dietary intake by shaping the food and eating environment [52], especially on the intra- and interpersonal socio-ecological levels. Parent-focused dietary interventions with an environmental focus are recommended and have yielded promising results [53-55].

1.2.2. Food preferences

On the intrapersonal level, a child’s preferences for food are essential for what they prefer to eat. Food preferences are formed by the interactions between genetic predispositions and the environment [56]. Taste is important for food preferences and is an essential determinant of children’s food intake [57]. A genetic predisposition is a preference of sweet and salty tastes [56]. An aversion of sour and bitter tastes, which are tastes often found in fruit and vegetables, is also an innate disposition to protect children against eating toxic or spoiled food [57, 58]. Since sweet and salty foods tend to be energy-dense and have low nutrient quality, this predisposition can contribute to a low diet quality if these foods are eaten and preferred instead of the sour and bitter foods that tend to be healthier. Leann. L. Birch [56] claims that whether these predispositions are manifested in healthy food preferences is depended on the food and eating environment, including the availability of healthy foods, and conducting health-promoting feeding practices.

Parents have a major opportunity to alter the diet through the environment, especially in the formative years [59]. Before the child is two years old, most children are positively inclined to try new foods, and even though they reject one type of food one day, they might be willing to try it again the next [53, 58]. However, from around two until approximately six years of age, there is a natural tendency of rejecting food, also called neophobia [58]. If a child starts liking a variety of foods before the neophobia period starts, they tend to have a better trajectory of food variety throughout the neophobia period and beyond [53]. Interventions to enhance healthy foods before two years of age can, therefore, contribute to the lifelong acceptance of a large variety of foods.

Including more fruit and vegetables in the diet is essential to enhance a toddler's diet [11, 17, 60]. Both fruit and vegetables can be sour or bitter, but compared to vegetables, fruit tends to be sweeter, have a softer texture, and can more easily be consumed raw as a snack, in drinks, or as desert [61, 62]. These issues contribute

to differences in taste perceptions and consumption patterns and, therefore, treating fruit and vegetables separately in interventions is recommended [61, 62]. Glasson et al. [62] found, among parents of primary school-aged children, that knowledge, consumption, stages of readiness for change, and correct perceptions of adequate intake were higher for fruit than for vegetables. The researchers suggest that increasing vegetable intake programs should focus on raising awareness, revealing the benefits of higher intake, and making the target group aware of the potential discrepancies between their own intake and recommendations [62].

Some studies indicate that a healthier diet and acceptance of a variety of foods can be obtained by letting children eat by themselves at an early age [63, 64]. There are some evident benefits of self-feeding: the children can smell, see, and feel the food and decide when to put it in their mouth [65]. They also develop fine motor skills, experience natural chewing, and less "entertainment" is needed during meals [66]. How and when parents should encourage children's self-feeding skills are discussed in the literature [63, 65, 67].

1.2.3. Parental feeding practices

The feeding practices the parents perform can promote or hinder a healthy diet. For example, if parents pressure their child to eat a particular food, this tends to drive a dislike of the actual food, while involving the child in food preparation can be positive and heighten their willingness to try new food [68].

Parental feeding practices are defined by Shloim et al. [69] as specific goal-directed behaviors that parents use to directly influence children's eating. Vaughn et al. [68] also incorporated less specific feeding practices in their definition of *food parenting practices* and developed a content map of these practices, which is discussed here in order to provide an overview of different approaches. *Food parenting practices* include both intentional and unintentional behaviors and actions parents perform that influence their child's attitudes, behaviors, or beliefs regarding food [68]. The content map has three overarching, higher-order food parenting constructs:

1) *Coercive control* practices focus on parents' pressure, instructiveness, and dominance, according to the child's feelings and behaviors. These practices and how they affect children's diets are addressed in several

studies [70] and these practices are also called negative feeding practices [71].

2) *Structure* practices represent how the parents organize children's environment to facilitate children's competence. Within this construct, we find practices that can be named health-promoting feeding practices (also called positive or protective feeding practices), which are associated with a healthy child diet [53]. An example is *food availability,* characterized by limiting the amount of unhealthy foods and increasing access to healthy alternatives. Another example is *meal and snack routines*, which includes incorporating family meals in daily life.

3) *Autonomy support* practices represent how parents promote psychological autonomy and encourage a child's independence. Health-promoting feeding practices are also found within this construct, e.g., *encouragement,* which incorporates the encouragement of trying new food, and *child involvement,* characterized by child involvement in planning and preparing meals.

The complex bidirectional interactions between child eating behavior and parental feeding practices shape the eating environment in the early years [72]. At the same time, these interactions interact with genetic predispositions, which together form the foundation for eating habits and health outcomes later in life [72]. The food habits and dietary preferences (likes and dislikes) established in the early years to a large extent reflect the feeding practices performed by parents [59, 72], which indicates that interventions targeting feeding practices are important from early development.

1.2.4. Food choice motives

Both parental feeding practices and parents' motives for selecting food are elements of the child eating environment which may impact children's dietary intake, and these determinants of child diet may also interact with each other [71]. Loth et al. [73] suggest more research on the relationship between feeding practices and food choices. In addition to the conscious choices we perform when buying food, the selection of food is guided by unconscious reflection, which is automatic, habitual, and subconscious and is guided by social interactions [74]. The conscious choices we make when selecting food can include motives like health, how familiar the food is, taste, or pleasure [34]. Parental food choice

motives can influence children's diet directly or through the parents' feeding practices [68]. Two studies conducted on parents of preadolescents showed that health and sensory appeal motives were the strongest motives when selecting food [75, 76], while health, nutrition, and taste were the most important motives in a study of parents of two to five-year-olds [77]. As seen in these studies, parents have the motive to provide their children with healthy foods. However, a lack of consistency is seen between motives and actual healthy behavior [77, 78]. The capability for forethought is one main distinctive human characteristic [79]. For some of the food choices parents perform when children are between one and two years old, the outcome is not visible in the short term, e.g., the development of NCDs in adulthood, making it harder to be motivated to perform healthy choices [80].

1.3. Health behavior change

Many theories about how to change behavior exist [81], and for a project to be effective in changing behavior, it depends on applying the most appropriate theories and practice strategies for the given situation [82]. Gochman [83] defines health behavior as “those personal attributes such as beliefs, expectations, motives, values, perceptions and other cognitive elements; personality, characteristics, including affective and emotional states and traits; and overt behavior patterns, actions, and habits that relate to health maintenance, to health restoration, and to health improvement.”

Health behavior theories have had a major focus on cognitive determinants, but newer models are increasingly addressing the relationship between behavior and the environment [84, 85]. An example is how the Theory of Reasoned Action (TRA) and the extended version, the Theory of Planned Behavior (TPB), can be used in combination with other models. These theories focus on how motivational factors determine the likelihood of performing specific behaviors [84], and Montano and Kasprzyk [84] recommend using the TRA/TBP in combination with other models (an ecological approach) merged in to the Integrated Behavioral Model (IBM). In addition to the motivational factors, knowledge, and skills to perform the behavior, the IBM incorporates the salience of the behavior, environmental constraints, and habit.

Social Cognitive Theory

Social Cognitive Theory (SCT), developed by Albert Bandura, includes environmental factors in its key model construct: reciprocal determinism [80]. SCT is one of the most applied theories used in health promotion [80, 86, 87]. This theory can guide researchers in determining the factors motivating healthy behavior and designing interventions to promote behavior change [88]. Cultural differences such as individualism versus collectivism as well as perspectives on gender, may change how the SCT constructs manifest in behavior [89]. Reciprocal determinism (see Figure 2) consists of three factors that influence individual behavior: *person* (cognitive factors), the e*nvironment* (physical and social factors), and the *behavior* itself [80, 86]. These three interact with each other, but the sources of the influences are not necessarily of equal strength nor do they necessarily occur simultaneously [90]. The personal cognitive factors have three constructs: *self-efficacy* (confidence to engage in a behavior), *outcome expectations* (foresee the outcome of behaviors), and *knowledge* (level of understanding) [86]. The physical and social environment consists of four constructs: *observational learning* (influential role models), *normative beliefs* (cultural beliefs about the social acceptability and perceived prevalence of the behavior), *social support*, and *opportunities and barriers* [86]. Behavioral factors are actions taken by the individuals that are health-enhancing or the opposite, and consist of three constructs: *behavioral skills*, *intention*, and *reinforcement* [86]. By modifying elements of these three interacting factors, SCT suggests that behavioral change is possible [86].

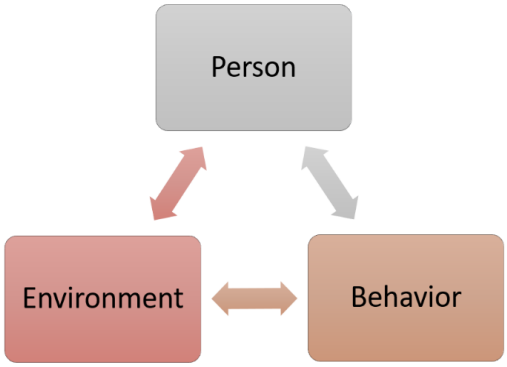

Figure 2. Reciprocal determinism developed by Bandura [80]

1.4. Parent-focused dietary interventions

In a parent-focused intervention, the elements in the intervention are addressed to parent and not, e.g., to health care nurses or kindergarten staff. Since parents are the primary gatekeepers of a child's diet in the early years, this strategy is logical and has shown to be beneficial [91].

Two non-digital parent-focused Australian studies conducted before 2016 are of particular interest when addressed the parental role in shaping the food and eating environments of infants and toddlers. The NOURISH trial recruited first-time mothers and targeted early parental feeding practices through 12 group sessions based on anticipatory guidance principles delivered when the child was four to 16 months old [92]. They found that protective feeding practices were used to a larger degree among the intervention mothers than the control mothers [93], and the children in the intervention group "liked" more fruit and less discretionary foods and beverages, and had been exposed to a larger variety of vegetables [94]. The cluster-randomized InFANT study targeted first-time parents and focused on parental skills related to physical activity and diet for children aged three to 18 months [95]. The intervention group received six two-hour lessons with a dietitian, while the control group received six newsletters on non-obesity themes [96]. The intervention group children consumed fewer sweet snacks and sugar-sweetened beverages post-intervention and had a better diet index score than children in the control group [96, 97]. The intervention was perceived as relevant and useful for most of the participants (82–93%) in the intervention group [98].

1.5. eHealth

In 2018, the World Health Assembly, which is the decision-making body of the WHO, acknowledged the potential of digital technologies to play a major role in improving public health [99]. In 2019, 58.8% of the world's population were Internet users, and the rate is increasing [100]. In Europe, 87.7% were Internet users in 2019, and in Norway, the number was as high as 98.4% [100]. Norwegian national figures from 2019 showed that 80% of the population aged between 25 and 34 searched for health-related information on the Internet in the last three months [101]. Norwegian women searched for this information (95%) more than men (65%) [101], which is the same pattern seen in an Australian study among parents of infants and toddlers [102]. This prevalent Internet use is an opportunity for health interventions to transmit health information and for learning through digital channels, also called eHealth (electronic health). The WHO defines eHealth as "the use of information and communication technologies for health" [103]. However, many definitions exist [104]. mHealth (mobile health) is a subgroup of eHealth, but is limited to hand-held devices [105]. The above eHealth definition is used in some parent-focused studies [106-

108], and mHealth is used in studies where the participants receive access to a mobile application (app) as the primary tool [109, 110]. By using an eHealth approach, a broad specter of parents can be reached, including those who are traditionally hard to reach, e.g., people living in rural areas [111-114]. eHealth interventions have several benefits for researchers: there is a possibility of recruiting many participants, the tool can easily be adapted to new groups and settings, and it is cost-effective [115, 116]. For the participants, a digital tool might be more appealing and be available 24/7 [115, 116]. Time commitments are known as a barrier for participation in interventions [117], and web alternatives may be less time-consuming. An American study targeting parents of one to five-year-old children compared online and in-person deliveries of the same nutrition education intervention [118]. Similar findings were found in both groups with one exception: increased frequency of eating breakfast for both parent and child were only seen in the online group. For the other measures, both deliveries showed a positive intervention effect for parents' knowledge, self-efficacy, and reported behaviors associated with reducing salt intake and healthy breakfast habits [118, 119]. Few differences between online and in-person deliveries are also seen in a study targeting low-income adults [120]. Therefore, online delivery can be favorable or equivalent to promoting nutrition-related changes compared with in-person delivery.

A systematic search was undertaken in March 2020 for parent-focused eHealth interventions that included dietary outcomes and targeted children below five years of age. The search string included phrases to include parents, young children, interventions, eHealth, and diet or nutrition. We excluded "youth" and "school" in titles and articles published before 2005 due to few Internet users before that time. The complete search string is available in Appendix 5. The search resulted in 666 articles. After excluding duplicates, 416 remained. The abstracts were scanned, and articles were excluded due to, e.g., child age, no intervention, non-English publication, and ongoing studies without any dietary results presented. After the abstract screening, 67 articles remained, and after full text screening 25. Of these 25 articles, 24 represented seven interventions (presented in Table 1), and the last article represented a pilot study (presented in the text below). The included eHealth studies in Table 1 were parent-focused, had a mean age of less than five years for participating children at inclusion, included dietary outcome results, and had a control group that did not receive any interactive nutrition treatment.

Table 1. Overview of parent-focused eHealth interventions targeting young children < 5 years, including dietary outcomes and with a control group not receiving interactive nutrition information.

Reference [1]	**Name of study**	**Country/ start date**[2]	**Child age**[2]	**N**	**Design, duration, content**	**Dietary outcomes, study findings**	**Other main findings**
Helle et al. [111]	Early Food for Future Health	Norway 2016	3–5 m	718	RCT, 6 m, IG: Access to a website with monthly delivered videos. CG: ordinary care.	Higher FV frequency and greater V variety. No effect for discretionary foods.	More family meals and fewer devices used at mealtimes.
Megan L Hammersley et al. [121].	Tim2bHealthy	Australia 2016	2–5 y (high BMI)	86	RCT, 6 m, IG: Web course followed by emails about healthy lifestyle. CG: Emails with information on similar topics.	Less frequency on discretionary foods (long-term effect), no effect on FV.	BMI: No statistical effect.
Nyström et al. [122]	MINI-STOP	Sweden 2013	4 y	315	RCT, 6 m, IG: App access. Promote healthy eating and PA. Some tailoring. CG: Information on paper.	Higher composite healthy score. Less SSB. No effect on FV.	FMI (fat mass index): No statistical effect.
Russell et al. [123]	Growing Healthy	Australia 2015 (disadvantaged areas)	In pregnancy or < 3 m	645	QES, 9 m, IG: Access to app and website on health promotion behaviors. CG: Ordinary care.	No effects for frequency or variety of core foods and discretionary foods.	Use of an app. Multiparous parents (> 1 child) had lower attendance.

Byrd-Bredbenner et al. [124]	HomeStyles	USA 2014	2–5 y	489	RCT, 12 m, IG: Website on healthy home-environment (diet, PA, sleep) CG: Website with another content.	No effect on diet (FV servings and SSB servings).	Less salty snacks at home. Use of website: High SES = higher attendance.
Nezami et al. [125]	Smart Mums	USA 2014	2–5 y (Maternal high BMI)	51	RCT, 6 m, IG: One group session, 18 web lessons about reducing SSB + healthy diet. CG: One group session + ordinary care.	Reduced SSB intake.	Maternal weight loss.
van Grieken et al. [126]	BeeBOFT	The Nether-lands 2008	18 m	2102	Cluster RCT, 6 m, IG: Web lessons about four health issues (diet = SSB). CG: Normal care.	No overall reduction in SSB intake, but for a sub-group.	No overall results, but for subgroups (e.g., boys eat breakfast more often).

IG: intervention group; CG: control group; RCT: randomized controlled trial; QES: quasi-experimental study; BMI: body mass index (kg/m^2); F: fruit; V: vegetables; SSB: sugar-sweetened beverages; PA: physical activity

[1]Reference to articles which include dietary outcomes; other articles from these studies also exist.

[2]Start date for the inclusion of participants and the child age at that time; y=years, m=months.

All the interventions represented in Table 1 used Social Cognitive Theory (SCT) as a theoretical framework, except for the Growing Healthy study which used the Behavioral Change Wheel framework, and the BeeBOFT study which included other frameworks in addition to SCT.

Of the included interventions, the Early Food for Future Health study was conducted in Norway and targeted infants during the weaning period from six to 12 months of age [127]. This intervention consisted of a webpage with new items, including videos of infant feeding, delivered every month. They found positive intervention results for child vegetable and fruit consumption, and families in the intervention group were more likely to eat breakfast and dinner together and less likely to use digital devices during meals [107]. The intervention group participants reported good adherence to the intervention and were positive regarding the content presented in the intervention [107]. The intervention group in the Time2bHealhty study received a web course followed by emails containing information about a healthy lifestyle [106]. The intervention resulted in lower consumption of discretionary food intake in the intervention group than the control group [122] and was the only one of the included studies which reported long-term effects as well as the only study excluding children with low BMI. The parents in the MINISTOP study received access to an app about healthy diet and physical activity and the parents also received tailored digital and personal feedback [128]. The study showed a positive effect of lower sugar-sweetened beverage (SSB) consumption and a higher healthy composite score in favor of the intervention group [122]. The Growing Healthy study delivered an app and a website focusing on healthy behaviors to the intervention group [109]. No effect of the dietary intervention was found [123]. First-time parents (primiparous) used the intervention more than multiparous parents (> one child) [129]. The Smart Mums study included only mothers with high BMI [125, 130]. The intervention group received one session in person and 18 web-lessons regarding healthy eating, with a particular focus on reducing SSB consumption for both mother and child. The children's consumption of SSB was highly reduced in the intervention group compared to the control group. The BeeBOFT study recruited parents of toddlers via health care centers, and the intervention group received two eHealth modules and thereafter personalized advice at regular health care visits [126]. The dietary focus was on SSB, and no results were found except that children of normal-

weight mothers in the intervention group consumed less SSB compared with the control group.

One pilot study, Jump2health, was identified in the systematic search [131]. This study targeted parents of three to five-year-olds [132] and included a website, Facebook groups, and text messages about healthy nutrition. They found a positive intervention effect on child fruit and vegetable intake.

An interesting eHealth study not included in the table, because both studied treatment groups received digital nutrition treatment, is the EMPOWER RCT study, which included parents of children at the age of four to six [133]. They compared two web-based deliveries of promoting a healthy lifestyle, one using SCT constructs and the other using knowledge-based constructs. They found a higher intake of fruit and vegetables in the SCT group and a lower intake of discretionary foods in both groups. An American study compared online and in-person deliveries targeting a healthy breakfast to parents of one to five-year-olds and found overall that both deliveries were effective in increasing breakfast-related knowledge [118]. Other promising studies have few published relevant results as of yet [134-139].

Few parent-focused eHealth interventions have targeted the youngest children thus far, none address solely 12–18-month-old toddlers, and few are exclusively digital. Positive dietary outcomes can be achieved through these kinds of interventions [106, 109, 127, 140-142]. Thus, eHealth strategies are becoming important strategies for behavior change and should be based on health behavior theories, and should also be evaluated [82, 143].

1.6. Parental information sources for child diet

Information about infant's and toddlers' diet and nutrition are in Norway traditionally provided by health care nurses at the municipality's health care centers. Over 95% of Norwegian parents attend the national health care program with their toddlers, which includes 13 visits with health care nurses or doctors before the age of two [144, 145]. Child diet and feeding practices are recommended topics in these consultations, and both pamphlets and oral information are usually provided to the parents.

The Internet has become an increasingly important and popular source of health information among parents [107, 146, 147]. Almost 80% of parents of one-year-olds in a Norwegian national eHealth study [107] reported that they preferred to

search for information about infant nutrition on the Internet, followed by books and brochures (71%), and less than 50% rated information from health care nurses at health care centers as the preferred source. According to Burrow et al. [148], parents prefer digital tools for families, which are easy to use, practical, and engaging. The parents also highlighted that a trustworthy source should endorse the information, and individual tailoring should be a part of the intervention. The parents' potential engagement was linked to the need for information and for the information to be in line with their beliefs and values. Similar findings are seen in the study of Litterbach et al. [149], who, in addition, found that parents preferred push notifications adjusted to the child's age and highlighted the importance of nonjudgmental information.

To be able to make use of health information, parents need a minimum degree of health literacy. A person with acceptable health literacy is categorized as being able to access, understand, and use health information [150]. A nuance of health literacy is eHealth literacy, defined by Norman and Skinner [151] as "the ability of people to use emerging information and communications technologies to improve or enable health and health care." Highly educated people tend to have higher health and eHealth literacy than persons with lower education levels, who find it harder to, e.g., select credible sources [152, 153]. Highly educated mothers also search for information about parenthood and health more frequently than lower educated mothers [154]. Dworkin et al. [155] examined parents' online behavior and found that parents wanted more education on how to distinguish between different online sources and recognize credible information.

2. Aims and objectives

The aim of this thesis is twofold: 1) to develop, implement, and evaluate an eHealth intervention, aiming to promote healthy dietary habits in toddlers by targeting parents' awareness of their child's food and eating environments, and 2) using baseline data to examine associations between parental food choice motives, parental feeding practices, and children's fruit and vegetable intake.

The specific aims were:

- To describe the development and rationale of the Food4toddlers study (paper I).
- To examine potential cross-sectional associations between parental food choice motives and infants' fruit and vegetable intake. Further, to examine the potential mediating effects of three health-promoting feeding practices on these associations (paper II).
- To examine the effect of the parent-focused Food4toddlers eHealth intervention on the child's diet assessed at two time points post-intervention. The dietary outcomes assessed were the frequency of vegetables, fruit, and discretionary foods, as well as the variety of vegetables and fruit (paper III). In addition, exclusively for this thesis a supplementary to examine other dietary outcomes complement the paper III findings.
- To conduct a process evaluation of the Food4toddlers intervention by examining the usage and perceived satisfaction of the intervention website in parents of toddlers and explore whether this differed according to education level and number of children in the household (paper IV).

3. Materials and methods

In the following sections, the study design and project outline will be presented. I then present the development of the intervention, including the theoretical framework, as well as the co-creating process and a description of the Food4toddlers website. Thereafter follows a description of how we performed the data collection, the study flow and sample, and a description of the papers in this thesis. In section 3.6 to 0 are the measures, ethics of participation, and statistical analyses presented.

3.1. Study design

The study's overall design was a two-armed, randomized controlled trial (RCT) used to evaluate the Food4toddlers intervention targeting parents of toddlers. Data was collected at three time points. The baseline questionnaire was delivered before the child turned one year old, follow-up 1 questionnaire at intervention conclusion six months after (child age 18 months), and follow-up 2 questionnaire six months after follow-up 1 (child age 24 months). The parents in the intervention group received access to the Food4toddlers website for six months after completing the baseline questionnaire. This thesis includes one study protocol and three original research papers, all based on data from the Food4toddlers study. One of the papers in this thesis (paper II) applied baseline data to investigate cross-sectional associations. The timeline of the study is shown in Figure 3.

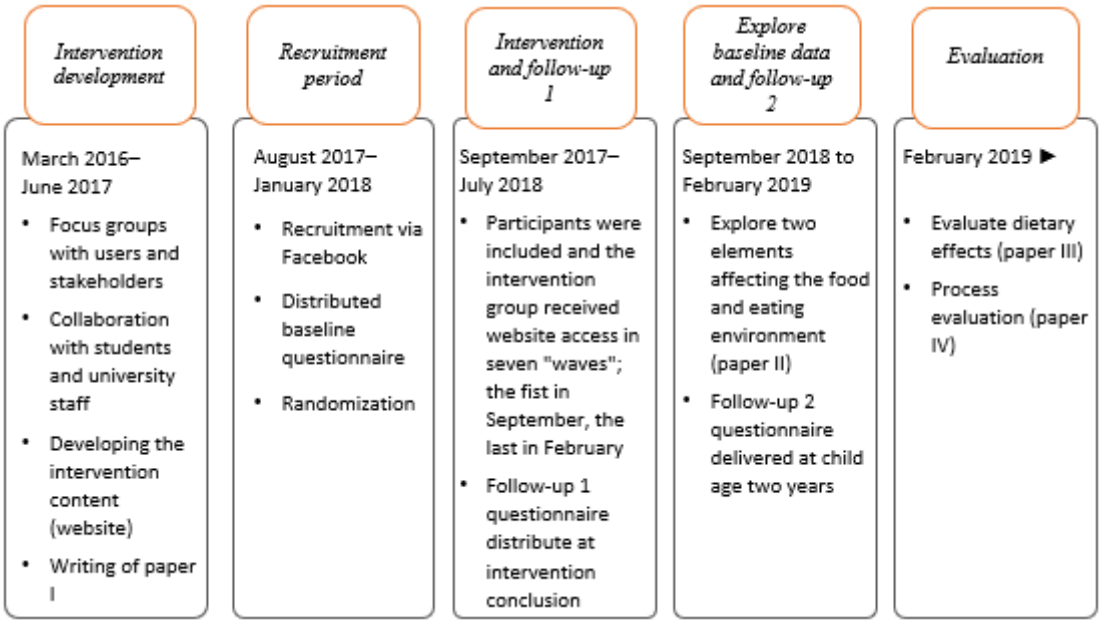

Figure 3. Timeline of the Food4toddlers study

3.2. Development of the intervention

The project group which developed the intervention included Professor Nina C. Øverby (leader), Frøydis N. Vik (professor), Elisabet R. Hillesund (professor), and Margrethe Røed (PhD student). This chapter answers the first specific aim of this thesis: to describe the development and rationale of the Food4toddlers study.

3.2.1. Theoretical approach

The Food4toddlers study used a combination of models and theories in the development and implementation of the intervention, along with suggestions from prior research and empirical findings in the field. A model or framework for the development of health interventions can help the developers to incorporate theoretical underpinnings in developing the intervention and to structure the work [156].

The Model for Planned Promotion of Population health developed by Brug et al. [39, 157] was used to structure the development and implementation of the intervention (see Figure 4).

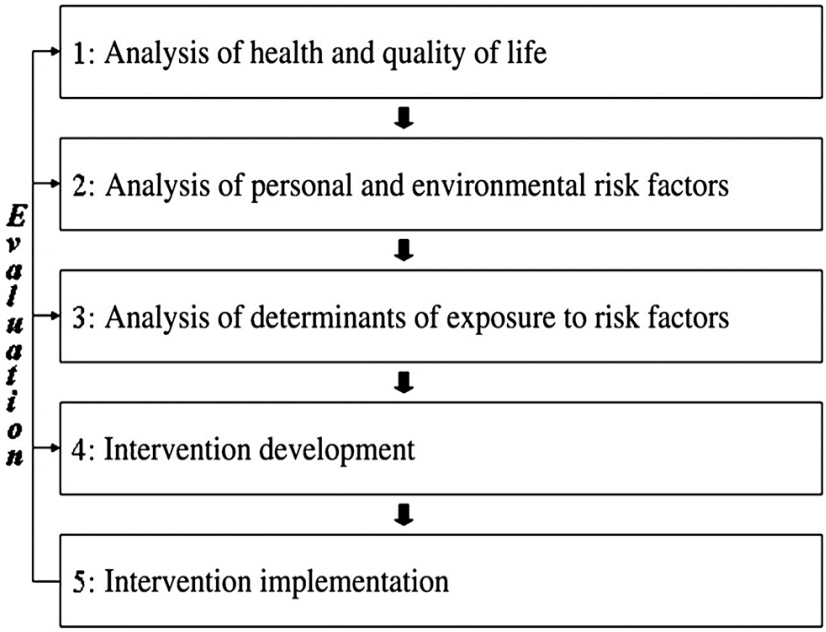

Figure 4. Model for Planned Promotion of Population health developed by Brug. et. al [39,157]

The first of the five steps in this model is to analyze health and quality of life. Knowing that the first 1,000 days of life is an important time for habitual traits to be established and that few interventions target dietary habits of one- to two-year-olds, this period was selected [29, 158]. This period is particularly interesting because here children adapt to the rest of their family's food and eating habits (e.g., sharing meals). The second step is to clarify potential behavior and environmental risk factors. Extensive collaboration with end-users and stakeholders (see section 3.2.2) as well as literature reviews helped us formulate potential risk: Norwegian toddlers have a low intake of fruit, vegetables, and fish [19, 20], and parents find it hard to find trustworthy digital

information regarding dietary issues. An unhealthy diet for toddlers is associated with overweight and obesity as well as non-communicable diseases later in life [2, 6].

A socio-ecological approach [35] was used to examine the third step of Brug et al.'s [37] model: to reveal the determinants of toddlers' dietary risks. A simple model of three target arenas (Figure 5) was developed: the plate (intrapersonal level), the home (interpersonal level), and the shop (community settings and policies).

Figure 5. Three target arenas: the plate, the home, and the shop (Pictures from Colourbox.com)

Knowing that approximately 200 of the choices we make every day relating to food and eating are unconscious [41, 42], we wanted to make the parents aware of potential unhealthy choices on different socio-ecological levels and reveal alternative approaches, and also promote positive choices in general.

Examples of determinants in the first arena, *plate*, are repeated exposure for the liking of vegetables and the offering of a variety of healthy foods. For the second arena, *in-home settings*, some of the themes were salience of food in the home environment and health-promoting and negative feeding practices. For the third arena, *out of home settings*, we presented and discussed placement in shops and food labeling (see further description of the website's content in section 3.3). Norwegian food-based dietary guidelines apply to toddlers (> 1 year), and the first recommendation is to have a "varied diet with plenty of vegetables, fruit and berries, whole grain products and fish, and limited amounts of processed meat, red meat, salt, and sugar" [10]. We decided to include messages that promoted an overall healthy diet, as described in the guidelines, however with a focus on fruit and vegetable consumption.

The fourth step of Brug et al.'s planning model [39], intervention development, was guided by Social Cognitive Theory [80]. The three factors influencing the behavior (person, environment, behavioral) in reciprocal determinism formed the basis of the implementation [80, 86]. We aimed to affect the parents regarding these three factors using different behavioral change techniques so that in the next step parents could influence their child's food and eating environment to enhance child diet. Figure 6 illustrates the expected interaction of parental personal, environmental, and behavioral factors of the Food4toddlers intervention and highlights the behavioral change techniques used.

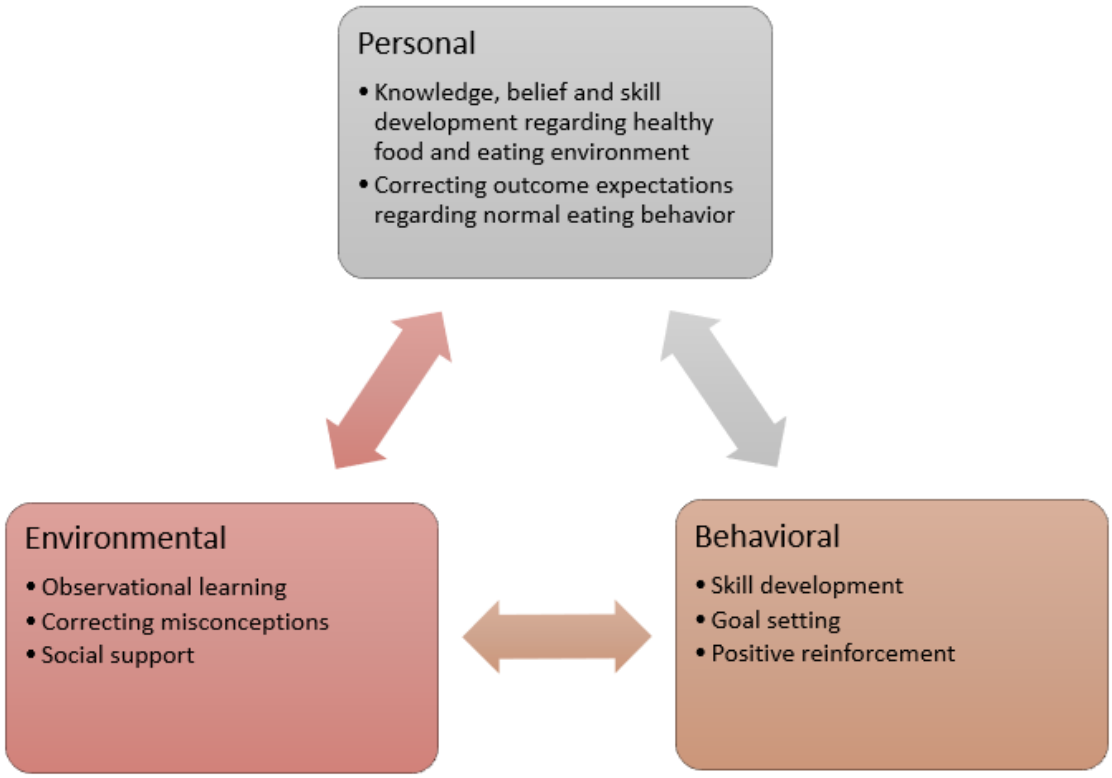

Figure 6. Personal, environmental, and behavioral factors on the Food4toddlers website

1) *Personal factors* refer to a person's abilities for processing information, applying knowledge, and making changes in their preferences [86]. In this project, we addressed knowledge, beliefs, and skills to create a healthy food and eating environment through the intervention modules. We also clarified outcome expectations regarding normal eating behaviors for a child (e.g., the number of repetitions to accept vegetables).

2) *Environmental factors* refer to physical and social elements in the environment that support the individual to perform a behavior [86]. The

Food4todders website is in itself an instrument in the environment which supports healthy eating. Methods used in the intervention for environmental influence were observational learning by showing videos of identifiable models performing and informing the intended behavior (i.e., cooking skills, doing groceries). Potential misconceptions about norms (e.g., eating everything on the plate) were corrected through quizzes, videos, and texts. Social support was addressed through interaction opportunities between peers and project staff available on the website.

3) *Behavioral factors* refer to actions that an individual performs [86]. We supported the parents in enhancing behavioral and coping skills (e.g., cooking and feeding practices) and encouraged them to set goals. Through positive reinforcement we highlighted potential positive outcomes of performing an action (e.g., potential to eat more varied food through family meals).

To engage and help the parents adhere to the intervention, the content of the intervention was gradually expanded [159], and the actors and settings used in videos and pictures were familiar (see Figure 7). The active learning methods used in this intervention are activity-based experiences such as quizzes and videos to enhance cooking skills [86]. Highlighting the importance of small changes was done so as to make the message affordable and not too discrepant for the parents [159].

Figure 7. Setting from one of the videos filmed in a local family home (Photo: Simen Sæther).

By using the SCT construct, *reciprocal determinism*, in the intervention's implementation, we tried to influence parents so they were enabled to create healthy food and eating environment for their child. Further, if the child's food and eating environment were enhanced, Figure 8 describes potential associations and how the children's behavior may be influenced by environmental, personal, and behavioral factors.

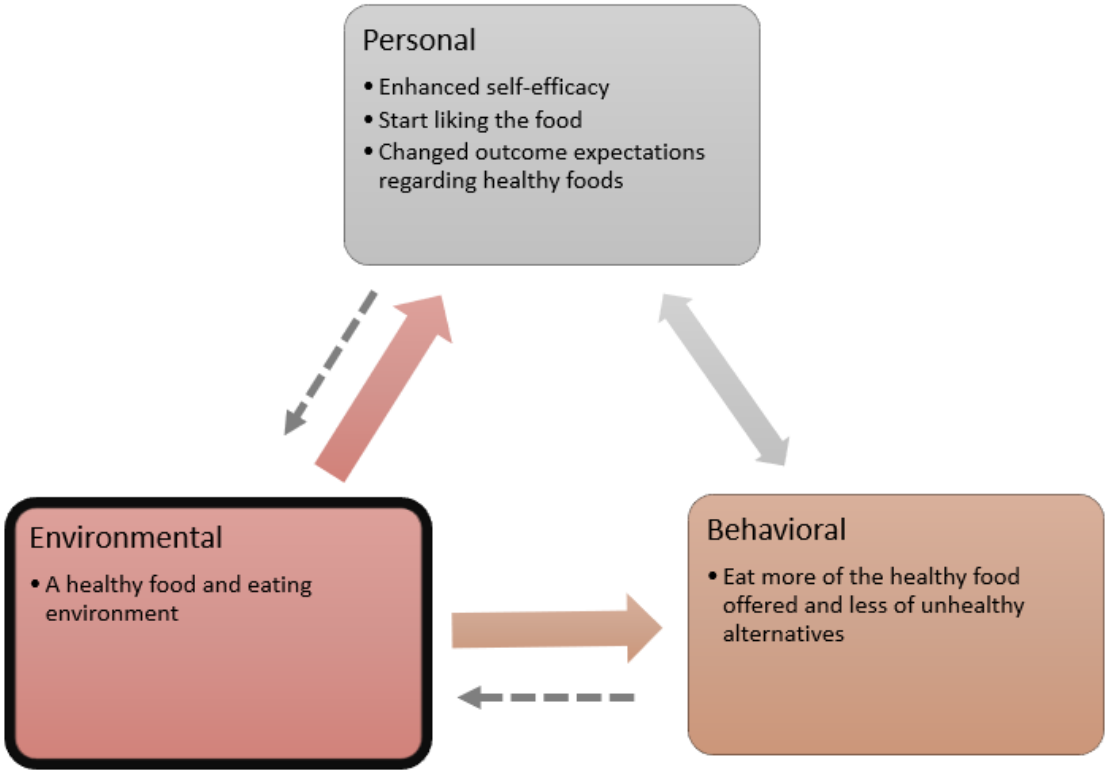

Figure 8. Potential associations and effects of children's exposure to the Food4toddlers intervention, through their parents

A healthy environment may influence a child's behavior directly or through personal experiences. A child probably eats more healthy food if it is more available and accessible. Regarding personal factors, the child may enhance self-efficacy, preferences, and outcome expectations of healthy foods through new experiences. Hopefully, the child's behavior change is that he or she eats more healthy foods and less unhealthy alternatives. The potential outcome is that their behavior and preferences regarding foods may contribute to a healthier environment in the long run, which is an example of a reciprocal effect, e.g., if parents observe that their child eats more vegetables, they may continue to buy more and make it available and accessible.

Finally, we performed the last step of Brug et al. [39] model and implemented the intervention. The evaluation of the intervention is still ongoing through follow-up data and articles in progress.

3.2.2. Co-creation of knowledge

The University of Agder's vision is "Co-creation of knowledge". This vision is specified in the strategy as follows: "Knowledge is successfully co-created when staff, students and the larger community challenge each other" [160]. Co-creation is a process by which (in this case) investigators, students, and users participate together in the creation of the study [161]. Many behavior change apps and websites have been designed, however with limited involvement of end-users and other stakeholders [162]. The Food4toddlers study included extensive involvement of users and other stakeholders in the first steps of its development and included technical contributors (e.g., to run the recruitment campaign) throughout the whole development and implementation period.

Users and stakeholders

First, health care nurses were contacted to gather impressions of what they valued as important within the field of nutritional care. We interviewed them regarding which questions parents tend to ask about nutrition, what the nurses themselves viewed as important, and how they thought parents would adapt and perceive an online tool in combination with an introduction at the health care centers. First, four health care nurses were individually interviewed (one face to face, three by telephone), and a focus group interview was conducted with two participants (at their workplace). One of the nurses worked in a disadvantaged community with a high proportion of families with low socioeconomic status (SES) and many non-native inhabitants. Before these interviews, we planned to make a cluster RCT including a video and facilitate group discussions at health care centers at the 12 months visit, followed by a digital tool provided to the participants. A major challenge was crystallized in these interviews: at the 12 months visit at the health care centers, the health care nurse is accompanied by a doctor, and a number of mandatory elements are scheduled (e.g., checking hearing and sight), leaving no room for new content. We therefore decided that the intervention had to be solely digital, which was viewed positively by the health care nurses.

Our next step was to invite parents of toddlers to attend focus group discussions to share and discuss dietary issues which they found challenging, as well as improvement strategies for their children's diet. In addition, we discussed the need and content of potential online tools. Few parents responded to the

invitation to participate in focus group discussions at the university despite intensive advertising. Therefore, we contacted settings were parents meet for other reasons. One focus group interview for end-users was delivered at the university, one in a home setting, and three in other settings (baby singing class and open kindergarten). Two telephone interviews with mothers were undertaken separately. In the interview that was conducted in the home setting, both parents attended. The other participants were mothers. Approximately 40% of the participants were non-native. Except for the first three interviews, the rest were taped, and seven out of the nine interviews have thus far been transcribed. In interviews with health care nurses and end-users, some dietary issues were discussed and valued as essential to include in the website: the safety of using spicy food, salt, nitrites, cinnamon, and foreign foods (sushi) in toddlers' diets. Users were also included in developing the questionnaire (see section 3.6) and participating in the pretesting of the website (see section 3.3).

Students

The website content, layout, and videos were co-created by the project team, students, and technical staff at the university. Two Multimedia and Educational Technology master's students at the University of Agder, Christina Lien and Svein Even Skogen, created the technical layout and designed the website without using any pre-made templates. This work formed the basis of their master's thesis. The collaboration included 11 face-to-face meetings and three Skype meetings, as well as several emails and telephone calls with the PhD student or the project group. These two students also designed the logo for the study, found pictures, invented a game, and made

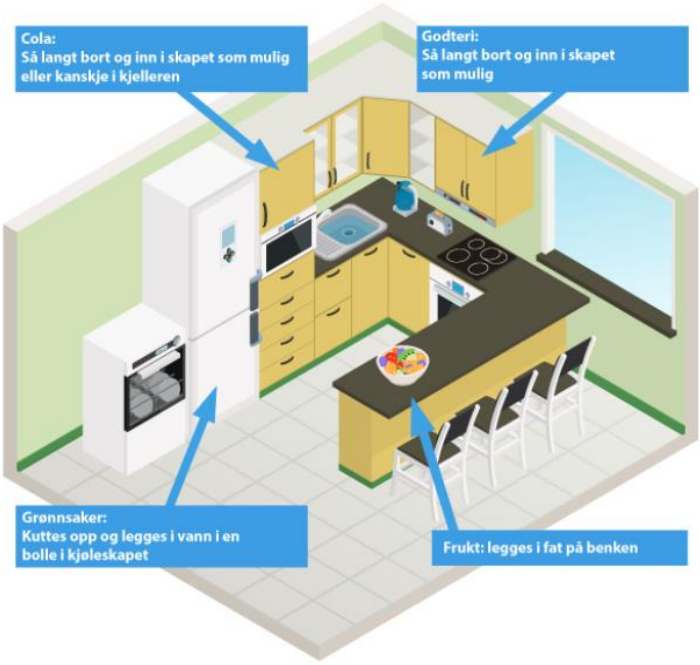

Figure 9. Illustration included in the website of where to place core foods and discretionary foods (Made by Christina Lien and Svein. E. Skogen)

illustrations for the website (see an example in Figure 9). They also contributed with comments and suggestions regarding the content and were in charge of the pilot testing.

We engaged undergraduate students studying Multimedia Technology and Design at the University of Agder to film and edit videos for the intervention, and they also contributed with suggestions regarding the content. One group of these students made nine cocking videos. Another student made information videos for the Facebook site (see an example here [163]), the study webpage, the front page on the Food4toddlers website and a video about food choices for one of the modules on the website (Figure 12).

Figure 10. Example of the animations (Made by Thomas Andersen)

The media unit at the university made animations for the videos and the study webpage. Examples are shown in Figure 10 and on the study webpage (timeline and in the video) [164]. Three Public Health master's students at the University of Agder developed recipes and cooking videos described in section 3.3.2. Throughout the development process, the project group had meetings and extensive email correspondence to discuss ideas, themes, the recruitment process, and how the content should be delivered on the website.

3.3. The Food4toddlers website

The website was developed in a learning management system (LMS) called NEO, a platform for managing all classroom activities and tracking student achievement. The design is intuitive, and it is thus easy to access the information. We named the website "Mat til minsten" in Norwegian (Food4toddlers). Since our intervention was a website, we defined it as an eHealth intervention [103]; however, the participants could install an app and access the same content there. A prototype of the website was pilot tested in February 2017 by 14 participants. A short survey was sent to the participants before and after completing the

testing. Some technical changes were made based on these responses and the tracking of the participants' use of the website.

All the information provided on the website related to creating a healthy food and eating environment for toddlers and the information was based on national guidelines and current research. When first accessing the website, parents received an email with login instructions. If both parent's names and email addresses were reported at signing in, both parents received the same access opportunities.

The website comprised four main elements: modules, recipes, a discussion forum, and an information section called "Good to know." These elements are described in Table 2 as well as in the following chapters. In addition to these four elements, information and a video appeared on the front page when the website was accessed. This video included an animation section about why small changes in the early years (i.e., adding a vegetable every week) can have an impact in the long run.

3.3.1. Modules

The first module was an information module which included the description of the study, how to install the website as an app, and information about recipes (e.g., that the recipes were made for two adults and two children with a possibility to change these numbers). The next seven modules included topics on how to enhance a toddler's food and eating environment. The modules had two to four lessons (see examples in Figure 11).

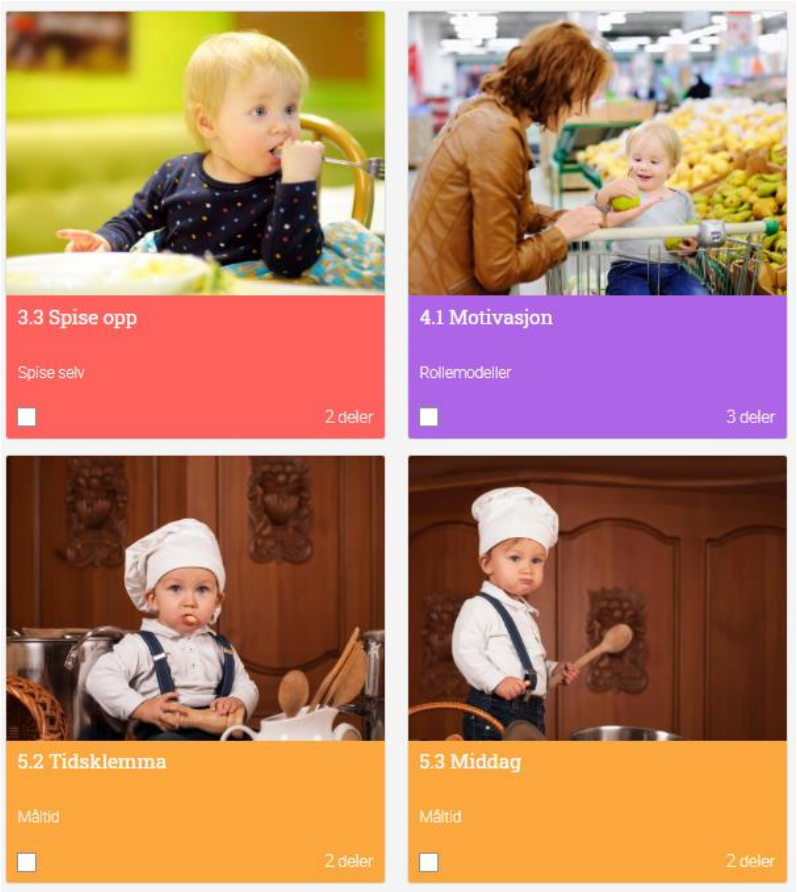

Figure 11. Layout of the modules with examples of four lessons; Eat up, Motivation, Time squeeze, Dinner. (Pictures from Colourbox, design: Cristina Lien and Svein E. Skogen)

Table 2. A description of the content of the Food4toddlers web site

Title	**Explanation**	**Content/topics**
Modules	The first module was an information module. The other seven modules included specific subjects, with two to four subheadings (lessons).	1) Introduction to the intervention website with information about recipes, how to install the website app, and descriptions of the study. 2) The importance of early eating habits and how to interpret food labeling. A special focus on accessibility, availability, and variety of healthy food and beverages. 3) How taste develops and the importance of repeated exposures, basic tastes, and spicy food. 4) Self-feeding skills and children's ability to self-regulate food intake. 5) Motivation to eat in a healthy way, being a good role model, and use of rewards. 6) Family meals: meal settings, preparing for meals, and meal composition. 7) Conscious and unconscious choices at home and in stores. 8) The benefits of children's participation in cooking and encouragement to try new family dishes.
Recipes	31 recipes were presented, 10 of which included an instructional video.*	Dinner (17 recipes/5 videos)*, snacks (7/1), bread and cereals (5/3), and beverages (2/1).
Forum	The forum was divided into two sections: general questions and recipes.	Participants could ask questions and discuss relevant issues with each other. In the recipe forum, they could, e.g., share recipes.
"Good to know"	Contained information about dietary issues relevant to the child's age.	Salt, honey, cinnamon, nitrites, potatoes, foreign foods (sushi), additives, and cod liver oil.

*One recipe with video was retrieved with permission from Godfisk.no

Each lesson included information and one to three recipes. One of the lessons in module seven contained a video about unconscious choices while shopping [42], made in a local store (see Figure 12). The mother in the video did her shopping, the video was reversed, and the crucial parts were replayed, accompanied by comments by the PhD student regarding the mothers shopping choices. The other lessons included a game (how to distinguish between the tastes), eight quizzes, six explanatory figures (see an example in Figure 9), and some links to recommended websites (e.g., https://www.melk.no/). The information module and the first lesson in module 2 were available when first accessing the website. Every following week a new lesson was delivered, and an email sent to the participants with information about the new content.

Figure 12. Filming at a local supermarket (Photo: Margrethe Røed, Actress: Cecilie Beinert)

3.3.2. Recipes

The recipes provided for this intervention were made to inspire the parents to make healthy food for the whole family. Children usually start eating the same food as the rest of the family in the intervention period (12–18 months). The ingredients were easily accessible in local supermarkets so as to lower barriers, and we tried to avoid high-cost foods that could have lowered the attendance of low-income parents [165]. The recipes were printable. Of the 31 recipes, 30 were developed by three master's students in Public Health at the University of Agder, in cooperation with the project group (the last recipe was retrieved from Godfisk.no). Short videos (1–3 minutes) were also developed for nine of the recipes to inspire the parents to use the recipes and to make the preparation easier. Undergraduate students in Multimedia Technology and Design at the University of Agder filmed and edited the videos.

3.3.3. Discussion forum

The participants could post questions and collaborate with other parents on a discussion forum. The forum was divided into two sections: general questions and recipes. Participants who joined the same group when receiving access to the Food4toddlers website had access to the same forum (7 different groups). The PhD student answered questions, usually within three workdays.

3.3.4. Highlighted information about foods and beverages

We listed information about salt, nitrites, cinnamon, foreign foods (sushi), honey, potatoes, food additives, and cod liver oil in a section titled "Good to know." The potential lack of health benefits of potatoes had been debated in the media during the developing period of the website, and we found it appropriate to incorporate information about potatoes as highlighted information. All information provided was based on recommendations from the National Health authorities and available for the participant during the whole access period.

3.4. Recruitment, study flow and sample

Recruitment

We designed a click tracking campaign on Facebook to recruit participants, together with staff at the Media Center at the University of Agder. Parents of children born between June 2016 and May 2017 who were literate in Norwegian were eligible for participation. A short video or a picture was launched on Facebook [163] with a link to the project website [164]. Potential participants received extended information about the project on this website through a video, text, and an information sheet (Appendix 1) and could sign up for participation. A registration system (Pindena) at the University of Agder was used to store personal information.

The advertisement on Facebook was targeted to include all parents with children up to 12 years of age with a special interest in either breastfeeding, pregnancy, or parenting. We also "instructed" Facebook to find a lookalike audience. We could supervise which pictures and videos were most effective in recruiting participants by regularly changing the pictures and videos, e.g., after the first week of recruiting with a promoting video launched, few had signed up (18), but after changing to a still photo the number increased in the following week (55). Members of the project group and others interested in the study posted and

shared the information on Facebook. The information was also posted on a Facebook page for the university and for a nationwide kindergarten company.

The recruitment period lasted from August 2017 to January 2018. This Facebook campaign was expensive (approximately 60,000 NOK), and we had a restricted time frame for the project, which together limited further extension of the recruitment period.

The Facebook campaign resulted in nearly 74,000 people being reached, and 2,249 clicks on the link. From across Norway, 404 parents of infants and toddlers were recruited.

The enrolled participants received an email with the baseline questionnaire approximately one month before their child turned one year old. After completing this questionnaire, the participants were randomized either into control or intervention groups according to an SPSS-generated randomization list prepared by Nina C. Øverby. If the parents had answered items concerning children's food intake and parental feeding practices, which were of greatest interest for the study, they were included despite the lack of other answers (e.g., shopping habits). After the randomization, Margrethe Røed enrolled the participants and informed them about their group assignment and provided access to the website for participants in the intervention group.

Study flow and sample

The flow of participants in the study is shown in Figure 13. The socio-demographic and behavioral data were obtained through the web-based questionnaire at three time points (Appendix 2-4). Baseline data were collected between September 2017 and February 2018 at child age 10.9 months, and 298 were included. A total of 148 participants were allocated to the intervention group, and 150 to the control group. Mistakenly, two participants in the intervention group did not receive access information and could not use the website, and one intervention parent decided to withdraw from participating. These three are still included in the measurements to obtain the intention-to-treat principle (ITT).

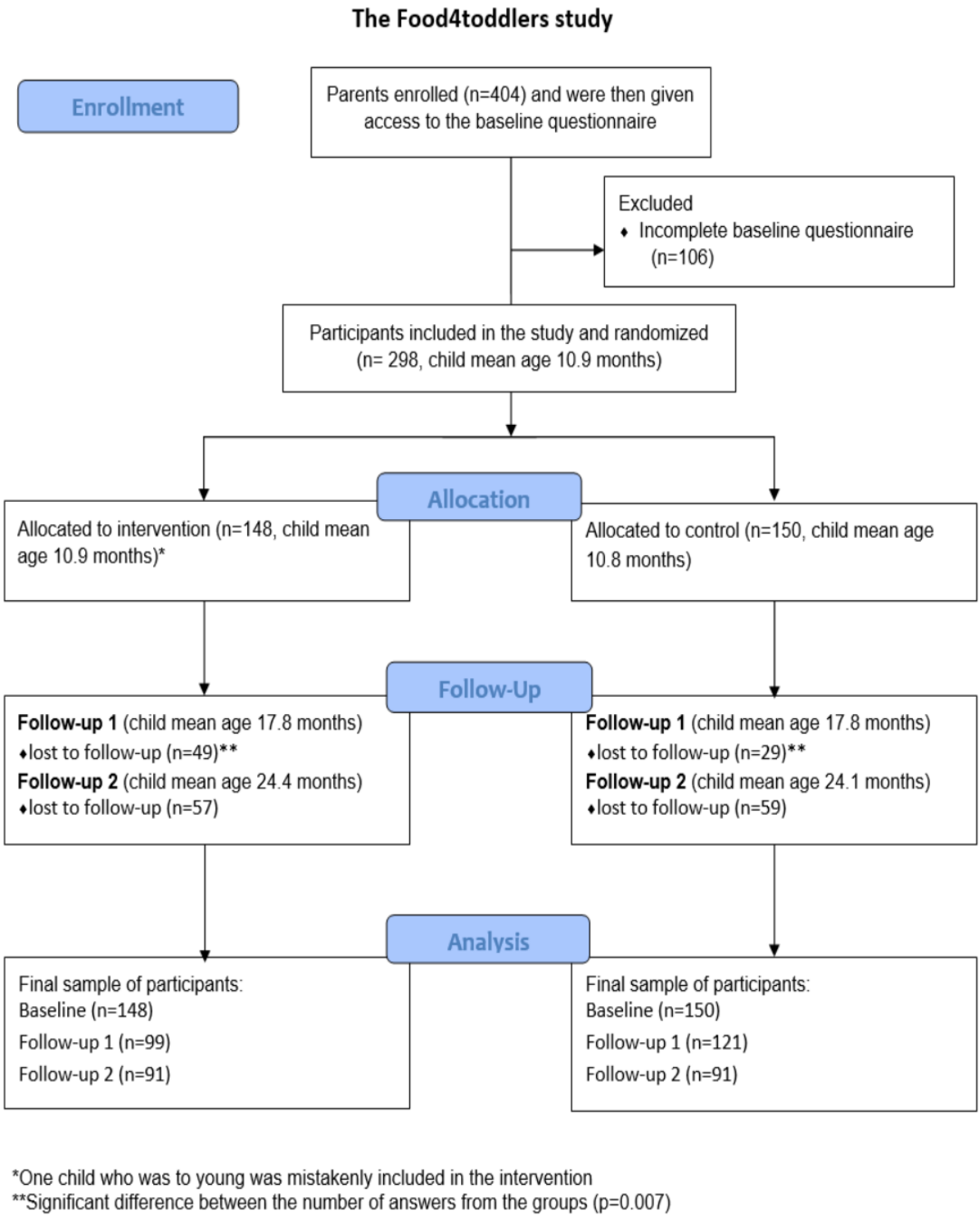

Figure 13. Flow chart of the Food4toddlers study

The intervention group had access to the Food4toddlers website for six months after completing baseline measurements, while the control group did not. The parents commenced their access to the Food4toddlers web site in seven different cohorts to match the time their child turned one year old: the first in September 2017, the last in February 2018. The children in the last cohort were younger than the others because we included children born until May 2017, and mistakenly included one born in July. Both groups received the usual care at the Child Health Centers, which usually includes three visits for children between 12 and 18 months of age.

Follow-up 1 questionnaire was delivered to the participants after the intervention period (seven waves) and collected between March and September 2018 at child age 18 months; 220 were fully or partly completed. Of those who answered the baseline and follow-up 1 questionnaire, ten were randomly selected to receive a gift card of 1,000 NOK, which was delivered to them in November 2018. Follow-up 2 questionnaires were collected at child age 24 months at two time points: November 2018 and February 2019, and a total of 182 were fully or partly completed. Participants with missing answers on some of the outcome variables used were excluded in the actual papers (see Table 3).

Table 3. Sample size of the papers

Questionnaire	**Paper I**	**Paper II**	**Paper III**	**Paper IV**
Baseline	298	297*	291**	148
Follow-up 1	NA	NA	209*	83*
Follow-up 2	NA	NA	174*	NA

*The number represents participants with complete answers on outcome variables
**Seven participants were excluded due to low child age (1) and missing demographic data (6)

For the discussion about the recruitment and study sample, see section 5.1.2. The questionnaires were delivered using the online survey software SurveyXact [166]. In the case of twins, the parent was asked to report on behalf of the eldest child. After receiving answers from 39 persons, we recognized that five responders had stopped answering after a few questions. The “hard” questions, which made them stop answering, were to fill in the length and weight of the

child reported at the health care centers. The parents usually have this information in a pamphlet. These questions were then moved towards the end of the questionnaire, and more participants completed most of the questionnaire after this revision. We sent a maximum of three reminders through email to non-responders from two different email addresses. The text in the reminders was modified a few times to make it more motivational, and we also added a deadline date for completing the questionnaire.

3.5. Presentation of the papers

This thesis consists of one study protocol and three research papers.

Paper I is the study protocol. A study protocol contributes to openness and ensures verifiability [167], and this article was peer reviewed. The protocol describes the project's rationale and theoretical approach, the development, recruitment and implementation strategies, and measurements, in addition to the baseline characteristics of the two randomized groups listed.

Paper II is based on baseline measurements and evaluates two elements (health-promoting feeding practices and parental food choice motives) in the child's eating environment and their associations with fruit and vegetable intake. We specifically assessed whether the feeding practices mediated the association between food choice motives and fruit or vegetable intake.

Paper III evaluates dietary effects (primary outcomes) of the intervention at two time points post-intervention (follow-up 1 and 2) using data from all three measurements. In addition, results from other food groups than covered in this paper are presented in Appendix 6 and 7 in this thesis to complement the dietary findings.

Paper IV is a process evaluation of how the participants in the intervention group used and accepted the intervention and is based on follow-up 1 measurements and user data retrieved from the Food4toddlers website.

3.6. Measures and assessment methods

The primary outcomes of this intervention were child diet quality and food variety.

For secondary outcomes the food and eating environment was conceptualized in parental feeding practices, family and meal settings (meal frequency and meal distractions), food choices, awareness of the food environment (at home and in

grocery stores), home food availability and accessibility, food planning and preparation, and child weight and length.

The questionnaires were approximately the same at all time points (Appendices 2–4). However, some questions were excluded at the follow-ups, such as country of birth. At follow-up 1, the intervention group received questions about their experience with the website and how they valued the website itself. The questionnaires were developed with measurements previously used and tested internationally or nationally, with some exceptions. A description of the measurements used in this thesis is presented below. A pre-version of the baseline questionnaire was sent to a teenager, and two mothers of young children for clarification, and some minor revisions were made thereafter. One of the mothers had older children in addition to a toddler and said she tended to answer some of the questions (e.g., if the child "helps" with food preparation) on behalf of the older children. The baseline questionnaire took approximately 35 minutes to complete.

3.6.1. Demographic measures

The following parental and child characteristics were reported at baseline: child gender, child's date of birth, whether the parent (answering the questionnaire) lived together with the child's other parent; parental height, weight, date of birth, whether Norway was their country of birth, and their own and their partner's educational level. Body Mass Index (BMI) was calculated from parental self-reported height and weight (kg/m^2). Parental educational level was categorized as follows: *Lower secondary education or less; Lower secondary education plus one year of, e.g., folk university college; Upper secondary education; Tertiary vocational education; College/university (≤ 4 years); College/university (> 4 years); Other; Do not know*, which is similar to categories used by others in Norway [19]. For the analysis, the education levels were dichotomized into two groups: four years of higher-level education or less, and more than four years of higher-level education (papers II, III, and IV). Parental education level is in our study used as an indicator of socioeconomic status (SES) [25, 168]. SES is a measure of a person's economic and social status and tends to be positively associated with better health and diet [169, 170].

3.6.2. Outcomes measures

Diet quality and food variety were the primary study outcomes of the randomized controlled trial. Parents reported frequencies of intake of a variety of foods and beverages normally eaten in Norway, a total of 59 items. In the papers contained in this thesis, the questions regarding vegetables, fruit, and discretionary foods were used (31 items). These food groups are indicators of the diet quality [14, 171-173] and of special interest regarding the intervention. Variety of fruit and vegetables among preschoolers is also an indicator of a healthy diet and is less often measured than quantity and frequency of intake of fruits and vegetables [174, 175]. Intake of other dietary outcomes than fruit and vegetables (20 items) are presented exclusively in this thesis and complement the paper III findings (Appendix 6 and 7).

Parents reported toddler's frequency of fruit and vegetable intake (paper II and III). The questions were retrieved from the nationwide Norwegian diet survey among 12-month-old children called "Spedkost" [19]. The FFQ were validated in two Norwegian studies of 1- and 2-year-olds [176, 177]. Questions covering items widely consumed in Norway [178] were as follows: *"How often does your child eat the following fruit/vegetables nowadays?"* Fresh, cooked, or squeezed fruit and vegetables and both homemade and commercially produced variants were included in the food items presented. In total, 13 vegetables and 11 fruit were listed.

We used a 6-point scale ranging from never to several times a day with the following response options, which were recoded into times per week: never or less than once a week = 0; one to three times a week = 2; four to six times a week = 5; once a day = 7; two times a day = 14; and three times or more per day = 24.5. Other studies have used similar recodings [51, 71, 179, 180]. A combined score of total vegetable intake was calculated, and another for total fruit intake (frequency per day).

For paper III, the same items as previously described for vegetable and fruit frequency were used to allocate two variety scores of eaten (coded 1) and not eaten (coded 0) vegetables (13 items) or fruit (11 items). In the same paper, a score of discretionary foods and beverages was allocated. To assess the consumption of snacks, questions from the MoBa study were included in the questionnaire and the rationale for this FFQ in a Norwegian setting is documented [181]. The questions on how frequently discretionary foods were

consumed were as follows: *"How often does your child eat the following foods nowadays?"* The following food groups were assessed: 1) cakes, waffles, and sweet biscuits; 2) dessert/ice-cream; 3) chocolate; 4) candy; and 5) chips. A 6-point scale was used, ranging from never to several times a day. The response options were recoded into times per week: never = 0; less than once a week= 0.5; one to three times a week = 2; four to six times a week = 5; one to two times a day = 10.5; and three times or more per day = 24.5. Beverage frequency options was retrieved from "Spedkost" [19] and assessed by the following question: *"How often does your child drink the following drinks nowadays?"* The response options were recoded according to daily intake: never/seldom = 0; one to three times a week = 0.29; four to six times a week = 0.71; one per day; = 1; two per day = 2; three per day = 3; four per day = 4; five or more per day = 6.

A discretionary food score of frequency per week, of the above mentioned five snack items and two beverage items, was allocated. Due to few items (7), a variety score like the fruit and vegetable scores was not allocated.

In the thesis supplements to paper III, other dietary outcomes (20 items) were elaborated (Appendix 6 and 7). Parents reported the children's beverage and porridge intake in the questionnaires. These items were retrieved from "Spedkost"[19] and recoded into the daily frequency of intake described for discretionary beverages above. These items were: breast milk, milk substitute, milk, water, artificially sweetened beverages, juice, smoothie, and three types of porridges. Sum frequency scores were made of artificially sweetened beverages (two items), smoothie (two items), and milk (two items).

The parents also reported the children's frequency of these foods: meat, fish, potato, rice, and bread. These items were retrieved from the MoBa study [182] and recoded in the same way as the above-mentioned discretionary food items to show weekly intake. Sum frequency scores were made for fish (2 items) and meat (2 items).

3.6.3. Measures of feeding practices and food choice motives

Two elements in the eating environment (health-promoting feeding practices and parental food choice motives) were described in paper II, and their associations with child fruit and vegetable intake were assessed in a mediation model.

Health-promoting feeding practices

Parental feeding practices were assessed using the Comprehensive Feeding Practices Questionnaire (CFPQ) [183] and added as the potential mediation factor in the analyses in paper IV. The CFPQ has 49 items on 12 subscales. All items are statements or questions measured on a five-point Likert-type scale ranging from disagree to agree or from never to often. The answers were coded into a score from 0 (disagree/never) to 4 (agree/often). The CFPQ is validated and tested for reliability for parents of children in different age groups [183-186], as well as in the Norwegian context [187]. See Appendices 2–4 for questions included in the questionnaire.

Of the 12 subscales, five can be considered health-promoting feeding practices. We investigated three of these (Cronbach's α values presented are for our sample): *encouraging balance and variety* (e.g., "I encourage my child to try new foods," four items, α = 0.47), *shaping a healthy environment* (e.g., "Most of the food I keep in the house is healthy," four items, α = 0.68), and *healthy modeling* (e.g., "I try to show enthusiasm about eating healthy foods," four items, α = 0.67). The Cronbach's α values for the three subscales used were similar to those reported in another study using the same measurements among parents of 1-year-olds [184]. Two subscales (*involvement* and *teaching about nutrition*) were excluded because of the child's young age, as was done in an Australian study [184].

Parental food choice motives

The Food Choice Questionnaire (FCQ) was used to assess parents' motives underlying their selection of food and is included as the independent variables in the mediation analyses in paper II. Steptoe et al. [34] developed this questionnaire, and the FCQ is widely used and also tested for validity and reliability at the country and cross-national levels [188, 189].

The FCQ comprises 36 items grouped into nine factors (*health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity,* and *ethical concerns*). The responses in the original FCQ were on a four-point scale [34], though Fotopoulos et al. [189] suggest using a seven-point scale to elicit a wider range of answers, which was used in the present study. The questions were translated into Norwegian for this study, back-translated into English, and adjusted as needed.

Participants were asked to rate their level of endorsement of statements such as *"It's important to me that the food I eat on a typical day […],"* rating each statement from 1 (extremely unimportant) to 7 (extremely important) [189]. The factors used were tested for reliability using Cronbach's alpha.

Five factors were included in the baseline questionnaire for the Food4toddlers study because they were regarded as important precursors for the development of healthy food and eating environments for toddlers. These five factors were (Cronbach's α values presented are for our sample): *health* (e.g., "It's important to me that the food I eat on a typical day is high in protein," six items, $\alpha = 0.81$), *convenience* (e.g., "It's important to me that the food I eat on a typical day is easy to prepare," five items, $\alpha = 0.79$), *sensory appeal* (e.g., "It's important to me that the food I eat on a typical day looks nice," four items, $\alpha = 0.64$), *price* (e.g., "It's important to me that the food I eat on a typical day is cheap," three items, $\alpha = 0.73$), and *familiarity* (e.g., "It's important to me that the food I eat on a typical day is familiar," three items, $\alpha = 0.73$).

In the fall of 2018, we performed a simple reproducibility study including 29 parents recruited from several kindergartens who were not participating in the Food4toddlers study. Information including a link to the online questionnaire was sent to the parents by email or posted on the kindergarten's homepage or Facebook site. Parents with children from ten months to four years were eligible to participate. The items were tested for reproducibility through a test-retest study at two time points (two weeks apart). The standardized measure, Pearson's correlation coefficient, showed acceptable-to-excellent correlations for the factors used (health: $r = 0.91$; convenience: $r = 0.93$; sensory appeal: $r = 0.78$; price: $r = 0.85$; familiarity: $r = 0.73$). Even though this was not a full-scale reproducibility study, the study gave us an indication of the quality of the measures.

3.6.1. Process evaluation measures

After the intervention period, the intervention group received an extended version of the online questionnaire (see Appendix 3), including questions about their experiences with and their perceived value of the Food4toddlers website (paper IV). The parents graded five statements about the intervention: Do you agree or disagree with these statements: 1) *The content was well adapted to the child's age;* 2) *The text was understandable;* 3) *The website was user-friendly;* 4)

The website had an appealing layout; and 5) *I learned something new*. The parents responded on a five-point scale, from *strongly disagree* to *strongly agree* with an additional *I don't know* answer possibility. The same five-point scale was used for the parents to respond to the following statements: 1) *The recipes were easy to follow;* 2) *The recipes were easily adapted for the whole family;* and 3) *The videos of the recipes were useful.* A recoding was done to merge the five-point scale into three groups (*agree, indifferent, disagree*). In addition, the parents were asked how many of the recipes they had made, with the following response options: *none; none, but got inspiration; 1–5; 6–10;* and *11 or more.*

Data from the use of the website was retrieved from the LMS (NEO). These data were retrieved manually from NEO, and the registered data accessible was 1) number of days the participants accessed the website, 2) the use of the 22 lessons, and 3) activity on the discussion forum. It was not possible to retrieve any data on the use of the recipes and the "Good to know" section. Some participants were registered as merely having visited the site and had no reports on the use of any lessons. They were coded as "one day users" since they entered the website and could have used the rest of the website except for the lessons (e.g., recipes).

3.7. Ethics of participation

Research clearance for the Food4toddlers study was obtained from the Norwegian Centre for Research Data, 08/06/2016, reference 48643 (Appendix 8). In June 2017, we received clearance for some minor changes, i.e., the design was changed from a cluster RCT to RCT, face-to-face components were removed, the digital tool was changed from an app to a website and some minor revisions of the questionnaire were done (Appendix 9). Informed consent from the parents was obtained when they signed in online for participation in the study. The trial was retrospectively registered internationally on the 13th of September 2017: https://doi.org/10.1186/ISRCTN92980420. The registration was sent in a few months before but not registered before September. The reason for the delay was that a wrong address was reported.

3.8. Statistical analysis

Sample size calculation

The sample size calculation was based on a healthy diet composite score from a Greek study [190] , because no such score has been developed and tested in Norway. The healthy diet score had ten components that assessed child diet, and a mean score of 60.5, with SD 9.2, was observed. A 3-point difference in score between the control and intervention groups was considered relevant from a public health perspective. With a statistical power of 80% and α of 5%, we estimated that 142 children in each group would be required to demonstrate statistical significance. Assuming a 40% loss to follow-up, we aimed to recruit 237 parents in each group.

Descriptive statistics

Descriptive statistics are presented as means with standard deviations for continuous variables, and for categorical variables, numbers and percentages are calculated. For lost to follow-up analyses (paper III, table 2) group differences were examined using a two-sided independent sample t-test for continuous variables and Pearson's chi-squared test for categorical variables.

Paper I

The protocol paper describes the development, implementation, and plan for the assessment of the intervention. Descriptive statistics between the intervention and control group are presented, i.e., parental gender, age, BMI, household characteristics, ethnicity, education level, and geographic residence as well as child gender and age. All analyses were conducted using IBM SPSS Version 25.

Paper II

In this paper, we examined two elements in the eating environment and potential associations with child fruit and vegetable intake. The product-of-coefficients method was applied [191] and tested whether parental food choice motives (*health, convenience, sensory appeal, price,* and *familiarity*) were associated with child fruit and vegetable intake as well as whether the potential associations were mediated by health-promoting feeding practices (*encouraging balance and variety, shaping a healthy environment,* and *healthy modeling*). For each food choice motive and its relation to fruit or vegetable intake, three single mediation

models were conducted. The bootstrap approach was performed to estimate 95% confidence intervals of the coefficients (n = 5,000; 95% CI) [191-193]. All analyses were conducted using IBM SPSS Version 25. Process 3.1 for SPSS from Hayes [193] was used to perform the single mediation analyses.

Paper III

This paper measured dietary effects of the study. We used generalized estimating equations (GEE) to determine whether the intervention had an effect on child vegetable, fruit and discretionary food consumption from baseline to follow-up 1 and follow-up 2. Frequency of intake (vegetables, fruit, and discretionary foods) and variety of intake (vegetables and fruit) were included as dependent variables in separate models. An interaction term between group (intervention vs. control) and time (baseline vs. post-intervention) was entered into all models to examine whether changes in dietary intake from baseline to follow-up 1 or follow-up 2 differed significantly between the control and intervention group. An unstructured covariance matrix and robust estimates of the standard error (SE) were used. The models were adjusted for child gender and age and parental BMI, education level, and age reported at baseline. These are known covariates for vegetable and fruit intake [194] and were stated in the Food4toddlers study protocol (paper I). The GEE method was developed by Liang and Zeger [195] in 1986 and was considered suited to our data because the method can be used for non-normal data, can handle missing data in the follow-ups and the potential correlation of data (using a group approach) [195, 196]. All participants can, therefore, be included. Sensitivity analyses (T-tests and Mann-Whitney U tests) using complete cases were ran to measure the difference between baseline and follow-up 1 values, and baseline and follow-up 2, respectively, for all outcome variables.

In the thesis supplement to paper III, Appendix 6 we present simple analyses of 16 food groups to complement the dietary findings. In addition, is the fruit, vegetable, and discretionary food intake presented in the same table. Mean scores with standard deviation (SD) and median with 25% (Q1) and 75% (Q3) quartiles were presented for dietary intake in the control and intervention groups at baseline, follow-up 1, and follow-up 2. Mann-Whitney U-test and independent-sample t-test were used to measure between-group differences. This supplement works as sensitivity tests for the between-groups differences in dietary intake we found in paper III (fruit, vegetables, and discretionary foods). In Appendix 7,

dichotomous categories were made between high and low fruit and vegetable consumers. The cut of was close to the highest quartile. Because many participants had the same score, the high consumers were not exactly 25% of the participants but the cut off was as close as possible. Then we measured the difference in intake of high and low fruit and vegetables consumers for 16 food and beverage items. Mann-Whitney U-test was used to measure differences between these groups. The intention-to-treat principle (ITT) was used in the analyses in this paper, keeping all participants in the treatment groups [197, 198]. All analyses were conducted using IBM SPSS Version 25, except for GEE, which was run in STATA version 16. Statistical significance was set to the $P \leq 0.05$ level.

Paper IV

In this process evaluation of the intervention means with standard deviations for continuous variables and frequencies and percentages for categorical variables were reported. Chi-square tests were used to test potential differences in the perceived value of the intervention between the two education groups and according to the number of children in the household. The intention-to-treat principle (ITT) was used in the analyses in this paper, including all intervention group participants [197, 198].
For possible group differences for continuous variables, independent sample t-tests were used. All analyses were conducted using IBM SPSS Version 25. Statistical significance was set to the $P \leq 0.05$ level.

4. Main results

The major findings of the four included papers are listed below.

Paper I

The Food4toddlers study – study protocol for a web-based intervention to promote healthy diets for toddlers: a randomized controlled trial.

This paper describes the rationale of the Food4toddlers study, the development of the study website, and the recruitment of the participants. The baseline characteristics of the participants are also presented. The rationale and development of the website are previously described (see sections 3.2 and 3.3). During the recruitment period from August 2017 to January 2018, 404 parents signed up for participation. In total, 298 answered the baseline questionnaire and were randomized into either control (n = 150) or intervention (n = 148) groups. The mean age of the participants was 31.9 (SD = 4.0) in the control group and 31.5 (SD = 4.4.) in the intervention group. The BMI was slightly higher in the control group, 25.1 (SD = 4.8) compared to the intervention group, 24.9 (SD = 4.6). Over 96% lived in a two-adult household, and the mean number of family members was 3.65 (SD = 0.9) in the control and 3.60 (SD = 1.0) in the intervention group. A total of 83.2% of the control group members were born in Norway, compared to 89.2% in the intervention group. Over 50% (control 56.5% and intervention 51.7%) of the participants had an education level of > 4 years of higher education. The child age at baseline was 10.8 (SD = 1.2) in the control group, and slightly older in the intervention group,10.9 (SD = 1.3). In total, 43.3% in the control group were girls, compared to 46.6% in the intervention group.

Paper II

Associations between parental food choice motives, health-promoting feeding practices, and infants' fruit and vegetable intake: The Food4toddlers study

Baseline data were used to describe two elements in the eating environment (parental food choice motives and health-promoting feeding practices) and their associations with child's vegetable and fruit intake. The food choice motives assessed were *health*, *convenience*, *sensory appeal*, *price*, and *familiarity*. The

health-promoting feeding practices assessed were *shaping a healthy environment, encouraging balance and variety*, and *healthy modeling*. All 298 who answered the baseline questionnaire were included in this paper. The mean score of three food choice motives (*health, convenience,* and *sensory appeal*) was above five on a scale from one to seven; *price* had a mean of 4.26 (SD = 1.39); and *familiarity* 2.71 (SD = 1.21). The mean score for all three feeding practices assessed was over three on a scale from zero to four. Higher scores on the motive of *health* were positively associated with infant vegetable intake (τ = 0.39 (SE = 0.10), p < 0.001). No other significant associations were found between food choice motives and fruit or vegetable intake. The feeding practice of *shaping a healthy environment* mediated the relationships between *health motive* and both vegetable ($\alpha\beta$ = 0.11, CI = 0.04–0.19) and fruit ($\alpha\beta$ = 0.07, CI = 0.00–0.15) intake. The feeding practice of *encouraging balance and variety* mediated the relationships between *health motive* and vegetable intake ($\alpha\beta$ = 0.09, CI = 0.03–0.15) and between *sensory appeal motive* and vegetable intake ($\alpha\beta$ = 0.05, CI:= 0.01–0.10). The feeding practice of *healthy modeling* mediated the relationship between *sensory appeal motives* and vegetable intake ($\alpha\beta$ = 0.03, CI = 0.01–0.06). Small effect sizes were seen for all mediators.

Paper III

Effect of a parent-focused eHealth intervention on child's fruit, vegetable, and discretionary food intake: The Food4toddlers RCT study

In this paper, dietary effects of the intervention were examined. In total, 291 were included in the analyses. Seven participants were excluded at baseline because of low child age (1) or missing data (6) on demographic variables (parental age, BMI, or education level). Those who lacked data at follow-up 1 and 2 had not answered the questionnaire at all or had missing data on the outcome variables, however, all participants were included in the GEE analyses because this model handle missing data at the follow-ups. A total of 209 (71.8%) had answered follow-up 1, and 174 (59.8%) at follow-up 2. Using GEE analysis, a difference between the groups from baseline to the first follow-up (immediately after the intervention conclusion) showed a significant time by group interaction for the frequency of vegetable intake (p = 0.02). The estimated difference between groups in the change from baseline to follow-up 1 was 0.46 vegetable

items/day (95%, CI = 0.06, 0.86) in favor of the intervention group. The difference was attenuated at follow-up 2 and no longer significant (items/day = 0.32, 95% CI= -0.12, 0.75, p = 0.15). No other significant between-group differences in dietary changes from baseline to either follow-up 1 or follow-up 2 were observed. However, a borderline significant difference in variety of vegetables in favor of the intervention group was seen from baseline to follow-up 1 (number tasted/week = 0.60, 95% CI= -0.04, 1.23, p = 0.07) and from baseline to follow-up 2 (number tasted/week = 0.73, 95% CI = -0.01, 1.46, p = 0.05). The sensitivity tests measuring the between-group differences from baseline to follow-ups confirmed the significant result.
This thesis supplement, which complements the findings in paper III (table 4, Appendix 6), shows no significant differences between the control and the intervention groups at any timepoints for any of the dietary outcomes measured, except for vegetable intakes. Significant differences were seen for the vegetable frequency at both follow-ups and vegetable variety solely at follow-up 2. The standard deviation was large in the sample, especially for discretionary foods and milk frequency at both follow-ups.

To identify how fruit and vegetable consumption were associated with other dietary intakes, the frequency of intake of other food items are presented according to fruit and vegetable consumption (see table 5, Appendix 7). The results show that those with a high daily frequency of vegetables also had a high intake of water, smoothies, homemade wholegrain porridge, and fish. Homemade whole grain porridge was also associated with a high vegetable variety, fruit frequency, and fruit variety, respectively. In addition, a high frequency of fruit was associated with a high intake of smoothies.

Paper IV

Process Evaluation of an eHealth Intervention (Food4toddlers) to Improve Toddler's Diet: Randomized Controlled Trial.

In total, 148 parents were allocated to the intervention group, and all but two received access to the Food4toddlers intervention website for six months. Paper IV is a process evaluation of the intervention. Data retrieved from the website showed that more than 86.5% of the intervention group participants visited the website. The mean days of access was 7.4 (SD = 7.1). This paper also uses data from the questionnaire at follow-up 1, and 83 (56%) intervention

participants responded to questions concerning website use. Most parents found the website appropriate to the child's age and easy to understand (86–93%). The interface and layout were appreciated by the majority of intervention participants (56–63%). The parents valued the recipes as the most useful part (43%) of the website, followed by the modules (32%). In total, 61% said that they learned something new from the intervention. Parents with higher education levels (> 4 years) used the intervention website more than those with a moderate education level (≤ 4 years of education), and those with one child used the website more frequently than those with more than one child in the family. Higher educated parents reported that they learned more from the website than moderately educated parents. The discussion forum included in the website was used by eight participants only, and only one posted more than one question.

5. Discussion

5.1. Discussion of the methods

5.1.1. Study design and development

The Food4toddlers study's design was an RCT design, which is often used to test intervention effects in groups within society or patient groups. This design for health behavior change interventions is known to be the most rigorous test of interventions [82, 199, 200]. In the 1990s, RCTs were increasingly promoted to evaluate public health interventions, and not only medical research [201].

In paper II we applied baseline data to investigate cross-sectional associations between two elements in children's eating environment and fruit and vegetable intake. This cross-sectional data (baseline), was suitable for these analyses, but hinder causal interpretation of the findings [202]. However, for further studies, cross-sectional relationships may be important to generate hypotheses [202]. Due to the strict timeline in the Ph.D. project, paper II was conducted while waiting for the follow-up 2 questionnaire. The findings of the different patterns of fruit versus vegetable intakes in paper II, contributed to the in-depth focus of these issues in paper III.

We targeted dietary behavior on the intra and interpersonal levels in this study; no other dietary determinants on other socio-ecological levels [35] (like taxes or food deliveries in grocery stores) were changed. The benefit of targeting a single dimension as we have done here through the website, is that it is easier to ascertain which elements cause the results [35]. The disadvantages are that all levels of influences are important, and some find that a multilevel intervention tends to be more effective in maintaining behavior change over time [35]. We used the main steps of Brug et al.'s [37] Model for Planned Promotion of Population health to guide the development of the intervention, where Intervention Mapping is often used for implementation. We decided to use Social Cognitive Theory (SCT) for implementation [80], which we considered particularly suited to our intervention, and due to the known challenge that the Intervention Mapping process is time-consuming [203, 204]. The simple but universal SCT model of reciprocal determinism are a well-known model for health behavior change and by focusing on the three elements in the model and techniques recommended to target within each element, we influenced the desired behavior from multiple angles and with different behavioral change

techniques. People acquire knowledge in different ways (e.g., learn facts or require pictures), and using different approaches increases the possibility for a variety of participants to learn from the tool [205].

Co-creation

Involving users and stakeholders in the development of digital tools has been increasingly important to ensure that the tools for health behavior change are suitable [161], and we considered the extended co-creation process a potential strength of this study. The parents and stakeholders we interviewed at the start of the intervention's development phase had a varied ethnic background. The potential to meet parents of different ethnic backgrounds was stronger where they meet for other reasons (e.g., baby singing classes) than at the university.

The design was changed from a cluster RCT to a regular RCT (solely digital) due to the interviews with health care nurses. Their valuable inputs, as well as inputs from parents interviewed, important issues (e.g., spicy food) were incorporated in the website. However, a closer co-creation process later in the developing phase might have yielded an important insight, particularly input regarding the website's interface, which was considered as less valued by the participants in our study compared to other elements measures (see section 5.2.3). A pilot version of the Food4toddlers website was tested during two weeks and with 14 participants. The short survey conducted before and after the implementation provided information which led to changes in the intervention, primarily of a technical nature. A longer duration of this pilot test and incorporated interviews with the pilot test participants might have contributed to a better understanding of how the intervention worked and may have contributed to better adherence and extended use of the website. Incorporating a comprehensive framework for user involvement, as done by Schnall et al. [162], may help integrate user involvement in all phases of the website development.

5.1.2. Recruitment and study sample

We wanted to have a representative sample of Norwegian parents so that the findings could be generalized to the population. We recruited more than 400 parents with children born in a restricted timeframe, however these were mostly highly educated mothers and we aimed for a larger sample.

Recruitment method

Facebook was used for the recruitment of participants, which is recommended as a cost-effective and rapid tool for recruiting [114, 127, 206, 207]. According to a review of 101 health studies by Thornthon et al. [206], few differences were found in the population's demographics when using Facebook relative to traditional recruitment methods.

All Norwegian counties were represented in our sample, which is a strength of the study. Proportionally, the southern parts where the University of Agder is located were overrepresented compared to national figures [208]. Information about the project was presented on the university's webpage and Facebook profile and staff at the university and other collaborators recommended it, which most likely contributed to the higher proportion of participants from the southern part of the country.

Our Facebook campaign resulted in more participants recruited than in a similar Facebook campaign conducted in the HomeStyles study [117]. This may indicate that we reached potential parents easier because we used a suitable search strategy, that the advertisement was appealing, due to national differences, or that the search function was better in 2017 compared to three years earlier during the recruitment period for the HomeStyles study.

When the participants in the Food4toddlers study signed in, they provided their email addresses. We did not ask for a mobile number, because we thought that the email address was suitable. However, spam filters stopped some emails, and a mobile message might have been easier to respond to.

We recruited participants when the child was about ten months old and recruited 404 during a period of 5.5 months. The recruitment process was easier in the Norwegian Early Food for Future Health study where dyads with children younger than six months were recruited [127]. That period is probably a better time for recruiting due to the lower activity level of the child, so parents are more active on the Internet, the need for information about feeding tends to be stronger [149], and Norwegian mothers are still on maternity leave.

In online settings, some researchers have shown that online users are prone to lie about their age [209], and some parents may have reported an incorrect child age to suit the intervention criteria. However, at follow-ups the date of birth was reported every time and checked for potential misreporting.

Characteristics of the reached sample

We did not reach an even number of mothers and fathers in this study. Only four out of the 298 participants answering baseline questionnaire were men. This tendency is seen in several studies [114, 127, 210-212]. We wanted to incorporate both mothers and fathers because both contribute to dietary upbringing, and studies have shown differences in food parenting between the genders [210]. Our results would probably have been different if more fathers had contributed. A lack of interest in health information may be one of the reasons why we did not reach men when recruiting for this study. Norwegian women search for health-related information on the Internet to a larger degree than men: 95% and 65% respectively [101]. In a study by Davison et al. [213], 80% of fathers wanted to participate in health research, but they said they were simply not asked. Our click tracing campaign probably reached women more easily than men even though we addressed it to parents in general. A possible solution could be to also use gender-specific advertisements, addressing solely fathers, which has shown promising results [214] and may have evened the gender imbalance in our study. Another alternative which has shown positive results is to recruit fathers through workplaces [215] or consider advertisement on websites used by young men, e.g., Gamer.no. Facebook is the most frequently used social media in Norway (daily use of 67% of the population), followed by Messenger (46%), Snap Chat (45%), Instagram (34%), YouTube (23%) and Twitter (8%) [216]. Only Twitter and YouTube are used more frequently by men than women and could have been an interesting alternative for recruitment; however, fewer daily users lower the potential to reach a large number through these channels.

Even though the child's "other" parent (mostly men) could enter the website, few did, or they accessed it but were not engaged enough to pursuing it further, which is also seen in another study [217]. A reason for this might be that the email they received with login instructions was perceived as spam mail or the intervention was not considered interesting to them.

Most of the sample participants were highly educated. The reason we recruited highly educated individuals is probably linked to the fact that highly educated parents search more frequently for health information [152] and are more willing to participate in health interventions [165], and that our advertisement appealed more to these groups. The education level is also high in Norway compared to

European and international figures [218], and higher among women than men in childbearing age [219], which means that many potential highly educated mothers are in the target population. A sample including more participants with lower education may have had a higher potential for improvement due to lower potential adherence to dietary guidelines among parents with lower education levels [220]. The generalizability (external validity) [221], according to the general population and other settings (e.g., other countries) is, therefore, lowered due to the unbalanced education level in the sample.

Sample size and missing data

We wanted to recruit an adequate sample size in order to detect true differences [199]. Attaining an adequate sample size when conducting research is a known challenge [199]. A report from a review of 114 multicentered trials showed that less than one out of three studies managed to recruit the target sample within the planned time frame [222]. The sample size calculation in the Food4toddlers study was a general calculation done before the recruitment period started. Due to the lack of suitable dietary data for young children and in a Norwegian setting, and in order to get a proximate number needed to identify differences between groups, results from Angelopoulos et al. [190] were used for this purpose. They presented data using a dietary index and that was chosen as measure for child diet quality. The Food4toddlers study's goal was 237 parents in each group, and we recruited 404 in total. Of the approximately 57,000 children born each year in Norway, about half were eligible to the study (the included participants had to be literate in Norwegian and have a child born in a restricted timeframe). Unfortunately, we had to stop the inclusion of participants because of the limited time and high costs of social media recruitment.

When the results were analyzed, the frequency and variety of key food groups were used instead of a dietary index like the one by Angelopoulos et al. [190] to measure the intervention's effect. Our arguments for this decision are elaborated in section 5.2.2. For a particular measure, a minimum number of participants is required to identify significant difference if such difference truly exists [223]. Presenting other findings than predefined primary outcomes may be considered a weakness of our study due to the lack of consistency to the predefined sample size. Low statistical power because of low sample size is a known challenge in health studies [224, 225]. A higher sample in our study might have given other significant results. One reason for few participants in the Food4toddlers study

was that the included children had to be born in a specific and narrow time frame because the intervention was specifically tailored to the children's age. However, with small adjustments in the Food4toddlers website, parents with slightly younger or older children could have benefited from attending. It might have been preferable to make such adjustments; however, parents report that age-specific content is important [148], which would have been more difficult with broader inclusion criteria and less age-specification can lower the acceptance of the content.

Missing data may occur in different stages of the study and can reduce the precision and power because of reduction of data and potential bias in the estimation of effects (both between and within-group effects) [226]. A challenge in our study was an extensive loss to follow-ups, which lowered the sample included at all time points. Approximately 25% of participants were lost between follow-ups (see flowchart in section 3.4). A thorough overview of baseline characteristics of participants who adhered to the intervention and those lost to follow-ups are presented in paper III (Table 2). Few differences were seen. However, the highly educated were more willing to answer the follow-ups (significant for follow-up 2) as also seen in another study [107], and this may bias the results e.g., these participants may be more willing to offer the children healthy food. In randomized trials, a participant's allocation to the control group may reduce their willingness to respond to follow-up questionnaires because these participants did not benefit directly from the study [227]. However, an observation in this study was that for the follow-up 1 measurement, more participants from the control group answered the questionnaire than the intervention group (Chi-square test, $p = 0{,}007$). This significant difference was not seen for follow-up 2 responses. Participants from both groups who answered the follow-up 1 questionnaire were part of a lottery and could receive one of ten gift cards for 1,000 NOK, meaning that both groups had an equal potential economic benefit from answering. The different response rates at follow-up 1 between the groups could be random, or one can speculate whether low adherence participants in the intervention group felt ashamed to respond due to their low attendance.

Another problem with missing data was that participants started to fill out the questionnaires but did not finish due to the potential too long questionnaire. At inclusion, we decided to include those who had answers on children's food

intake, parental feeding practices, and demographic data (all important data for this study), which increased the number of included participants.

Even though one cannot be sure, we assume that the data is missing at random (MAR), and observed data could estimate the missing values [228, 229]. For this matter, GEE analyses is an appropriate method [196], which we used in paper III. This analysis purpose of making inferences about the population when accounting for correlation within-subject and is preferred on small samples [230].

In the papers in this thesis, the sample size was not consistent. In paper I and II using baseline data, all study participants were included (n = 298). In paper II, one participant who lacked responses to FCQ questions were excluded in analyses including FCQ questions. Excluding this participant in all analyses would probably have been a better choice due to a consistency in number.

In paper III the sample was lower because we excluded a parent-child dyad with a too young child, which we, unfortunately, overlooked when we started processing the data in the other papers. In addition, we excluded six participants with missing answers on variables we adjusted for (parental age, BMI, and education level). Missing values on single variables were not a major problem in our digital questionnaire because most of the variables were mandatory to answer, except for answers where they had to fill in exact numbers (e.g., age). Everyone in the intervention group was included in the process evaluating paper (paper IV).

Given the low sample size and a relatively large standard deviation observed in the results, an alternative to the RCT design could have been a within-person design where each person gets exposed to more than one of the treatments being tested, and therefore fewer participants' are required [231]. The participants' behavioral changes are tested when the experiment's circumstances change [231]. However, the tailoring by age in our study makes this approach more complicated, and there is a potential for learning and transfer across conditions using a within-person design. Our main goal was not to measure changes from one time point to another or between one type of condition to another but to assess a between-group effect of one treatment compared to no treatment in which RCT is a preferred method.

Intention-to-treat (ITT) in RCT studies keeps participants in their allocated groups and accounts in the final treatment analyses for them [198].

The ideal ITT approach is no missing outcome data, however, is merely not possible. Therefore, to avoid loss was strived for in the Food4toddlers study both in planning, conducting, and analysis as recommended by Polit and Gillespie [198], e.g., by being theory-driven, by conducting a pilot test, sending out reminders, provide benefits for those who answered questionnaires and use methods that accounts for missing data at follow-ups. One potential disadvantage in our study was the long time period from signing up to inclusion for some of the participants due to the possibility of registering for the trial between ages six to 12 months while not being included in the study before the child's first birthday. Personal contact for non-responders might also have been beneficial (see the section about "Recruitment method" above for other considerations). An in-depth investigation of low-adherent participants, especially in the pilot study, could have given us insight into hinders to participation [198]. For the papers, the ITT principle was followed by including all participants in the analyses.

5.1.3. The quality of the questionnaires and scores used

In this section the quality of the measures used in this thesis from the Food4toddlers questionnaire will be discussed and, in addition, considerations about the scores used. Most of the measures used in the questionnaire have previously been used and tested internationally or nationally; see specifications below. The questionnaire was self-reported, which is a weakness of the measures because the answers rely on memory [232], e.g., self-reported height and weight might be less valid due to potential underreporting of weight and overreporting of height [233].

We experienced that several participants only responded to parts of the questionnaire. The length of a questionnaire has a substantial impact on non-response, and short alternatives are preferred unless the quality of the measurement is reduced due to less precise measurements [234]. A length of approximately 35 minutes was probably too long for some participants. Incomplete questionnaires were seen at all time points.

The digital RCT design in this study was well suited to be distributed nationally, and we assumed that there was a low potential bias of contamination of intervention content between participants in the intervention and control group.

We dichotomized education levels into high and moderate education levels for use in the analyses. The groups without any college or university education were

very small. Knowing that every year of education counts in terms of better health [235], the education levels were dichotomized to achieve close to equal group sizes: four years of higher-level education or less and more than four years of higher-level education (papers II, III and IV). An equal sample size increases the statistical power and the possibility to detect type 1 error [236]. Dichotomization between parents with no higher education or with a higher education is more common and has been done in other comparable studies [121, 127, 237], but in all of these studies, the number of parents with no higher education was larger than in our sample. Despite the fact that persons with university degrees were incorporated in both groups, we found differences between them regarding how they used the intervention (see section 5.2.3).

Food Frequency Questionnaire (papers II and III)

FFQs are known to be a cost-effective method for assessing the usual dietary intake over a specified period of time in a population [238]. The food frequency questionnaires used in Food4toddlers have been tested for the Norwegian setting [19, 182]. Quantifying the increase in grams and nutrient calculations might have given more precise estimates of between-group dietary differences. However, such detailed information was not asked for in the questionnaire.

The score of discretionary foods (paper III) comprised of two beverages items retrieved from the national diet survey, "Spedkost" [19], and five snack items from the MoBa study [181]. The response alternatives were not identical in the two questionnaires, but each variable was recoded in terms of the number of times eaten a week. This may have introduced less precision in the measurement and potentially lowered our ability to detect potential true differences or associations.

In deciding how to present the primary outcomes, several approaches were considered. As the power calculation was done using a score, this could have been an alternative; however, we chose differently. It would have been interesting to explore our primary outcome using a score, but there are several reasons why that is challenging. 1) Dietary recommendations before and after the age of one year are somewhat different, e.g., for cow milk consumption, which is not recommended before one year of age but is recommended after [10, 239]. A dietary index represents the level of adherence to dietary guidelines and reflects the overall diet quality [240]. To compare an index using data before and after one year of age is difficult because of the different recommendations. 2) Few

dietary indices are developed for infants and toddlers, and many include food diary records [241], which were not included in our study. In the paper of Tonkin et al. [242], published in 2018, they adjusted a dietary index made for older children to aboriginal Australian infants and toddlers, which may be considered for further studies. 3) When we started processing the data, we discovered that some items were problematic to fit in an index or score for small children as either a healthy or unhealthy alternative (e.g., meat or industry-made porridge), which left us with fewer possible alternatives to make scores or indices. The intervention's focus was to create healthy food and eating environment and of particular interest was to have healthy food available, and the opposite for unhealthy alternatives. Fruit and vegetables were of particular interest due to their importance for healthy diet quality and were often included in the intervention videos or texts and were therefore chosen as a proxy for diet quality. A high intake of fruit and vegetables is a stable recommendation for all age groups, as well as a low intake of discretionary foods. Therefore, these food groups are essential to measuring and indicators of a healthy diet quality [240, 243]. To complement the findings in article III a table is provided (Appendix 6), solely for this thesis, of other dietary outcomes in the intervention to give an overview of the children's diet at all time points and compare the intervention and control groups.

We also wanted to measure variety because a diet, including various healthy foods, is beneficial and recommended by the Norwegian government [10, 174] and is also an indicator of a healthy diet quality [175]. Our questionnaire had a rich number of fruit and vegetable items, and we made separate variation scores. To further justify that fruit and vegetable consumption is a good measure for diet quality, Appendix 7 shows baseline dietary differences between high and low fruit and vegetable consumers. We found that children with the highest intake of vegetable frequency (the 25 % with the highest intake) had a higher intake of healthy foods and beverages (water, smoothies, fish, and whole grains porridge). A high score on vegetable variation, fruit frequency, and fruit variation was also associated with a high intake of whole grains porridge. These results may indicate that fruit and vegetables are indicators of a healthy diet quality also in our sample.

Comprehensive Feeding Practices Questionnaire (paper II)

Several measurements to measure feeding practices were considered for the Food4toddlers study, e.g., the measurements developed by Vereecken et al. [244] and by Birch et al. [245], but for both of these measurements the questionnaires were more suitable for older children than infants and toddlers. We used the Comprehensive Feeding Practices Questionnaire (CFPQ), developed by Musher-Eizenman and Holub [183], which captures the most interesting aspects of our intervention. In a recently published review by Heller and Mobley [246], they found 33 individual responsive feeding-related instruments, and the CFPQ was considered one out of three that had passed rigorous validation and reliability testing. Heller and Mobley [246] also concluded that there were limited instruments intended for children from birth to two years of age, leaving CFPQ as one of few alternatives. Although we excluded some questions because of the children's age, there is a potential bias that multiparous parents report on their older children, instead of the toddler, as one of the mothers who tested out our questionnaire commented. Studies show that parents may use different feeding practices when feeding siblings [247, 248]. If the parents report on behalf of the eldest child, there is a potential for misclassification which then lowers the possibilities for detecting the correct differences and associations.

The Cronbach's alpha values for the used subscales were similar to those reported in another study using the same measurements among parents of 1-year-olds [184], but not as high as would have been preferred [249]. Cronbach's alpha is sensitive when few items are used in the scales, such as the CFPQ scales used in this study [249]. Cronbach's alpha requires strict and often unrealistic assumptions and therefore makes measures look less reliable than they are [250]. Other measures (e.g., the greatest lower bound) could probably have been used advantageously to estimate the reliability [250]. However, due to the potential to compare with findings from the study of Russell et al. [184], this measure was used.

Food Choice Questionnaire (Paper II)

Steptoe et al.'s [32] food choice questionnaire (FCQ) is widely used and tested [188], and we decided to use it in the present study. We asked the parents about their own food choices, not primarily the motives for providing food for their child or the family. Other studies have modified Steptoe et al.'s FCQ so as to be

phrased for children [77] or the family [76], which lowers the comparison to our study because of slightly different questioning. However, in the three studies, health and sensory appeal/taste were identified as important food choice motives, showing that the selection of one's own foods or food for the family/child have similarities. Somewhat contrary findings were found in a study where mothers were asked to distinguish between motives for choosing food for themselves and for their children [251]. The mothers rated health motives higher when providing food for their children than for themselves. However, when it came to what food they actually gave their children, the children were given less healthy foods than the mothers ate themselves, which supports precision in questioning. Snuggs et al. [252] found that mealtime feeding goals were different from the parents' goals when buying food. The mealtime goal *stress/conflict avoidance* outscored health goals when providing food. In addition, Snuggs et al. [252] questioned the face validity of the FCQ (e.g., if the parents understood the terms "health" or "convenience"). They developed a new measurement of parental feeding goals, and their results can inform the design of healthy eating interventions that target specific feeding goals, which are potentially more effective [252].

A single-item questionnaire has recently been developed by Onwezen et al. [253], and they indicate that this FCQ can be a flexible and short substitute for the multi-item FCQ. A shorter questionnaire may make it easier for more parents to contribute. A simpler response scale (e. g., a 4-point scale compared to the 7-point scale we used) may also lower the participant burden, but is not recommended due to the potentially lower precision, which may make it harder to detect a true difference [188].

The Cronbach's alpha values for this study were slightly lower than those reported by Pollard et al. [254] (four-point scale) and higher compared to Fotopoulos et al.'s [180] study (seven-point scale) for three out of five items (all items except sensory appeal and price). The scales had acceptable or good α values, except for one scale (*sensory appeal*, $\alpha = 0.64$*).*

Engagement measures (Paper IV)

Since we developed the intervention website from scratch and co-created with master students, we did not at the beginning know which system would be appropriate for the intervention. We ended up using a learning management system (NEO), where we could retrieve data on how many times the participants

accessed the website, the number of fulfilled lessons, and the contributions to the discussion forum. It was not possible to track the participants' use of other parts of the website, which would have provided a more comprehensive overview of website use. The data were manually retrieved from NEO, which lowers the reliability. Participants who logged in, but did not visit any of the lessons, were registered as one day users. How much they used the website (e.g., recipes), is not known. We have user data from all the participants and did not need to only rely on participants' self-reported responses to the follow-up 1 measurements, which is a clear strength of this study.

5.2. Discussion of the results

The aim of this thesis is twofold: 1) to develop, implement, and evaluate an eHealth intervention, aiming to promote healthy dietary habits in toddlers by targeting parents' awareness of their child's food and eating environments, and 2) using baseline data to examine associations between parental food choices motives, parental feeding practices, and children's fruit and vegetable intake.

The development and implementation of the intervention is described in this thesis method section (see chapter 3).

5.2.1. Eating environmental factors and associations with child diet

The psychosocial processes that drive parental feeding behaviors are important to explore in order to understand how to improve children's eating behaviors. In paper II we explored associations between two elements in the eating environment (parental food choice motives and health-promoting feeding practices) and their individual and combined association with child fruit or vegetable intake. We explored whether any of the five food choice motives assessed (*health, convenience, sensory appeal, price,* and *familiarity*) were directly associated with fruit or vegetable intake. In addition, the potential mediating effect of three health-promoting feeding practices (*encouraging balance and variety, shaping a healthy environment,* and *healthy modeling*) on these associations was assessed.

A higher score on health motives was directly associated with higher infant vegetable intake. In other studies, associations appeared between strong health

motives and both fruit and vegetable intake [71, 255]. Those with strong health motives may be especially aware of the specific dietary challenges and make the effort to familiarize themselves with the guidelines on these issues. Given these associations, a particular focus on promoting health motives to parents with low such motives may be essential in parent-focused interventions.

The importance of health motives is seen in several studies [71, 76]. For the present study, the participants had high scores on the importance of health motives (the mean was over five on a scale from one to seven). In a recently published paper, Snuggs et al. [252] discuss whether the importance of health motives is biased in interventions due to the overrepresentation of parents (mothers) with a particular interest in health issues. A more varied sample, including more lower educated parents as well as more fathers, may have reduced the importance of health and increased the importance of some of the other factors like familiarity or price. Maybe we would have seen other significant associations with fruit or vegetables in such a sample.

The participants in our study had overall high scoring on convenience (over five), but no associations to fruit or vegetable intake were seen. Contrary to our findings, other studies have found associations between higher scores on convenience motives and lower fruit and vegetable consumption [255] or higher intake of energy-rich foods [76]. However, the children in these studies were older than toddlers, and convenience motives may be more important as the child grows, as older children have more opinions about and insight into the food provided and the eating situations.

Roos et al. [76] expected to find associations between price and nutrient-dense food, but as in our as well as another study [77], no association was found. Contradictory findings were found in two other studies [256, 257]. Parents with a high socioeconomic status (SES) are more likely to rate price motives as less important than other motives, and the high proportion of high SES parents (measured by education level) in our study as well as other studies [75-77] may result in other motives out competing the price motive. High SES parents likely have a personal economy that supports selecting food for reasons other than price.

The means of the three feeding practices examined were rated between 3.08 and 3.57 (on a scale from 0–4), which is similar to the results reported by Russell et al. [184]. A possible explanation for these positive scorings may be many parents

with a high education levels in the sample, who tend to use health promoting feeding practices to a larger extent than others [184], and that parents tend to overreport positive practices [258].

Shaping a healthy environment and *encouraging balance and variety* were more influential mediators than *healthy modeling* in the present study. The children's young age may contribute to the low impact of *healthy modeling*. This feeding practice may have a more substantial impact as the child grows older and can understand the language as well as cognitively understand their parent's actions. The importance of shaping the environment is well known, and the practice is characterized by a high access and availability of healthy foods, and the opposite for unhealthy alternatives [68, 259]. *Shaping a healthy environment* explain over 26% of the associations between health motives and child vegetable intake. This result is not surprising and underpins the importance of this feeding practice.

The positive associations between encouraging healthy eating and children's fruit and vegetable consumption are relatively consistent in previous studies [260, 261]. The feeding practice *encouraging balance and variety* mediated both the relationship between sensory appeal motives and vegetable frequency, and health motives and vegetable frequency in our study. If sensory appeal motives are important, the food provided is probably food which the parent likes the taste of. When liking a food type, encouraging others to eat the same food is probably easier to accomplish.

In many parent-focused dietary interventions, the aim is to increase the parental use of health-promoting practices, with a minor focus on reducing the amount of practices associated with poor health outcomes (negative practices) which parents make use of [106, 109, 127, 130, 184]. Despite that, more negative feeding practices than health-promoting ones are being examined [70]. The results from this present study can guide researchers regarding which practices and motives to target in interventions to come. According to our findings, a focus on the feeding practices *shaping a healthy environment* and *encouraging balance and variety* is appropriate for similar populations. However, the small effect sizes on mediation found in this study may indicate that more research is needed to confirm findings.

Mediation analysis is applied to identify potential mediating variables in a wide range of associations in nutrition research [262]. However, the method is controversial, especially for cross-sectional data [263, 264], e.g., many rarely

acknowledged assumptions in empirical studies have to be met. There is a risk of oversimplifying the results for the mediation analyses. We cannot exclude the possibility of reverse causation between the two eating environmental elements measured, given the cross-sectional nature of the data [263]. The results must be interpreted with caution because using only a single mediation variable does not allow us to model multiple mechanisms simultaneously in a single integrated model [193]. Many elements can affect the dietary intake (outcome variables) in our study, meaning that there could be a correlation between a mediator and another variable that causally influences the outcome [263]. Adding more than one mediator to the model had allowed us to see which indirect effect of the mediators was the strongest. However, a more complex model is harder to interpret concerning the number of items investigated in this study. We wanted to investigate both fruit and vegetable consumption separately, and the simple mediation model was considered to be well suited. Some researchers claim that fruit and vegetables can advantageously be studied separately [61, 62, 265]. The different results for fruit and vegetables in this study confirms their suggestions. The bootstrap method used in our analyses is recommended by Hayes [193] in studies with small samples and should be considered a strength due to the increase in power. A recently published review showed that presentations of sensitivity analyses were limited in studies using mediation [266] and Lange et al. [267] calls for extensions in existing software that makes it easier to perform these analyses. In addition to using the Prosess 3.1. for SPSS software, we calculated similar results step by step according to MacKinnon [191] procedure. Conducting sensitivity analyses as described by Imai et al. [268] could have tested the robustness of our results, but were unfortunately not done in our study.

5.2.2. Dietary effects of the intervention

The intervention aimed to make the parents aware of children's food and eating environment and facilitate healthy choices to enhance their child's diet. The findings in paper III suggest a positive intervention effect on our primary outcome, however, we did not manage to engage 13 % of the participants.

Toddlers fruit and vegetable intake

The intervention had an effect on the frequency of vegetable intake, and we also found a positive trajectory of vegetable variety in favor of the intervention group.

There is probably not a single reason for the positive findings. One reason may be that we addressed several aspects of enhancing the intake of vegetables and, in particular, did so at the start of the intervention period. Knowing that the interest in digital interventions is highest at the start of the intervention, both in ours and other interventions [269], essential elements of the content should be presented early, so that most participants receive this information. There was a video on the website's front page which focused on adding a weekly vegetable to the diet, and in the first thematic lesson the theme was accessibility and availability of healthy foods, the importance of repeated exposure of healthy foods, and the offering of a variety of healthy foods. These issues are particularly important for vegetable consumption because of the bitter taste that children need to be exposed to. This lesson was also the only thematic lesson available when first accessing the website. These issues may have given the participants key information.

We wanted to find out if the most frequent users of the website benefited to a larger degree from the intervention than the rest of the participants and, in addition, if they differed in baseline characteristics. In a Norwegian study, good adherence to diet and physical activity apps was associated with a better diet among adults [270]. Additional analyses were done in our study (data not shown), and no such differences were found. The quartile of most frequent users (*n*=36, fulfilled lessons >14 lessons) did not differ significantly from the rest of the intervention group in dietary intake at any time points and neither for baseline characteristics. Also, no baseline differences or differences in fruit, vegetable, and discretionary food intake at any timepoints were observed between users and non-uses (*n*=38, fulfilled lessons = 0). These results underpin that the focus at the intervention's start on vegetables may have been important and not how many lessons the participants accomplished or personal characteristics.

Addressing repeated exposure before the neophobic period as we have done here, may be especially beneficial to the acceptance of a variety of vegetables and for ensuring that this acceptance persists over time [58]. The borderline significant results of a variety of vegetables may indicate that we managed to accomplish this.

A reason for the increased vegetable intake in the intervention group, contrary to fruit intake, may be a higher potential for adding more vegetables to a toddler's diet compared to fruit. A child typically adapts to the family's meals around the time of this intervention, and since vegetables are a major ingredient of hot

meals, the potential for increased intake may be higher for vegetables. Fruit as a snack, dessert, or drink (smoothie) may already be a part of habits not dependent on sharing family meals and lower the potential for improvement.

The intake of commercially made hot meals decreases during the second year of life [19, 20]. In a study where the content of pre-prepared commercial infant feeding meals was compared to equivalent home-cooked recipes, the variety of vegetables was higher in the pre-prepared commercial meals [271]. The variety of vegetables in our sample was relatively stable at all time points in the control group but higher for both follow-ups in the intervention group. An intervention in this period wherein home-made alternatives replace commercially prepared food may be especially beneficial for addressing vegetable consumption.

In the latest Norwegian nationwide dietary surveys, a positive tendency of a higher intake of fruit and vegetables is seen among infants and toddlers [21, 22]. National surveys show that fruit and vegetables intake is still low among older children in Norway [272, 273]. However, we are waiting for updates on these surveys. Our study's children had an average daily fruit and vegetable frequency of over six items at all time points, which may indicate that the daily intake of five handfuls per day is met [10]. However, we do not know precisely how much they eat of each item. Still, our study's positive results for vegetable consumption argue for the potential for improvement in this age group. When our study was conceived, literature reviews showed this food group as one of the dietary challenges and, in particular, to introduce various of foods before the neophobic period came about to maintain the intake over time. We also got suggestions through interviews with stakeholders and parents to incorporate how to get enough and the right food, and fruit and vegetables should be an important part of such a diet. However, the positive trend of higher fruit and vegetable consumption in Norway may guide interventions to come to elaborate other potential better approaches as more focus on food choice motives and positive feeding practices, which may contribute to maintaining healthy habits over time.

The sample of parents in the Food4toddlers study had high scores for health motives at baseline, and we saw a positive association with vegetable intake (paper II). Nevertheless, as seen in other studies [77, 252], there may still be a lack of consistency between their own health motives for selecting food and the actual deliverance of a healthy diet to the child. By making the parents more

aware of the influences of the food and eating environment, this discrepancy may have become more apparent and encouraged them to make changes.

The relatively large standard deviation of the toddler's dietary intakes may indicate that there are large variations in the parents' patterns of action that make it challenging to find an intervention that suits everyone.

The tendency for parents to report in favor of their own image is called a socially desirable response, and may have occurred here in both intervention and control groups [274]. More problematic, however, may be that the intervention group's parents may report according to the purpose of the intervention [275, 276], which may have biased our findings towards a larger effect of the intervention. Because of the low numbers included in the study compared to the calculated numbers needed, the result should be interpreted with caution. However, a strength of the effect results is the similarities between adjusted and unadjusted measures. We also used conservative estimates in the GEE analyses to avoid type 1 errors. Sensibility analyses were performed to test the robustness of our findings. We ran different GEE analyses, without outliers and with
different correlation structures, and no major differences in results were seen (data not shown). Another test we performed, showing between-group differences in change from baseline to the follow-ups (complete cases), confirmed the findings for vegetable frequency from baseline to follow-up 1 (data not shown). However, there were no borderline significant differences for vegetable variety. Also, we measured the difference in dietary intake between the two groups at all time points (Appendix 6). These results show a significant difference in intake at follow-up 1 and 2 for vegetables frequency and solely at follow-up 2 for vegetable variety. All sensitivity tests put weight on the significant between-group differences for vegetable frequency from baseline to follow-up 1, and no such differences for either fruit or discretionary food measurements. The other measures for vegetable intake are less robust.

The solely digital delivery design enables the delivery of the intervention to a population at large, though at the same time limits personal tailoring. We challenged the parents to undertake concrete actions, e.g., buy more fruit and vegetables and then self-monitor whether they ate more the following week. Even though the website was not personally tailored, this may have affected vegetable intake.

Toddlers discretionary food intake

The children's natural likings of discretionary food due to the sweet or salty taste may be challenging [277]. A high intake is linked to overweight and obesity and the development of noncommunicable diseases [6]. The children's intake of discretionary foods and beverages was low at baseline and relatively low at the follow-ups in this present study, which is also seen in other Norwegian studies of young children [21, 22, 107]. The potential of reducing a low intake is limited, and no difference between the groups was detected. If the Food4toddlers intervention affects the intake of these kinds of foods, we may have to look for longitudinal results where the participants potentially include less discretionary foods in the diet as the child grows older. However, with no short-term effects in this intervention, the potential to measure significant long-term effects may be scarce [122]. Nevertheless, even small differences may be beneficial from a public health perspective despite no significant results when measuring through a questionnaire. Positive changes and healthy habits in the early years can be beneficial regarding the entire lifespan [1].

The Time2bHealthy study [121] targeted children older than toddlers and excluded children with a low BMI, and found beneficial intervention effects for discretionary foods. The intake of these foods tends to be higher as the child grows [21, 22]. Even though the message about a low intake of discretionary foods is important from an early age, an effect is more likely to be detected if there is more variation in the intake and if the participant finds the message relevant [149], which may indicate that a focus on this type of foods is more appropriate in interventions targeting children older than toddlers.

If the child is overweight, there is a tendency for the mother to be overweight and for the child to have a high intake of unhealthy food [278]. The Smart Mums study recruited overweight mothers [125] and focused on reducing the sugar-sweetened beverage (SSB) intake of both mother and child. They found a reduction in the unhealthy intake among the children and also a reduction in maternal BMI. A review of SSB interventions (both traditional and eHealth) found that recruiting vulnerable populations and having a special focus solely on SSB, as in the Smart Mums study, were success factors in these kinds of interventions [279]. Other success factors were to use multiple strategies (e.g., in-person and digital), interventions in child care settings, and a high contact time

[279]. Few of these factors were incorporated in our intervention and may explain the lack of intervention effect for discretionary foods.

A more varied group of participants, including parents with lower education levels, might have yielded more intervention effect on both discretionary foods and fruit due to the potential lower adherence to dietary guidelines among parents with lower academic levels [23]. However, despite the homogeneous group of parents, there was still an effect in the Food4toddlers intervention.

Other dietary outcomes

As a supplement to this thesis to complement dietary results in paper III, we elaborated crude effects of the intervention by testing differences between control and intervention groups for additional food groups. We saw no differences between the groups. The lack of intervention effect for meat, potato, bread (in general) and industrial made porridge, is not surprising because we did not have a specific focus on these foods, and they are not specifically defined as either healthy or not healthy.

5.2.3. How the intervention website was perceived and used

In order to evaluate how the Food4toddlers intervention was perceived and used, we conducted a process evaluation by examining the parents' usage and perceived satisfaction of the website and explored whether this differed according to education level and the number of children in the household. The Internet is an important channel for information regarding child health for parents [154]. A critical barrier for parents, however, is to decide which sources to trust [155]. By accessing the Food4toddlers website the parents received evidence-based and theory grounded information about children’s diet and a healthy food and eating environment. The website was used by most intervention participants (86.5%), and the mean days of access was above seven. We did not manage to engage all participants, which is a known challenge but still a weakness of our study. Probably are the first contact at the start of the intervention essential when the app or website is introduced the first time. The Swedish MINISTOP study [128], which had good adherence, contacted the participants two days after introduced the app to provide the participants with information about, e.g., using and installing. This contact most likely heightened adherence. The 20 push notifications in our study probably contributed to increasing the number of access days, as confirmed by several studies, though how often and when to send

them is not unambiguously described in the literature [217, 280-282]. Sending a notification once a week as we did is probably an acceptable average, however, sending extra emails to non-responders, as was done in the MINISTOP study, might be a good addition [282]. Better adherence might have occurred if we had used SMSs instead of emails for push notifications, as preferred by a sample of Australian parents [283], as well as delivering short reminders ("booster sessions") after the end of the main content of the intervention [284]. These types of reminders can easily be incorporate in an eHealth intervention.

The participants reported that the website was appropriate to the child's age and easy to understand (86–93%). The text was written in such a manner as to be easy to understand, and the content was designed to avoid misinterpretation by the participants, which is recommended [159] and may explain the positive results. The content was also regularly expanded with age-specific themes, which parents suggested as important for engagement [148]. Personal tailoring, including contact with, e.g., a dietitian, or digital alternatives based on personal delivered data, is preferred by participants and tends to increase adherence [115, 148]. More tailoring might have contributed to a higher adherence and stronger effect of the Food4toddlers intervention, leaving digital tailoring as the best option for a large population.

The recipes were valued as the essential part of the website, while the cooking videos made for the recipes were not highly valued. The importance of including recipes in these types of interventions is convincing, though written text alone may suffice. It is also possible that videos perceived as more suitable than ours would have had a more positive effect.

Most of the participants in the intervention group appreciated the interface and layout of the website (56–63%). These numbers indicate, however, that there remains potential for improvement. More qualitative elements in the development phase, such as usability testing in a lab might have contributed to a better interface and layout in our study, e.g., some Norwegian researchers conducted lab tests of how the participants technically used the website (e.g., tracking eye movement), followed by discussions with the test subjects [285]. It is worth noting that the majority of participants reported that they learned something new from the intervention (61%), which indicates that the content was delivered appropriately.

Differences in how the intervention was perceived according to education levels

The educational characteristics of the sample led us to set a high cutoff between the education levels. The participants with at least four years of higher education used the intervention more than those with lower education levels. The same gradient in use was also seen in the Growing Healthy study [129]. In the Early Food for Future Health study, no such differences were observed [107]. The great use of videos in the Early Food for Future Health intervention is the main difference with regard to the Food4toddlers intervention. Videos may be especially beneficial for the lower educated participants and contribute to higher adherence from this group, but this depends on the quality of the videos [217].

The different cutoffs for high and low education levels prohibit direct comparison with other studies. The highest educated parents reported that they learned more from the intervention than did lower educated parents. Their higher engagement may be the reason for this, or it may be that the content was more in line with their beliefs and values [148]. The highest educated parents tend to have a higher level of health literacy than others, making it easier for them to understand and adopt the content [150, 152, 153]. Our findings are not positive from a public health perspective, because they indicate that the intervention may increase the socioeconomic divide. The high education level may compromise our findings' generalizability, and a more varied sample in other studies indicates more variety in the results [17, 23]. Our results indicate that there are also differences in the gains of health-related information within those groups with higher education levels; However, there is a large standard deviation in the results, which lowers the results reliability. As sensitivity tests (Mann-Whitney-U tests) were conducted, and these findings were in line with the reported results.

Differences in how the intervention was perceived according to the number of children in the household

Not surprisingly, parents with more than one child (multiparous) used the website less frequently than households with one child (primiparous). Multiparous parents may have more knowledge and higher self-efficacy regarding parenthood and feeding, and as these factors increase, program attendance appears to diminish [148, 286]. Some of the intervention content was probably familiar, and everyday life busier with more children at home, resulting

in less engagement and time for access. These suggestions are confirmed in a process evaluation of the Growing Healthy Program [217]. Sensitivity tests conducted (Mann-Whitney-U tests), did not support the significant result, which lower the reliability of the results as does a large standard deviation. Due to the distribution of the dependent variable, the Mann-Whitney-U test might have been the preferred measure in this analysis.

The use of the discussion forum

Few of the parents engaged in the discussion forum (8). A Facebook group might have been better suited due to Facebook's high daily use in general [101]. Parents in another study considered a Facebook group to be a comfortable environment for discussion [217]. Nevertheless, there was little interaction between the participants in the Facebook groups in the same study. Allowing participants to first meet physically in groups and then make interactive online groups tends to contribute to more interaction [286]. A discussion forum might not be worth the effort to incorporate in a website due to the potential low attendance.

5.3. Lessons learned and future implications

Glanz et al. state that "the best theory is informed by practice; the best practice should be grounded in theory," and to do so, theory-based interventions have to be performed and evaluated [82]. Health and nutrition information on the Internet has escalated in recent years, both in amount and as to how important it is for parents [107, 146, 147]. Dietary interventions targeting young children through their parents hold significant promise, but there is still a lack of knowledge on how the results can be achieved and retained [287, 288]. The design of new studies should have a longer perspective within a life-course framework including long-term follow-ups, reach out to a larger population and require high quality in all parts of the interventions development and implementation [288].

The Food4toddlers study contributes with evidence to the field by delivering a trustworthy, solely digital tool targeting toddlers. Future studies should emphasize how information about nutrition should be provided and ensure that the tools are easily available and accessible for parents. In all parts of the development and implementation phase, users, in particular fathers and parents

with low education levels, should be engaged as co-creators in order to make the tool as appropriate as possible.

Kohl et al. [211] address the need for more research on effective elements instead of effective interventions, with an emphasis on long term effectiveness. The positive intervention results for vegetable consumption indicate that some elements from our interventions concerning vegetable intake should be carried forward. Toddlers may benefit especially from interventions targeting vegetable consumption and maybe leaving the focus on discretionary foods to older age groups or vulnerable groups, especially in the Norwegian and other similar cultural settings.

There is a need for more comprehensive research on how to reach and incorporate low educated groups and fathers in dietary eHealth interventions. From this study we see that Facebook has limitations as a recruitment arena, reaching mostly highly educated mothers. Other types of tailoring on Facebook or other Internet channels (e.g., YouTube) might be considered for recruitment.

The work of Snuggs et al. [252] highlight the distinctions between motives for buying food and motives for serving food to the family. With this in mind, interventions in the future can be more precise in targeting the most important behaviors. A further natural step from this intervention is to continue to identify which feeding practices and food choice motives are most important to target in parent-focused interventions and how they interact with each other.

5.4. Ethical consideration

In all research involving humans, the researchers should try to avoid the risk of causing harm and ought to try to contribute positively [289]. Children, and in particular young children, are a vulnerable group in scientific research. Therefore, all aspects of participating parents' involvement should be carried out with specific caution, avoiding any harm to the children. The Food4toddlers study was carried out in line with the Helsinki Declaration [290], and research clearance was obtained from the Norwegian Centre for Research Data, 08/06/2016, reference 48643.

Recruitment to scientific studies through Facebook has increased dramatically in recent years and is an effective and cost-efficient recruitment arena for health, medical, and psychosocial studies [206]. Specific guidelines for recruitment in social media were scarce when we started recruiting for this study in 2016 [291],

and guidelines are still lacking or unknown for decision-makers, according to Hokke et al. [209]. Therefore, researchers interpret traditional ethical guidelines when using social media, which has shown to be problematic because the researchers and decision-makers are often unfamiliar with technical possibilities and benefits and are unaware of the risks and limitations [209]. The participants in the Food4toddlers study were recruited through Facebook; however, no personal information was stored on Facebook, but only on the university's recruitment system, which undergoes strict safety routines. The further collection of data was treated with confidentiality, and all contact with parents was done in a respectful manner [289]. Informed consent was obtained from all parents when they chose to sign up for participation, and an information sheet about the study was made available to them (see Appendix 1). Great emphasis was placed on providing this information understandable and precise.

The advice provided on the website was in line with national guidelines and updated research. Offering access to an eHealth intervention such as the Food4toddlers website is not likely to have adverse, negative, harmful, or disadvantageous effects [292]. The participant burden is low in such interventions, and the child is indirectly affected by potentially living in a more health-promoting environment, and which may lead to better health later in life [31]. However, even though the intervention's messages were constructed so as not to cause any harm, the child may, e.g., be negatively affected by the particular focus on repeated exposure and feel pressure if they refuse over time. Parents may be ashamed if they do not feel they fulfill the parent role, and they may perceive the website as “another task to accomplish,” which may contribute to more stress [293]. However, the parents could unsubscribe at any time.

6. Conclusions

Our findings support the use of eHealth interventions as an avenue for supporting parents in their children's dietary upbringing.

Through making the parents aware of dietary determinants and encouraging them to create a healthy food and eating environment for their child, child diet was slightly improved in the intervention group. The children of parents who received access to the Food4toddlers website had a better trajectory of vegetable consumption than those in the control group. No intervention effects were seen for other food groups. The low number of participants included lowers the robustness of the results.

Parents' own motives for selecting food were mostly not related with children's fruit and vegetable intake, except that selecting food for health reasons was positively associated with children's vegetable intake. Health-promoting feeding practices explained some of the associations between the parents' food choice motives (health and sensory appeal) and child fruit or vegetable consumption. However, the effect sizes were small. These findings contribute to a more detailed understanding of interactions between elements in children's food and eating environment and their diet and may help guide the development of successful prevention programs.

We found that most participants used the intervention website during the intervention period and found it relevant and useful, however, we did not manage to engage 13 % of the participants. Parents with more than four years of university education reported that they used and learned more from this intervention than those with lower education levels.

The evidence of a positive intervention effect of the Food4toddlers intervention may encourage similar public health interventions targeting parents of toddlers and be important in a public health perspective if scaled to be implemented in the general nutritional upbringing of toddlers.

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Paper 1

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STUDY PROTOCOL Open Access

The Food4toddlers study - study protocol for a web-based intervention to promote healthy diets for toddlers: a randomized controlled trial

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Abstract

Background: Eating habits are established during childhood and track into adolescence and later in life. Given that these habits have a large public health impact and influence the increasing rates of childhood obesity worldwide, there is a need for effective, evidence-based prevention trials promoting healthy eating habits in the first 2 years of life.

The aim of this study was to develop and evaluate the effect of an eHealth intervention called Food4toddlers, aiming to promote healthy dietary habits in toddlers by targeting parents' awareness of their child's food environment (i.e., how food is provided or presented) and eating environment (e.g., feeding practices and social interaction). This paper describes the rationale, development, and evaluation design of this project.

Methods/design: We developed a 6-month eHealth intervention, with the extensive user involvement of health care nurses and parents of toddlers. This intervention is in line with the social cognitive theory, targeting the interwoven relationship between the person, behavior, and environment, with an emphasis on environmental factors. The intervention website includes recipes, information, activities, and collaboration opportunities. The Food4toddlers website can be used as a mobile application. To evaluate the intervention, a two-armed pre–post-follow-up randomized controlled trial is presently being conducted in Norway. Parents of toddlers ($n = 404$) were recruited via social media (Facebook) and 298 provided baseline data of their toddlers at age 12 months. After baseline measurements, participants were randomly allocated to an intervention group or control group. Primary outcomes are the child's diet quality and food variety. All participants will be followed up at age 18 months, 2 years, and 4 years.

Discussion: The results of this trial will provide evidence to increase knowledge about the effectiveness of an eHealth intervention targeting parents and their toddler's dietary habits.

Trial registration: ISRCTN92980420. Registered 13 September 2017. Retrospectively registered.

Keywords: Randomized controlled trial, Parental feeding practices, Food environment, Eating environment, Toddlers, eHealth, Shopping behavior

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Background

It is acknowledged that long-term health has an early developmental origin [1, 2]. The period from conception until 2 years of age, "the first 1000 days of life", is recognized as a critical period for growth and development as the developing child adapts both metabolically and behaviorally to its nutritional and overall environment via gene expression and epigenetic mechanisms [3, 4]. Given that an unhealthy diet is one of the key risk factors for overweight, obesity, and other related noncommunicable diseases (NCDs) [5], diet quality during these formative years may strongly influence the child's life-long health trajectory [6].

In Norway, as in other countries, unhealthy dietary patterns characterized by low intake of fruits and vegetables and high intake of non-core foods and beverages, are observed among toddlers [7–11]. In addition, at 12 months of age, about 80% of Norwegian children eat commercial baby food, with the main food intake for more than 15% of children aged 24 months still coming from jarred foods [12, 13]. Furthermore, studies have shown unhealthier dietary patterns in young children from families with lower socioeconomic status (SES) than those with higher SES [14–16]. There is a social gradient in child diet quality disfavoring the long-term health of children with lower SES [16, 17].

Parents are the gatekeepers of foods served during the first years of life and they have a unique role in shaping their child's dietary behavior [18, 19]. Dietary preferences (likes and dislikes) and food habits established early on reflect to a large extent parental feeding practices, such as the type and variety of foods offered during the first 2 years of the child's life [18]. Early dietary habits have been shown to track to later in childhood and adulthood [7, 20]. Fostering healthy dietary habits is therefore crucial to long-term health and obesity prevention [20]. Whether healthy or unhealthy dietary preferences are established depends on what, when, and how the child is fed [18]. To promote the internal regulation of energy balance, parents should be responsive to a child's hunger and satiety cues during meals and feeding [21, 22]. One-year old children are capable of eating foods consumed by the whole family, and the development of self-feeding skills should be encouraged in this period [23].

Parental feeding practices are influenced by nutrition knowledge, family meal practices, and overall food preparation and parenting skills [24]. Non-responsive feeding (i.e., excessively controlled feeding, indulgent feeding, or uninvolved feeding) has been linked to childhood obesity [25]. Campbell and Crawford [26] identified several factors in the family environment to be important for children's diet, including parental food preferences and beliefs, children's food exposure, role modeling, media exposure, and child–parent interactions around food. In another study, those authors demonstrated several aspects of the family's food environment (e.g., TV viewing and shared meals) to be associated with child dietary characteristics that are likely to promote fatness [27].

Lobstein et al. [28] claimed that the food environment is the leading factor driving obesogenic behaviors. The *food environment* refers to factors that directly relate to how food is provided or presented such as its salience, structure, packaging or portion size, and how it is served [29]. The food environment is further divided into *macro-scale* (e.g., food shopping outlets) and *micro-scale* (e.g., home environment). The *eating environment* refers to factors that are independent of foods, such as social interactions around meals, atmosphere, and the time of day that meals are eaten [29]. Roberto and Kawachi [30] found that many of people's daily eating habits are guided by default options, e.g., large portion sizes in restaurants. According to Roberto and colleagues [31], current food environments exploit our biological, psychological, social, and economic vulnerabilities by making it easier to access and eat unhealthy non-core foods that either increase overall energy intake or replace healthy core foods in the diet. In-store environmental factors (e.g., the placement of healthy foods) influences parents' choices when shopping [32]. The food industry produces jarred food, squeezable fruit pouches, and baby porridge for children up to the age of 24 months and older that are often packed in colorful, attractive wrappings and marketed as a healthy choice. These high-cost products are often strategically placed in the store. These foods are unnecessary for toddlers and do not meet the child's need for different texture, flavors, and dietary variety [33]. Addressing awareness of how both the macro- and micro-scale food environments affect choices regarding foods and feeding is important, to help parents make more informed choices.

Although interventions at early ages are decidedly needed, they are scarce [34–37]. Two dietary intervention trials in Australia have addressed the parental role in shaping healthy eating environments for young children [22, 38]. The cluster-randomized INFANT study focused on parenting skills related to diet and physical activity in children aged 3–18 months, and resulted in lower consumption of sweet snacks and less daily television time [39]. The NOURISH trial, a community-based intervention targeting early parental feeding practices in 4- to 16-month old children [22], reported higher use of protective feeding practices conducive to the development of healthy eating patterns and healthy growth in the intervention group compared with the control group [40]. To our knowledge, no studies have applied eHealth approaches targeting diet in young age groups via the parents [34, 35, 41].

Interventions using smartphones and computers have a high potential to reach a large number of people, including those with low SES. Such interventions are cost-effective, flexible, have a low participant burden, and may be more visually appealing and engaging [42]. Therefore, we developed an eHealth intervention called Food4toddlers, with a mobile application (app) version for use with a smartphone.

Objectives and outcomes

The aim of this study was to develop and evaluate the effect of an eHealth intervention called Food4toddlers, aiming to promote healthy dietary habits in toddlers by targeting parents' awareness of their child's food and eating environments.

Primary outcomes

Primary outcomes of the study are child diet quality and food variety assessed at baseline and after the intervention.

Secondary outcomes

Secondary outcomes include the food and eating environments conceptualized as: parental feeding practices, family meal settings (frequency of meals, meal distractions), food choice, awareness of the food environment (at home and in the grocery store), availability and accessibility of food at home, food preparation and planning, and child weight and length.

Methods/design

Study design

This study is a randomized controlled trial to evaluate the effect of the Food4toddlers intervention, in which the intervention group has access to the Food4toddlers intervention website and the control group does not, see Fig. 1. Children in the intervention and control groups receive their usual care at community child health centers, which normally includes three consultations with a health care nurse for children between 12 and 18 months of age. The study started in August 2017 and is ongoing.

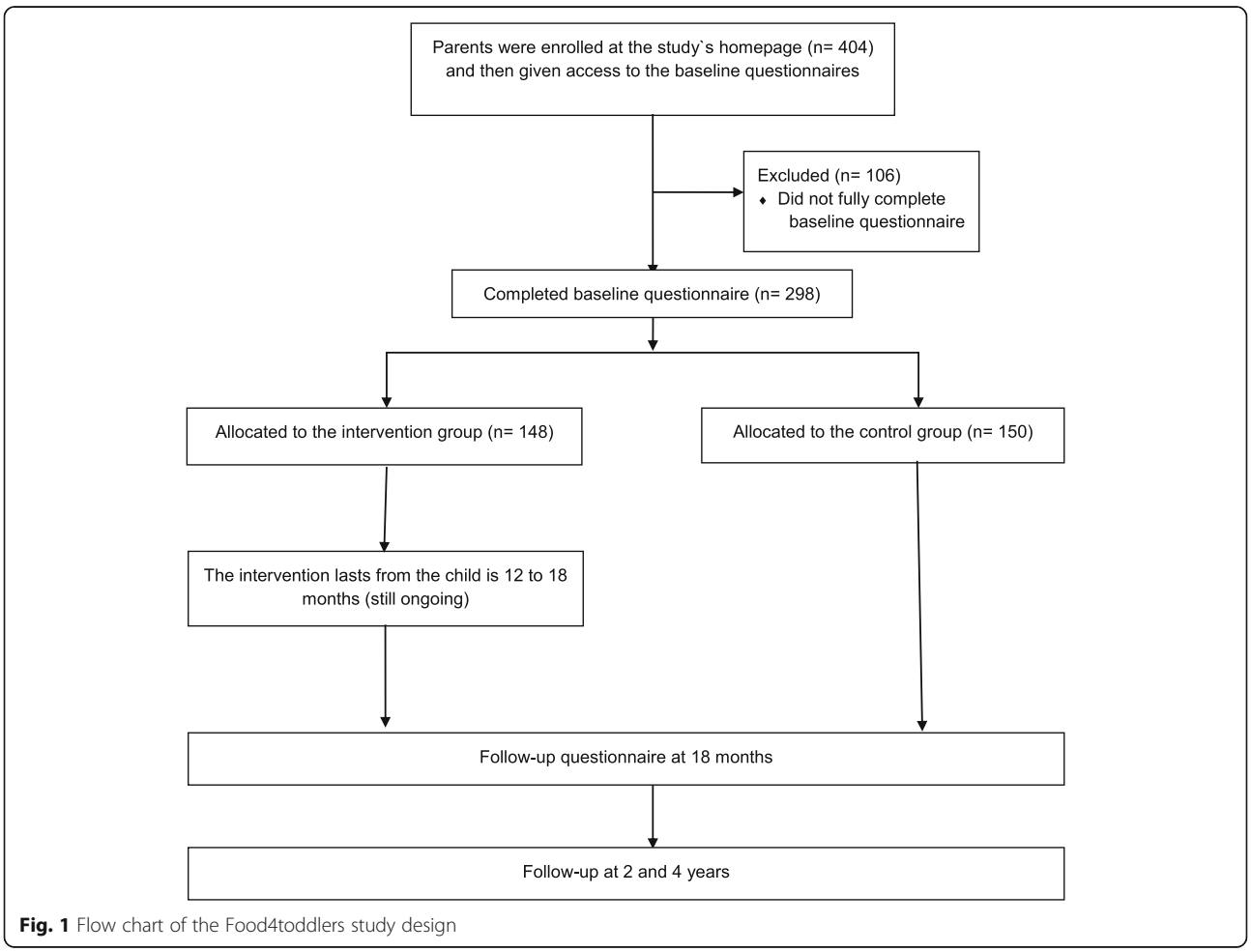

Fig. 1 Flow chart of the Food4toddlers study design

Participating parents complete questionnaires at baseline, post-intervention (end of intervention, after 6 months), and at two follow-ups (i.e., when their child turns 2 and 4 years old). The intervention runs in waves, and the first group started the intervention in September 2017. New groups were started every month through February 2018.

Study sample and recruitment

The study population comprised children close to 12 months and one of their parents. To be included in the study, parents had to have a child born between August 2016 and April 2017 and the parents had to be literate in Norwegian. Participants were recruited via Facebook. A short video was launched on Facebook with a link to the project website containing information about the project and the opportunity to sign up. The recruitment period lasted 5.5 months from mid-August 2017 to January 2018. In total 404 parents were recruited. The month before the child reached age 12 months, the enrolled parent received an e-mail with a link to a questionnaire. Three reminders on e-mail were sent to non-responders the following weeks. We included a total of 298 parents who responded to more than half of the survey questions. After they had completed the baseline questionnaire, participants were randomized according to an SPSS-generated randomization list prepared of NCØ, of 500 to the intervention and control group (SPSS version 24.0). The first author was the one who enrolled participants and assigned participants to the intervention group and control group. Among the participants who answered baseline and post intervention questionnaires, ten participants were selected to receive a gift card of 1000 Norwegian kroners. Demographic characteristics of the sample are provided in Table 1.

Sample size was calculated for one of the primary outcomes, child diet quality. As we have no data on healthy eating score for the Norwegian toddler population, we used the data of Angelopoulos and colleagues [43], which showed a mean healthy eating score of 60.5 among children (SD 9.0). We considered a 3-point difference in such a score between the intervention and control groups to be relevant from a public health perspective. We calculated that 142 children in each group would be required to demonstrate statistical significance with a statistical power of 80% and α of 5%. Assuming loss to follow-up of 40%, we aimed to recruit 237 parents in each group.

Table 1 Characteristics of participating parents and children

		Intervention (n = 148)	Control (n = 150)
Parents (N = 298)	Mother/father/other (n)	144/4/0	148/0/2
	Age (year), mean (SD))	31.5 (4.4)[a]	31.9 (4.0)
	Height, mean kg (SD)	168.7 (6.0)	168.1 (5.9)[b]
	Weight, mean cm (SD)	70.8 (14.3)	71.1 (14.8)[b]
	BMI, mean (SD)	24.9 (4.6)	25.1 (4.8)[b]
	Two adult household (%)	98.0	96.7
	Family members (n), mean (SD)	3.60 (1.0)	3.65 (0.87)
	Born in Norway (%)	89.2	83.2[a]
Education		[a]	[a]
	Upper-level secondary school or less (%)	12.2	11.4
	College/university (≤4 years) (%)	31.3	36.9
	College/university (> 4 years) (%)	56.5	51.7
Geographic residence			
	Northern Norway (%)	4.5	6.7
	Central Norway (%)	10.8	10.7
	Western Norway (%)	23.0	20.7
	Southern Norway (%)	16.2	20.0
	Eastern Norway (including Oslo) (%)	44.6	42.0
Child			
	Age (months (SD))	10.9 (1.3)	10.8 (1.2)
	Girls (%)	46.6	43.3

[a]one missing, [b]two missing

Theoretical framework

This study was developed using the basic steps from the Model of Planned Promotion for Population Health, which recognizes the importance of evidence- and theory-based intervention planning [44]. The model builds on the Theory of Planned Behavior [45] and Social Cognitive Theory [46]. Health behavior theories have had a major focus on cognitive determinants, but newer models are addressing the relationship between behavior and environment [47, 48]. As suggested by Brug and colleges [44], a focus on how to promote action rather than mere motivation is emphasized. The present intervention is in line with the social cognitive theory, targeting the interwoven relationship between the person, the behavior, and the environment [49], with an emphasis on environmental factors. Research suggests that environments influence us at a basic level of which we are unaware and that we do not monitor [29, 50]. In this project, we aim to make parents aware of how the environment influences them and render them more conscious about the over 200 food choices they make on behalf of their children throughout their daily routines [29].

Intervention development and user involvement

With the Food4toddlers intervention, we aim to influence child diet quality and food variety by targeting the main caregivers, the parents, and their awareness of the food and eating environments. The intervention outline was developed based on a literature review, extensive user involvement, and in-depth thematic discussions among the project group. Users in the development phase were parents of toddlers and health care nurses who were involved in several steps of the development of Food4toddlers. The first step in development was to contact public health nurses to get an overview of the questions that parents tend to ask about diet and nutrition, potential challenges, and how parents might perceive the potential need for online information. Three interviews were conducted (one face to face, two by telephone). We further conducted a focus group interview with health care nurses at their workplace, followed by an individual telephone interview to further elaborate on what health care nurses perceived as the most customary questions asked by parents regarding diet. One of the nurses worked in a disadvantaged community that included a large non-native population with low SES.

Our next step was to invite the parents of toddlers to a focus group interview to share and discuss the information that they were lacking and would find useful for improving the diet and food environment for their children. In total, five focus group interviews for parent groups were conducted, one at the university, one in a home setting, and three in settings where parents meet for other reasons (e.g., baby singing class). Two telephone interviews with mothers were conducted separately. Both parents attended the interviews conducted in the home. The remaining interviews were conducted among mothers only. Approximately 40% of focus group participants were non-native individuals. The most common questions and comments in interviews with users and health care nurses confirmed the main topics that were already planned for incorporation in the intervention. However, in line with the results of the interviews, the intervention was changed to include more focus than originally planned on spicy and exotic foods for the whole family, the right amount of different foods, self-eating skills, and family meal settings.

Based on a review of the literature, feedback from users, and discussions among the project group, the intervention was framed based upon three concepts: “the plate” (i.e., the food that is actually offered to the child), “the house” (referring to food that is available and accessible at home and parental feeding practices and food preparing skills), and “the grocery store” (parental awareness of the influence of environmental cues and how to make healthy choices).

Website development

A prototype website was developed, and pilot tested with 14 participants in February 2017. The content of Food4toddlers was further refined based on this pilot test, recommendations from health authorities, and updated research in the field.

The website was developed using NEO Learning Management System. Two Masters students in Multimedia and Educational Technology at the University of Agder created a technical layout of the website, and the project group produced the content. The information provided on the website all relates to creating healthy food and eating environments for toddlers.

The homepage of the website contains an informational video about the website and information on why small changes in diet during the early years of a child’s life may be important in the long term. This page also gives some practical information on how to navigate the website and how to use the same information on a smartphone app. There is no difference in usability between the website and the smartphone app.

The website comprises four main elements: modules covering an introduction and seven topics on promoting healthy food and eating environments for the child, recipes, a discussion forum, and general information about food and beverages (the “Good to know” section), as shown in Table 2. When participants first accessed the website, not all content of the modules was visible to them, only the first two chapters. During the intervention period, access was expanded regularly (20 times) to

Table 2 Content of the intervention

Title	Explanation	Concept development
Modules	Topics are divided into modules with two to four subheadings (chapters). One general information module is also available.	1) Introduction to the intervention website with information about recipes, how to install the website app, and descriptions of the study. 2) The importance of early eating habits and how to interpret food labeling. A special focus on accessibility, availability, and variety of healthy food and beverages. 3) How taste develops and the importance of repeated exposures, basic tastes, and spicy food. 4) Self-feeding skills and children's ability to self-regulate food intake. 5) Motivation to eat in a healthy way, being a good role model, and use of rewards. 6) Family meals: meal settings, preparing for meals, and meal composition. 7) Conscious and unconscious choices at home and in stores. 8) The benefits of children's participation in cooking and encouragement to try new family dishes.
Recipes	A total 31 recipes are presented, 10 of which include an instructional video[a]	Dinner (17 recipes/5 videos),[a] snacks (7/1), breads and cereals (5/3), and beverages (2/1).
Forum	The forum is divided into two sections: general questions and recipes.	Participants can ask questions and discuss relevant issues with each other. In the recipe forum, they can share recipes.
"Good to know"	Contains information about dietary issues relevant to the child's age	Salt, honey, cinnamon, nitrites, potatoes, foreign foods (sushi), additives, and cod liver oil.

[a]One of the recipes with video was retrieved with permission from godfisk.no

include new content on the website; at this time, all the participants in the same wave received an e-mail with a link to the newly available information.

Modules

The first module contains information about the website and the project. The other seven modules contain two to four chapters. For each chapter, general information and tips and strategies to promote healthy behaviors are provided. In addition, one or two recipes, usually thematically linked to the topic, are recommended. The chapters also contains a video about unconscious choices while shopping [51], a game, eight quizzes, six explanatory figures, and some links to recommended websites (e.g., http://www.matportalen.no).

Recipes

Out of a total of 31 recipes, 30 recipes were developed by three Masters students in Public Health at the University of Agder, in cooperation with the project group (Table 2). The focus for recipe development was to inspire the preparation of healthy meals for the whole family. The age span covered in the intervention is the period in which children should be able to eat the same foods as the rest of the family. The ingredients used should be available at a local supermarket. It was possible to print the recipes. For nine of the recipes, short instructional videos were developed to inspire parents to prepare the foods and to make the preparation process easier. The videos lasted from about 1 to 3 min and were produced by undergraduate students in Multimedia Technology and Design at the University of Agder.

Discussion forum on the website

It was possible for participants to post questions and share information (e.g., recipes) with each other on a discussion forum. A project worker answered questions, usually within 3 working days. Participants who joined the same group had access to the same forum.

"Good to know" information

In the interviews with health care nurses and end-users, some issues about special nutrients and dishes where discussed, including salt, nitrites, cinnamon, and foreign foods (such as sushi). We listed information about these issues together with information on honey, potatoes, food additives, and cod liver oil. The information given was based on National Health Authority recommendations.

Behavioral change methods

Several behavioral change methods where included on the website, to improve the child's diet through parental awareness of the child's food and eating environments [52]. One method was belief selection. The messages on the website were designed to strengthen positive beliefs, weaken negative ones, and introduce new beliefs (i.e. reinforce the importance of family meals and highlight the importance of repetition of new foods) that are in line with the theory of planned behavior [53]. The active learning method included in this intervention are activity-based experiences; i.e. use of videos as a way to enhance cooking skills, as well as different quizzes [49]. Persuasive communication can include messages created in such a way as to be familiar and not too discrepant for participants [54]. The importance of small changes

was highlighted on the website, and familiar settings were discussed (e.g., sitting as a family at the dining table). As mentioned, not all of the information on the website was immediately available to participants in the intervention group from the beginning. Revealing information gradually on the website over a span of time can enhance retention through repetition as well as the level of interest in and persuasiveness of the information [54]. Modeling is a method that can reinforce the desired action [49]. The website features videos with actors, who are in the same age group as participants, modeling desired behaviors. Our aim was to highlight barriers and facilitators and empower parents to make changes in their environment. The outcome might be that the environment for the child is created in a way that makes it easier to take action or reduces barriers to action [49].

Measures and instruments

The primary outcome of this trial is the child's overall diet and food variety (Table 3). Parents reported frequencies of intake of a variety of food normally eaten in Norway. Categorical scales ranging from 1) "never/less than every week" to 8) "five times a day" were used for food items from a national Food frequency questionnair (FFQ) [12] and 1) "never" to 6) "three times a day" for items from the MoBa study [55]. The secondary outcomes include parental feeding practices, family meal setting, food choice, awareness of the food environment, availability and accessibility of food in the home, food preparation and planning, and child weight and length. See Table 3 for specification about continuous and categorical variables. Most of the instruments used have previously been used in Norway or other countries and have been validated and in addition, some new questions were added. The new items about meal distraction are categorical variables with response alternatives from "disagree" to "agree" on a five-point scale: i.e. "I often look at the mobile phone during meals". To measure the food environment three different categories of questions were used. The first type of questions relates to how available different foods are in the nearby shop and at home (i.e. fruit or whole grain biscuits) with response alternatives on a four-point scale from "not available" to "very available". The second type of questions are statements on why they chose the way they do. The parents should respond on a 5 point-scale of "disagree" to "agree" on statements like: "I buy more if the shop is tidy and neatly organized". The third category of questions include where in the house food is stored ("very accessible i.e. on the shelf", "accessible i.e. in a cupboard/freezer/fridge", "not accessible i.e. stored away in the basement/freezer/cupboard"). A test-retest was conducted in 2018 among 30 parents in kindergarten responding to these new questions twice with 2–3 weeks apart to test the reliability. The results showed a mean correlation of r = 0,551.

Other variables

The website contains information about which modules participants have used, how many times they have entered the modules, and the date and duration of each session. This information will form a part of the descriptive measurements in the study.

Statistical analysis plan

For this protocol paper we present descriptive statistics of sample characteristics. All analyses were performed by using IBM SPSS Statistics 25.0.

Intervention effects on child diet, will be examined by use of mixed models (Linear Mixed Models and Generalized linear mixed models) with time as within factor (differences between baseline and post-test, follow-up 1, 2 and 3, respectively) and condition (intervention group, control group) as between-group factor. All models of pre-post outcomes will be adjusted for baseline values to account for regression to the mean effects. Using mixed models allows for use of incomplete data at the different follow-ups and thereby increase statistical power. We will present both crude and adjusted results. Intervention effects on both primary and secondary outcomes will be adjusted for the following variables: parental SES, BMI and age, and child gender and age (variables known from previous research to potentially confound such associations). To examine potential moderating effects such as parental SES (lower versus higher education level), a three-way interaction effect (time*condition*moderator) will be investigated for each outcome. As loss to follow up is expected, loss to follow-up-analyses will be performed, analyzing those lost to follow up compared to those remaining in the study. This will be done to identify if there are characteristics specific of those lost to follow up important to interpret the results.

The data will be stored securely on a password-protected computer with no connection between the data and personally identifiable information. The data will be available after project completion.

Discussion

With increasing interest in and use of eHealth programs in health promotion, it is a high public health priority to determine what works best and in what context. For health promotion programs to be successful, it is suggested that interventions should be based on theory, include end-users and stakeholders, and have a randomized controlled design to establish effect.

This study protocol of the Food4toddlers intervention describes a randomized controlled trial targeting an important time span when the child's preferences for food and eating habits are being established. Our project is in line with The Global Action Plan for the Prevention and Control of NCDs, focusing on early childhood

Table 3 Description of variables, measures, and instruments

Variable	Purpose of measure	Variable (Categorical/continuous)	Measure	Instrument	When to collect
PRIMARY OUTCOME					
Child's diet	PSO, IC	Overall diet Food Variety (Continuous)	Food intake (core-and non-core foods) Healthy eating index	FFQ based on nationwide Norwegian diet survey among 12-month-old children [12] and the MoBa-study [55]	At baseline, 18, 24, and 48 months
SECONDARY OUTCOME Eating environment					
Child level: food preferences	SSO, IC	Food neophobia (Continuous)	Rating the child's willingness to try new foods	The food neophobia scale [61]	At baseline, 18, 24, and 48 months
Parental level: feeding practices	SSO, IC	Feeding style and feeding practices (Categorical)	Under–/over-eating, hunger, infant cues. Feeding attitudes, practices, perceptions or concerns about weight	Comprehensive feeding practices [62, 63]	
	SSO, IC	Food neophobia (Continuous)	Rating the parent's willingness to try new foods	The food neophobia scale [61]	
	SSO, IC	Self-efficacy (Categorical)	Parental self-efficacy in eating situations	Feeding self-efficacy [64]	
Family level: meal setting	SSO, IC	Frequency of shared meals (Categorical)	Frequency of meals and meal distractions	Questionnaires from the nationwide Norwegian diet survey among 12-month-old children [12] and items developed for this study	
Food environment					
Macro-level: grocery shopping	SSO, IC	Food choice and awareness of food environment (Categorical)	Planning, grocery shopping, what influences food choice	FCQ [65] SCQ: some elements made for this study, are based on theory of Wansink [51], and additional items developed for this study	At baseline, 18, 24, and 48 months
Micro-level: Home	SSO, IC	Availability and accessibility of food (Categorical)	Availability and accessibility of non-core and core foods Food preparation and planning	Questions developed for this study and items from Helland and colleagues [66]	
	SSO, IC	Meal management and food coping strategies (Categorical)	Self-efficacy related to meal management and food coping strategies	Meal management and food coping strategies questionnaire [67]	
OTHER					
Child anthropometrics	SSO	Anthropometric outcome (Continuous)	Height and weight	Self-reported, but measured at scheduled health center visits	At baseline, 18, 24, and 48 months
Parental characteristics	SC	Height and weight Demographics Socioeconomic status Food behaviors	Height and weight Education, occupation and food intake	Self-reported on questionnaire and simple FFQ [12]	
Website use	IC	Use of website by the intervention group	Usefulness and usability	Questions developed for this study, but include elements from Helle and colleagues [58]	At 18 months (intervention group)

Abbreviations: PSO primary study outcome, *SSO* secondary study outcome, *IC* intervention component, *SC* study covariate, *FFQ* food frequency questionnaire, *FCQ* food choice questionnaire, *SCQ* shopping choice questionnaire

intervention, and alerting and empowering parents in their role as gatekeepers of their child's diet [56]. We expect that the intervention will provide parents with practical tools and make them more conscious of their child's food and eating environments.

Laws and colleagues [57] compared three recruitment strategies in recruiting pregnant women or mothers with infants for an mHealth intervention; they found Facebook to be the best strategy. This is in line with the findings of a Norwegian eHealth study recruiting parents with children aged 3–5 months [58]. Facebook was the only recruitment tool used in Food4toddlers which might have a potential to recruit more low SES parents than other recruitment ways [57]. It was not very easy to recruit for this study as evidenced by a lower number of participants than initially aimed for. Because most parents with toddlers in Norway have already returned to work after having completed their maternity (or paternity) leave, we assumed that it would be more difficult to recruit for this study than for studies of younger aged

children [58]. The time period from the participants signed up for recruitment (child age 7–12 months) until the baseline questionnaire was sent out, was up to five months, since the age of the child had to be 12 months at baseline. This might be one reason why there was a loss of participants from recruitment to baseline assessment.

Even though both fathers and mothers were invited to participate, only four fathers completed the baseline questionnaire. This is in line with respondents in other family-based interventions [59, 60]. The mother remains the main influence on the child's diet [10] and can more easily engage in traditional non-technological interventions. Nevertheless, we had hoped that fathers would be engaged in this project as it uses an eHealth approach. The anthropometry measures were self-reported in this study. Measures by i.e. research staff would have increased validity of these data, but that was not possible in this study due to participants in all counties of Norway.

The findings of this study will enhance the understanding of how parents of toddlers access, use, collaborate with others, and engage in an eHealth intervention.

The benefits of participating in the intervention group include being updated on current information regarding healthy food and eating environments, and the possibility of improving their child's diet quality and subsequent health. There are no foreseen risks related to participation in this study.

Abbreviations

app: Mobile application; NCDs: Noncommunicable diseases; SES: Socioeconomic status

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Availability of data and materials

When results will be published from this trial, dataset supporting the conclusions will be available in the UiA Open Research repository (https://dataverse.no/dataverse/uia).

Authors' contributions

NCØ, FNV, and ERH conceived the study. MR, ERH, FNV, and NCØ developed the intervention and questionnaires. MR conducted the data collection. MR drafted the manuscript, guided by ERH, FNV, WVL, and NCØ. All authors have read and approved the final manuscript.

Ethics approval and consent to participate

This trial was approved by the Norwegian Centre for Research Data, 29/06/2017, ref.: 48643. Written consent was obtained from all parents when they chose to sign up for participation.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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Paper 2

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ORIGINAL ARTICLE

Associations between parental food choice motives, health-promoting feeding practices, and infants' fruit and vegetable intakes: the Food4toddlers study

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Popular scientific summary

- The parental food choice motive of health is associated with higher infant vegetable intake.
- Health-promoting feeding practices mediate the relationships between the parental food choice motives of health and sensory appeal and their infants' fruit and vegetable intakes, and the feeding practices of shaping the environment and encouraging balance and variety are the strongest mediators on these associations.
- The findings contribute to the understanding of parental feeding behaviors.

Abstract

***Background*:** Parents influence their infants' diets and are the providers of healthy foods such as fruit and vegetables. Parental motives can influence infant's diets directly or through parental feeding practices.
***Objective*:** This study aimed to assess the associations between parental food choice motives and infants' fruit and vegetable intakes and to examine whether parental feeding practices mediated these associations.
***Design*:** A total of 298 parents participated in the Norwegian Food4toddlers study. Before the child's first birthday (mean age = 10.9 months), the parents completed an online baseline questionnaire. Five parental food choice motives were assessed: health, convenience, sensory appeal, price, and familiarity. Infants' fruit and vegetable intakes and three health-promoting feeding practices were also assessed. For each food choice motive and its relation to fruit or vegetable intake, three single mediation models were conducted. Mediation effects were examined using MacKinnon's product of coefficients procedure, and bootstrap confidence intervals (CIs) were used for inferential testing.
***Results*:** Higher scores on the motive of health were positively associated with infants' vegetable intake ($\tau = 0.394$, $P < 0.001$). No other significant associations were found between food choice motives and fruit or vegetable intake. The feeding practice of shaping a healthy environment mediated the relationships between health motive and both fruit ($\alpha\beta = 0.067$, CI: 0.001–0.146) and vegetable ($\alpha\beta = 0.105$, CI: 0.042–0.186) intakes. The feeding practice of encouraging balance and variety mediated the relationships between health motive and vegetable ($\alpha\beta = 0.085$, CI: 0.030–0.150) intake and between sensory appeal motive and vegetable intake ($\alpha\beta = 0.047$, CI: 0.005–0.103).
***Conclusion*:** High levels of parental health motive are associated with higher infant vegetable intake. Our study contributes to understand the structure of parental feeding behaviors that may have implication for nutrition interventions targeting parents.

Keywords: *infant*; *healthy food intake*; *mediation*; *diet*

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Food is fundamental for health, growth, and development and also plays a central part in the increasing childhood obesity rates (1). Eating behaviors early in life track into later childhood and adult life (2–5). Efforts to establish a healthy diet should therefore start early (5, 6).

Importance of fruit and vegetables

Fruit and vegetables are valuable sources for a wide range of micronutrients, fiber, and antioxidants and important for growth and development (7, 8). Further, a healthy diet rich in fruits and vegetables is known to prevent certain cancers and to reduce the risk of cardiovascular diseases, diabetes, and mortality (9, 10), and is considered as an important part of infants' healthy dietary patterns and diet quality (11, 12). The infant period between 6 and 12 months, when solid food is recommended to introduce, is important for the development of the child's food and eating behavior. Offering a variety of fruit and vegetables in this period may be especially important for a higher consumption in childhood (2, 13). Still, the fruit and vegetable intakes among infants in Norway reported in national surveys are suboptimal (5, 14).

Parental feeding practices

Parents of infants play a key role in what their children eat. They provide food and shape the food and eating environment for their children (15–17). The infants are totally dependent on the adult according to how nutritious food they are provided. Parental feeding practices have been shown to be central in the development of obesogenic eating behaviors and excessive weight gain in young children (18). Relevant parenting practices include both intentional and unintentional behaviors and actions parents perform that influence their children's attitudes, behaviors, or beliefs (19).

Several studies have focused on *coercive control practices* (also called negative feeding practices) and how they affect children (20, 21). Other dimensions, *structure* and *autonomy support and promotion*, entail practices that are positive and promote healthy eating among children, such as providing a healthy food and eating environment, encouraging balance and variety, and healthy modeling (19). These positive practices are of interest in this article.

Vaughn et al. (19) place food parenting practices in a large conceptual model, including how parents' motives influence their food parenting practices and their children's dietary intakes. Parental motives can influence a child's dietary intake directly or indirectly through food parenting practices (19). When it comes to what kind of foods parents buy and serve their children, parents may be driven by different motives (e.g. purchasing inexpensive foods or pleasure). Most parents have a strong intention to both promote healthy eating and create a healthy food environment for their children, but there is a tendency for these good intentions to not necessarily translate into actual behavior (22, 23).

To our knowledge, few studies have explored how food choice motives act as precursors for parental feeding practices. Two studies conducted by Kiefner-Burmeister et al. (21) and Hoffmann et al. (24) investigated the effect of negative feeding practices on the association between maternal feeding motives and children's diets, but health-promoting feeding practices have not yet been examined in relation to this association.

The aim of the present study was to examine the potential associations between parental food choice motives (health, convenience, sensory appeal, price, and familiarity) and infants' fruit and vegetable intakes. Further, we aimed to examine the potential mediating effects of three health-promoting feeding practices (encouraging balance and variety, shaping a healthy environment, and healthy modeling) on these associations.

Methods

Procedure and participants

This study used baseline data from the Food4toddlers randomized controlled intervention study. Food4toddlers is a digital intervention aiming to promote healthy dietary habits among toddlers (12–18 months) (25). The recruitment period for this study was from August 2017 to January 2018, and our aim was to recruit 474 parent/infant dyads (25).

Parents of infants in Norway were recruited through tailored advertisement (i.e. targeting potential parental age and interest groups) on social media (Facebook). In Norway, 67% of the population uses Facebook daily (26). The Facebook advertisement included a relevant video or a picture and a link to the project website, where the parents received extended information about the intervention and had the opportunity to sign up. Consent for participation was obtained as part of the sign-up process. Participants had to be literate in Norwegian and have a child who was born from June 2016 to May 2017.

Approximately 1–2 months before the infant's first birthday, those who signed up for the study received an email with a link to the baseline questionnaire. Data were collected using SurveyXact, an online survey software tool. The protocol for the present study was approved by the Norwegian Centre for Research Data (08/06/2016, reference 48,643) and is in accordance with the Helsinki Declaration of 1975, as revised in 2008.

We recruited 404 parents of infants through Facebook. One to two months before each infant turned 1 year old, a baseline questionnaire was sent to the parents. A total of 298 (response rate 73.8%) parents who originally signed up for the study answered more than half of the questions in the baseline questionnaire and were included in the present analyses.

Most participants were mothers (98.0%), and the mean age was 31.7 years (standard deviation [SD] = 4.2). Most parents lived in two-adult households (99.0%), 86.7% of the parents were born in Norway and the majority of

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participants were from Eastern Norway (43.3%), which has the densest population. See Table 1 for more details.

Measures

Each participant reported their age, the age of the child, the number of persons in the household, the county of residence, and their own level of education. These items have previously been used and tested in Norway (14). The participants also reported whether Norway was the country of birth and their own body mass index (BMI) (self-reported).

Independent variables: food choice motives

The Food Choice Questionnaire (FCQ) was used to assess parents' motives underlying their selection of food. Developed by Steptoe et al. (27), the FCQ is widely used and has been tested in other context at country and cross-national levels (28, 29). For the present study, the questions were translated into Norwegian, back-translated into English, and adjusted as needed.

The FCQ comprises 36 items grouped into nine factors (health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concerns), and responses to the original FCQ were on a four-point scale (27). Fotopoulos et al. (29) suggested using a seven-point scale to elicit a wider range of answers; this approach was used in the present study.

Table 1. Characteristics of participating parents and infants at baseline

Characteristics	Total
Parents (*N* = 298)	
Parent filling out the form: mother (%)	98.0
Age in years, mean (standard deviation [SD])[a]	31.7 (4.2)
Body mass index (BMI), mean (SD)[b]	25.0 (4.7)
Two-adult household (%)	99.0
Total number of household members, mean (SD)	3.6 (0.92)
Born in Norway (%)	86.7
Education (%)[b]	
Upper-level secondary school or less	11.7
College/university (≤4 years)	33.9
College/university (>4 years)	53.7
Other	0.7
Geographic residence (%)	
Northern Norway	6.0
Central Norway	10.7
Western Norway	21.8
Southern Norway	18.1
Eastern Norway (including Oslo)	43.3
Children	
Age in months, mean (SD)	10.9 (1.25)
Child's sex: male (%)	55

[a]There was one missing case on this variable.
[b]There were two missing cases on this variable.

In the questionnaire, participants were asked to rate their level of endorsement of statements such as 'It's important to me that the food I eat on a typical day […]', rating each statement from 1 (extremely unimportant) to 7 (extremely important) (29). The reliability of the factors used was tested using Cronbach's alpha (α).

Five factors were used in this present study (Cronbach's α values presented are for our sample): *health* (e.g. 'It's important to me that the food I eat on a typical day is high in protein', six items, $\alpha = 0.81$), *convenience* (e.g. 'It's important to me that the food I eat on a typical day is easy to prepare', five items, $\alpha = 0.79$), *sensory appeal* (e.g. 'It's important to me that the food I eat on a typical day looks nice', four items, $\alpha = 0.64$), *price* (e.g. 'It's important to me that the food I eat on a typical day is cheap', three items, $\alpha = 0.73$), and *familiarity* (e.g. 'It's important to me that the food I eat on a typical day is familiar', three items, $\alpha = 0.73$). These five factors were included in the baseline questionnaire for the Food4toddlers intervention because they were regarded as important precursors for the development of a healthy food and eating environment for toddlers. The Cronbach's α values for this study were slightly lower than those reported by Pollard et al. (30) (except for *familiarity*) and higher for three out of five items (all items except *sensory appeal* and *price*) compared with the study of Fotopoulos et al. (29).

We did not perform a full-scale reproducibility study; however, in October 2018, the items were tested for reproducibility through a test–retest study at two time points (2 weeks apart) with 29 participating parents who did not participate in the intervention recruited from several local kindergartens. The standardized measure, Pearson's correlation coefficient (r), showed acceptable-to-excellent correlations for the factors used (health: $r = 0.910$; convenience: $r = 0.933$; sensory appeal: $r = 0.777$; price: $r = 0.846$; familiarity: $r = 0.726$).

Outcome variables: infants' fruit and vegetable intakes

Infants' fruit and vegetable intakes were assessed using the Food Frequency Questionnaire, which was previously used in a nationwide Norwegian diet survey among 12-month-old children (14). A validation study of the Food Frequency Questionnaire has been conducted for 1-year-old Norwegian children (31). In the questionnaire, parents report their infant's frequency of consumption of fruits and vegetables. The questionnaire items include fresh, cooked, or squeezed fruits and vegetables, as well as both homemade and commercially produced variants.

These items are answered on a six-point scale ranging from *never* to *several times a day*. In the present study, the response options were recoded to reflect times per week:

never or *less than once a week* = 0, *one to three times a week* = 2, *four to six times a week* = 5, *once a day* = 7, *twice a day* = 14, and *three times or more per day* = 24.5 (3.5 times/day was used in the calculation of this value). Similar recoding has previously been used by others (21, 32–34).

The items included fruits and vegetables normally consumed in Norway (e.g. apples, melons, carrots, and tomatoes), and there was also the additional item of 'other fruits/vegetables'. The reported weekly consumption scores for these items were aggregated into sum scores and divided by seven. Results for fruits (11 items) and vegetables (13 items) showed the daily frequency of fruit and vegetable intakes.

Potential mediating factors: parental health-promoting feeding practices

Parental feeding practices were assessed using the Comprehensive Feeding Practices Questionnaire (CFPQ) (35). The CFPQ has 49 items on 12 subscales. All items are statements or questions measured on a five-point Likert-type scale ranging from *disagree* to *agree* or from *never* to *often*. The CFPQ has been validated and tested for reliability for parents of children in different age groups (35–38), including in the Norwegian context (39).

Of the 12 subscales, five can be considered health-promoting feeding practices. We investigated three of these (Cronbach's α values presented are for our sample): *encouraging balance and variety* (e.g. 'I encourage my child to try new foods', four items, $\alpha = 0.47$), *shaping a healthy environment* (e.g. 'Most of the food I keep in the house is healthy', four items, $\alpha = 0.68$), and *healthy modeling* (e.g. 'I try to show enthusiasm about eating healthy foods', four items, $\alpha = 0.67$).

The Cronbach's α values for these subscales were similar to those reported in another study using the same measurements among parents of 1 year olds (36). As Russell et al. did in an Australian study (36), the subscales of two health-promoting feedings practices, *teaching nutrition* and *involvement*, were excluded because of the children's young age.

Statistics

In the preliminary analysis, we examined the potential associations between the demographic variables (parental BMI, age, and educational level) and the exposure variables of interest (food choice motives and feeding practices) to assess the need to control for demographic variables in later analyses. No significant associations were found, so no covariates were included.

In the main analysis, we applied the product of coefficients method (40) and tested whether parental food choice motives predicted child's fruit and vegetable intakes, as well as whether potential associations were mediated by feeding practices. Bootstrapping was performed to estimate the 95% confidence intervals (CI) of the coefficients ($n = 5{,}000$) (40–42).

Figure 1 shows the investigated associations among food choice motives, infants' fruit and vegetable intakes, and potential mediation factors.

The overall associations (path τ) between food choice motives (predictor variables) and fruit and vegetable intakes (outcome variables) were calculated by regressing the outcome variables on each food choice motive (health, convenience, sensory appeal, price, and familiarity).

The first test in the product of coefficients method is the action theory test, which involves estimating the association between each predictor and the potential mediators (path α). Second, the conceptual theory test estimates the association between each potential mediator (health-promoting feeding practices) and the outcome variables, adjusted for the predictor variables (path β). The indirect effect was calculated by multiplying the α-coefficient by the β-coefficient. Bootstrap CIs ($n = 5{,}000$) were used instead of the SOBEL test (which tests the significance of

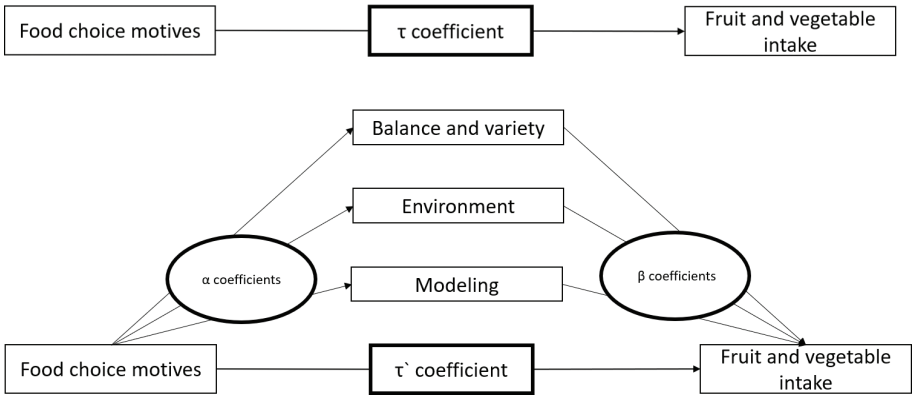

Fig. 1. Mediation model of the relations between food choice motives and fruit and vegetable intakes, with three feeding practices as potential mediation factors. Only single mediations were conducted.

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a mediation effect) to conduct the inferential tests of the indirect effects, as recommended by Hayes (42). To estimate the size of the indirect effect (mediated effect), the ratio of the indirect effect to the total effect was computed by dividing the product of coefficient ($\alpha\beta$) by the overall association (τ-coefficient) (43). A sample size of 500 is recommended for this estimate, but a smaller sample size is adequate if all estimates are statistically significant (40). In addition, $\alpha\beta$ and τ' should have the same sign (43). A significant total effect (path τ) is not a necessary condition for mediation (42, 44).

All analyses were conducted using IBM SPSS Statistics (Armonk, NY: IBM Corp.), Version 25. Hayes' Process 3.1 for SPSS (42) was used to perform the single mediation analyses. Data for one person were missing on the FCQ items. The analyses that included the FCQ therefore included data on 297 participants.

Results

Mean daily servings of fruits and vegetables consumed by the infants were quite high at 2.85 (SD = 1.60) and 3.15 (SD = 1.59), respectively (see Table 2). Food choice motives and feeding practices are also presented in Table 2.

There were high scores on all measured motives except familiarity. In terms of the examined feeding practices, balance and variety (3.57, SD = 0.46) had the highest score.

Main association between food choice motives and fruit and vegetable intakes (path τ)

In our exploration of the relationship between food choice motives and fruit and vegetable intakes, only the motive of health was significantly associated with vegetable intake (τ = 0.394, P < 0.001) (see Table 3). The effect size was moderate. No other food choice motives were significantly associated with either infants' fruit or vegetable intakes.

Table 2. Mean and standard deviation (SD) for food choice motives (FCQ[a]), health-promoting feeding practices (CFPQ[b]), and infants' fruit and vegetable intakes

Variables	Mean	SD
FCQ: health	5.15	0.92
FCQ: convenience	5.09	1.08
FCQ: sensory appeal	5.35	0.96
FCQ: price	4.26	1.39
FCQ: familiarity	2.71	1.21
CFPQ: balance and variety	3.57	0.46
CFPQ: environment	3.08	0.78
CFPQ: modeling	3.29	0.69
Fruit intake[c]	2.85	1.60
Vegetable intake[c]	3.15	1.59

[a]FCQ: Food Choice Questionnaire (measured on a seven-point scale (1–7), ranging from *extremely unimportant* to *extremely important*).
[b]CFPQ: Comprehensive Feeding Practices Questionnaire (measured on a five-point scale (0–4), ranging from *disagree* to *agree* or from *never* to *often*).
[c]Daily servings (times/day).

Association between food choice motives and potential mediators (path α, action theory)

The results from the single mediation analysis are shown in Table 3. The food choice motive of health was significantly associated with all three feeding practices: balance and variety (α = 0.136, P < 0.001), environment (α = 0.268, P < 0.001), and modeling (α = 0.265, P < 0.001). All relationships were in the expected positive direction, with greater values for health food choice motive associated with higher scores on these feeding practices. The food choice motive of sensory appeal was also positively associated with balance and variety (α = 0.063, P = 0.023) and modeling (α = 0.126, P = 0.002). The food choice motives of convenience, price, and familiarity were not significantly associated with any of the feeding practices.

Associations between potential mediators and fruit and vegetable intakes (path β, conceptual theory)

As Table 3 reflects, in this single mediation model, path β shows the associations between health-promoting feeding practices and fruit and vegetable intakes, adjusted for the food choice motives. When adjusted for the motive of health, the conceptual theory tests revealed that the feeding practice of environment was associated with fruit intake (β = 0.248, P = 0.001), whereas both environment (β = 0.391, P = 0.001) and balance and variety (β = 0.620, P = 0.002) were related to infants' intake of vegetables.

When adjusted for the other food choice motives (convenience, sensory appeal, price, and familiarity), the tests revealed that environment was associated with fruit intake, whereas all three practices were associated with vegetable intake. All statistically significant relations were positive, such that greater scores on these feeding practices were associated with a higher intake of fruits or vegetables among the infants.

Mediation effect (path αβ)

The feeding practices of balance and variety ($\alpha\beta$ = 0.085, CI: 0.030–0.150) and environment ($\alpha\beta$ = 0.105, CI: 0.042–0.186) mediated the relationship between health motive and vegetable intake (Table 3), with a small effect size. This means that the association between health motive and infant's higher consumption of vegetables was partly explained by the encouragement of balance and variety and by the creation of a healthier food environment. The percentage of the effect mediated was 21.4% for balance and variety and 26.6% for environment.

Table 3. Associations (τ and τ') between food choice motives[a] (independent variables) and fruit or vegetable intakes (dependent variables) and action (α) and conceptual (β) theory tests and indirect effects ($\alpha\beta$) of health-promoting feeding practices[b] on the associations between independent and dependent variables

Variables	τ (standard error [SE])	τ' (SE)	α (SE)	β (SE)	$\alpha\beta$ (SE)	95% confidence interval (CI) for $\alpha\beta$[c]	Mediated effect[d] (%)
Health[a]							
Outcome: fruit intake	0.073 (0.101)						
Balance and variety		0.027 (0.105)	**0.136 (0.028)*** **	0.334 (0.209)	0.046 (0.028)	−0.007, 0.067	
Environment		0.006 (0.106)	**0.268 (0.047)*** **	**0.248 (0.125)***	**0.067 (0.037)**	**0.001, 0.146**	
Modeling		0.072 (0.108)	**0.265 (0.041)*** **	0.004 (0.145)	0.001 (0.037)	−0.073, 0.074	
Outcome: vegetable intake	**0.394 (0.098)*** **						
Balance and variety		**0.309 (0.100)** **	**0.136 (0.028)*** **	**0.620 (0.200)** **	**0.085 (0.031)**	**0.030, 0.150**	**21.4**
Environment		**0.289 (0.102)** **	**0.268 (0.047)*** **	**0.391 (0.120)** **	**0.105 (0.037)**	**0.042, 0.186**	**26.6**
Modeling		**0.329 (0.104)** **	**0.265 (0.041)*** **	0.243 (0.140)	0.064 (0.038)	−0.006, 0.143	
Convenience[a]							
Outcome: fruit intake	−0.110 (0.086)						
Balance and variety		−0.105 (0.086)	−0.013 (0.025)	0.341 (0.201)	−0.005 (0.011)	−0.029, 0.018	
Environment		−0.095 (0.086)	−0.063 (0.042)	**0.239 (0.119)***	−0.015 (0.014)	−0.048, 0.007	
Modeling		−0.111 (0.086)	0.030 (0.037)	0.046 (0.135)	0.001 (0.008)	−0.015, 0.018	
Outcome: vegetable intake	−0.005 (0.086)						
Balance and variety		0.006 (0.084)	−0.013 (0.025)	**0.788 (0.196)*** **	−0.010 (0.021)	−0.053, 0.031	
Environment		−0.027 (0.084)	−0.063 (0.042)	**0.502 (0.116)*** **	−0.032 (0.023)	−0.082, 0.010	
Modeling		−0.017 (0.085)	0.030 (0.037)	**0.400 (0.133)** **	0.012 (0.011)	−0.022, 0.049	
Sensory appeal[a]							
Outcome: fruit intake	0.025 (0.097)						
Balance and variety		0.003 (0.098)	**0.063 (0.028)***	0.348 (0.203)	0.022 (0.017)	−0.005, 0.062	
Environment		0.030 (0.097)	−0.017 (0.047)	**0.251 (0.119)***	−0.004 (0.013)	−0.035, 0.021	
Modeling		0.021 (0.099)	**0.126 (0.041)** **	0.032 (0.138)	0.004 (0.020)	−0.035, 0.045	
Outcome: vegetable intake	0.121 (0.097)						
Balance and variety		0.072 (0.095)	**0.063 (0.028)***	**0.768 (0.197)*** **	**0.047 (0.025)**	**0.005, 0.103**	
Environment		0.129 (0.094)	−0.017 (0.047)	**0.502 (0.115)*** **	−0.009 (0.015)	−0.061, 0.038	
Modeling		0.072 (0.097)	**0.126 (0.041)** **	**0.381 (0.135)** **	**0.030 (0.015)**	**0.006, 0.063**	
Price[a]							
Outcome: fruit intake	−0.088 (0.067)						
Balance and variety		−0.088 (0.067)	0.000 (0.019)	0.349 (0.201)	0.000 (0.008)	−0.017, 0.018	
Environment		−0.082 (0.067)	−0.024 (0.033)	**0.244 (0.119)***	−0.006 (0.010)	−0.028, 0.011	
Modeling		−0.089 (0.067)	0.034 (0.029)	0.050 (0.135)	0.002 (0.007)	−0.011, 0.018	
Outcome: vegetable intake	0.076 (0.067)						
Balance and variety		0.076 (0.065)	0.000 (0.019)	**0.787 (0.195)*** **	0.000 (0.017)	−0.036, 0.033	
Environment		0.088 (0.065)	−0.024 (0.033)	**0.502 (0.115)*** **	−0.012 (0.017)	−0.047, 0.021	
Modeling		0.062 (0.066)	0.034 (0.029)	**0.390 (0.133)** **	0.013 (0.013)	−0.009, 0.042	

Table 3. (Continued)

Variables	τ (standard error [SE])	τ' (SE)	α (SE)	β (SE)	$\alpha\beta$ (SE)	95% confidence interval (CI) for $\alpha\beta$[c]	Mediated effect[d] (%)
Familiarity[a]							
Outcome: fruit intake	0.016 (0.077)						
Balance and variety		0.029 (0.077)	−0.035 (0.022)	0.335 (0.202)	−0.012 (0.012)	−0.040, 0.005	
Environment		0.034 (0.077)	−0.070 (0.038)	**0.256 (0.119)***	−0.018 (0.014)	−0.052, 0.003	
Modeling		0.018 (0.078)	−0.035 (0.033)	0.040 (0.136)	−0.001 (0.008)	−0.020, 0.011	
Outcome: vegetable intake	0.080 (0.179)						
Balance and variety		0.109 (0.075)	−0.035 (0.022)	**0.813 (0.196)*****	−0.028 (0.013)	−0.073, 0.007	
Environment		0.116 (0.075)	−0.070 (0.038)	**0.518 (0.116)*****	−0.036 (0.020)	−0.078, 0.001	
Modeling		0.095 (0.076)	−0.035 (0.033)	**0.409 (0.133)****	−0.014 (0.015)	−0.030, 0.011	

*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.
[a]Five food choice motive factors (health, convenience, sensory appeal, price, and familiarity) were measured using the Food Choice Questionnaire.
[b]Three scales of parental practices (encouraging *balance and variety*, shaping a healthy food *environment*, and healthy *modeling*) were measured using the Comprehensive Feeding Practices Questionnaire.
[c]Bootstrap confidence interval for the indirect effect.
[d]Estimate of the size of the indirect effect. The ratio of the indirect effect ($\alpha\beta$) to the total effect (τ): $\alpha\beta/\tau$.
τ-Coefficient: estimate of the association between food choice motives and toddler's fruit or vegetable intakes; τ'-coefficient: estimate of the association between food choice motives and toddler's fruit or vegetable intakes, adjusted for health-promoting feeding practices (mediators); α-coefficient: estimate of the association between food choice motives and health-promoting feeding practices (mediators); β-coefficient: estimate of the association between health-promoting feeding practices (mediators) and toddlers' fruit or vegetable intakes, adjusted for food choice motives; $\alpha\beta$: product of coefficient estimate, indirect effect.

Despite the lack of a direct significant association between health motive and fruit intake (see Table 3), the feeding practice of environment ($\alpha\beta$ = 0.067, CI: 0.001–0.146) emerged as a mediator in this relationship. However, the effect size was small.

No significant association was observed between sensory appeal motive and vegetable intake, but balance and variety ($\alpha\beta$ = 0.047, CI: 0.005–0.103) and modeling ($\alpha\beta$ = 0.030, CI: 0.006–0.063) mediated this relationship. The effect sizes were again small.

Discussion

The aim of this study was to examine the associations between parents' food choice motives and infants' fruit and vegetable intakes, as well as the mediating effects of parents' health-promoting feeding practices on these associations. Health was the only motive that was directly associated with a higher infant vegetable intake. No motives were associated with fruit intake. The feeding practice of encouraging balance and variety mediated the association between health motive and vegetable intake and the association between sensory appeal motive and vegetable intake. The associations between health motive and both fruit and vegetable intakes were mediated by the feeding practice of shaping the environment. Modeling was the only mediator of the association between sensory appeal motive and vegetable intake.

Food choice motives and fruit and vegetable intakes

The importance of health as a food choice motive for older children has been assessed in other studies, for example, two studies of preteens in Nordic countries (45, 46), which have shown a pattern similar to that found in the present study.

Studies conducted in the United States have reported an association between the motive of health and fruit and vegetable intakes among preschoolers (21) and among 7- to 11-year-old children (24). In the US context, an association between the motive of natural content and fruit and vegetable intakes has also been reported among preschoolers (21). One study also assessed convenience as a motive, finding a negative association of this motive with both fruit and vegetable intakes (24). Roos et al. (46) assessed whether food choice motives predicted a higher intake of 'nutrient-dense food' (fruits, vegetables, berries, and rye bread) among 10- to 12-year-old Finnish children. They reported that parental motives of health and nutrient content and sensory appeal were positively associated with healthy food intake, and that the motive of convenience was negatively associated with nutrient-dense food intake.

An Australian study targeting parents of 2- to 5-year-old children reported a tendency for the motive of health and nutrition to be associated with children's fruit and vegetable

liking (22). The parents in the same study rated health and nutrition factors as the most important motive when choosing food for their children. Nevertheless, the children's own food preferences and requests influenced the children's food decisions to a larger degree than did the parents' health motive. The present research was the first study to assess these relationships in infants, and our results are in line with the existing literature on the importance of the health motive.

Food choice motives and parental feeding practices

In terms of the direct association between the parental food choice motives and feeding practices, parents with higher scores on the motive of health in the present study also had higher levels of all assessed health-promoting feeding practices, indicating the importance of this motive. It is not surprising that parents with an interest in health would use health-promoting feeding practices, but previous work has shown that healthy motives do not always translate into beneficial actions such as shaping a healthy food and eating environment for children (23). It has been recommended that parents serve as positive role models by creating a supportive home environment through increasing their encouragement of healthy eating, making fruits and vegetables more available, and incorporating rules to govern eating behavior (47, 48). According to Pollard et al. (30), sensory appeal (e.g. taste, texture, smell, and appearance) can influence which foods a person chooses to buy and consume. In the Food4toddlers study, a high parental score on sensory appeal motive was not associated with a higher fruit or vegetable intake, but it was associated with two of the three health-promoting feeding practices: healthy modeling and encouraging balance and variety.

The mediating effect of health-promoting feeding practices

Regarding the mediation effects, balance and variety and environment were stronger mediators, compared with modeling. The effect sizes were small, but, for both environment and balance and variety, the mediation effects explained more than 20% of the effect of health motive on vegetable intake, meaning that these practices partly explained the association.

The feeding practice of shaping a healthy environment seemed to be an important mechanism between health motive and the quantity of fruits and vegetables children ate (49, 50). Corsini et al. (51) recommended focusing on shaping a healthy environment instead of on restrictive practices (i.e. coercive control practices). A recent review on how to reduce parents' provision of unhealthy foods to 3- to 8-year-old children recommended more research on the effects of persuasion, modeling, and environmental restructuring (52).

The other mediator shown to be important in the present study was encouraging balance and variety, meaning that the parent encourages the child to eat new and varied foods and talks positively about healthy foods. A study of 3- to 5-year-old children (53) and another study of 6- to 18-year-olds (48) showed that this type of parental encouragement positively influenced both fruit and vegetable consumption, in contrast to a Norwegian study of preteens (50) that did not find balance and variety to be associated with either fruit or vegetable consumption.

Healthy modeling may contribute to higher fruit and vegetable intakes (54). However, in the present study, healthy modeling did not mediate the associations between food choice motives and fruit and vegetable intakes to the same degree as the other examined feeding practices. The young age of the children in our study may explain the lack of mediating effects for this practice because very young children may not recognize what their parents eat or take notice of the link between their parents' engagement with healthy foods and the food offered to the children.

The assessed feeding practices mediated the associations between food choice motives and vegetable intake to a larger extent than they did the associations with fruit intake. This supports the notion that fruits and vegetables should be treated as separate entities in new interventions, as recommended by Glasson et al. (55) and Appleton et al. (56).

To our knowledge, the present study was the first to explore the associations between food choice motives, health-promoting feeding practices, and fruit and vegetable intakes in this age group. Two studies conducted in the United States (21, 24) explored the same overall constructs (feeding motives, child's diet, and parental feeding practices), but these studies examined negative feeding practices, other diet outcomes, and only two food choice motives in each article (compared with the five treated in the present study). The results of these studies were not consistent. Their first study showed that the children (aged 3–6 years) of parents who used negative feeding practices were often more likely to eat unhealthy foods, despite their parents' healthy feeding motives (21). The second study found that children (aged 7–11 years) whose mothers emphasized health motives consumed more healthy food and less unhealthy food; however, in contrast to the results of the first study, negative feeding practices did not mediate the associations in this second study (24). The children's age difference between the two studies may explain the different results. The children in both studies were older than those in our study. Because dietary habits are established early and track into adolescence, focusing on the youngest age groups is important from a public health perspective.

Strengths and limitations

A potential strength of this study is that, by using social media (Facebook) as a recruitment channel, participants from the entire country (57) could be included, and we

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were able to reach a relatively large sample of children born in a restricted time frame. Additionally, the questions used in the study were validated and reliability tested and have been widely used in other studies. Finally, the study is particularly important because there is a lack of studies on this young age group (28).

An important limitation of this study involves its cross-sectional design, which hindered causal interpretation of the findings (58). Some questionnaires were, unfortunately, not fully answered, probably because of the length, and we included those who had answered more than half of the questionnaire. We wanted to recruit a broad spectrum of parents using Facebook, which is known to be an effective recruitment arena (59). However, not reaching non-users of Facebook is a limitation in our study. The aim was to reach more fathers and parents with low Socioeconomic status (SES) than would otherwise be possible; however, the majority of people recruited were mothers (98.0%) with high SES. It is not known whether the findings would have been different if more fathers had participated. It is possible that using video services (such as YouTube), as recommended in a recently published Norwegian study (60), would have been a better approach. Another potential limitation is that parents may have reported a healthier lifestyle than they actually followed because they may have been ashamed of some of their choices, as has been seen in comparable studies (61).

Regarding the generalizability of our findings, participants were more highly educated, compared with national figures (62). In addition, the included parents were more likely to be especially interested in health and nutrition issues because they initially responded to the advertisement on Facebook. A more representative study sample might have given different results according to infant diet, which studies in Europe (63) and Australia (64) have indicated. Finally, our findings contribute to the knowledge of parental determinants (or predictors) of fruit and vegetable consumption among infants, but they should not be generalized to other age groups.

Conclusion

Our results confirm previous findings on the importance of health motives for infant and children's vegetable consumption. We also see that the health-promoting feeding practices assessed mediate associations between some food choice motives (health and sensory appeal) and fruit and vegetable consumption, but not to a large degree.

Health-promoting feeding practices may mediate associations between parental characteristics other than food choice motives, such as knowledge, attitudes, and general parenting style, and infants' fruit and vegetable intakes. Such associations should be examined in further studies to identify which feeding practices and potential predictors of these feeding practices should be targeted in interventions to enhance the intake of fruits and vegetables among infants and toddlers.

Our results contribute to understand the underlying motives of parental feeding behaviors in this age group. The results may be different investigating older children because, for example, the family interaction and tastes changes by age. Continuing to study the interplay between infant's food intake and parents' motives and practices about healthy and unhealthy eating behaviors is an important endeavor.

Authors' contributions

NCØ, ERH, and FNV conceived the study. MR, ERH, FNV, and NCØ initiated and designed the study and developed the intervention. MR performed the data collection, supervised by ERH, FNV, and NCØ. MR performed the analysis, supervised by WVL and NCØ. MR drafted the manuscript with substantial input from ERH, FNV, WVL, and NCØ. All authors contributed to read and approved the final version of this manuscript.

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Paper 3

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Effect of a parent-focused eHealth intervention on child's fruit, vegetable and discretionary food intake: The Food4toddlers RCT study

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Abstract

Background: In Western countries, children's diets are often low in fruits and vegetables and high in discretionary foods. Diet in early life tends to track through childhood and youth and even into adulthood. Interventions should, therefore, be delivered in periods when habitual traits are established, as in toddlerhood when children adapt to their family's diet.

Objectives: In this study, we assessed the effect of the Food4toddlers eHealth intervention, which aimed to enhance toddlers' diet by shaping the food and eating environment.

Method: The Food4toddlers randomized controlled trial was conducted in Norway in 2017/2018. Parent-child dyads were recruited through social media. In total, 298 parents completed an online questionnaire at baseline (child age = mean ± SD: 10.9 ± 1.2 months). Post-intervention questionnaires were completed immediately after the intervention (follow-up 1; child age = mean ± SD: 17.8 ± 1.3 months), and six months after the intervention (follow-up 2; child age = mean ± SD: 24.2 ± 1.9 months). The intervention is guided by Social Cognitive Theory, targeting the linked relationship between the person, the behavior, and the environment. The intervention group (n = 148) got access to the Food4toddlers website for six months from baseline. The website included information on diet and how to create healthy food and eating environment, activities, recipes, and collaboration opportunities. To assess intervention effects on child diet from baseline to follow-up 1 and from baseline to follow-up 2, we used generalized estimating equations (GEE) and a time by group interaction term. Between-group differences in changes over time for fruits, vegetables (frequency and variety), and discretionary foods (frequency) were assessed.

Results: At follow-up 1, a significant time by group interaction was observed for the frequency of vegetable intake (p = 0.02). The difference between groups in the change from baseline to follow-up 1 was 0.46 vegetable items/day (95% CI = 0.06, 0.86) in favor of the intervention group. No other significant between-group differences in dietary changes from baseline to follow-up 1 or follow-up 2 were observed. However, there is a clear time trend that the intake of discretionary foods increases

by time from less than one item/week at baseline to more than 4 items/week at two years of age (p<.001) regardless of groups.

Conclusion: A positive intervention effect was observed for the frequency of vegetable intake at follow-up 1, but not at follow-up 2. No other in between group effects on diet were observed. eHealth interventions of longer duration, including reminders after the main content of the intervention is delivered, may be needed to obtain long-terms effects, along with tailoring in a digital or a personal form.

Keywords: toddler, child, eHealth, intervention, RCT, fruit, vegetable, discretionary food

Trial registration

https://doi.org/10.1186/ISRCTN92980420 Registered 13 September 2017.

Background

What toddlers eat is crucial for their health and growth, and in several western countries, young children do not meet dietary guidelines. A specific challenge is the low intake of fruits and vegetables and the high intake of sugar-sweetened beverages and snacks [1-4]. An unhealthy diet early in life increases the risk for overweight, non-communicable diseases, and certain cancers [5, 6].

The World Health Organization's (WHO) report on ending childhood obesity [5] recommends that appropriate and context-specific nutrition information should be easily available for specific target groups and be delivered in ways that are perceived meaningful for the users. WHO argues that such information is specifically relevant for parents of infants and toddlers. Diet in early life tends to track through childhood and youth and even into adulthood [5, 7]. Interventions should, therefore, be delivered when healthy habitual traits are established in the early years, and one of these periods involves the transition from specific baby foods to eating family meals [7-10].

Parents are the primary gatekeepers of child diet in this period [11, 12]. To date, few studies assessing the effect of dietary interventions targeting young children through their parents have been undertaken [13, 14]. Internet is a popular source for health information among parents, and parents report a need for trustworthy, evidence-based, and highly accessible information sources [15-18]. Theory- and evidence-based eHealth interventions, where intervention messages are delivered to the target audience via electronic means and are easily available and accessible for the parents, may fill this information gap. eHealth interventions have the potential to reach many, can easily be changed and adapted to new groups, are available 24/7, and are cost-effective [19-21].

Parental focused interventions with an emphasis on creating a healthy food and eating environment for the child are recommended and have shown promising results [22, 23]. A healthy food environment is characterized by the accessibility and availability of healthy foods for the child and restricted access to unhealthy alternatives [22, 24]. In order to create a healthy eating environment, it is essential to incorporate health-promoting feeding practices, such as healthy modeling and repeated exposure to healthy foods [7].

The aim of this study was to examine the effect of a parent-focused eHealth intervention on the child's diet assessed at two time points post-intervention. We hypothesized that, compared with the control group, the children in the intervention group would develop a more frequent and varied intake of fruits and vegetables and less frequent intake of discretionary foods from baseline to post-intervention.

Methods

Design and study population

This study used data from the Food4toddlers' randomized controlled trial (RCT), an eHealth intervention aiming to promote a healthy food and eating environment for toddlers. Details of the intervention's design and components have previously been published [25]. The study was a 2-armed

RCT involving 298 parent-child dyads. This eHealth intervention was conducted in Norway in 2017/ 2018. Data was collected at baseline, after six months (follow-up 1 = post-intervention), and after 12 months (follow-up 2 = 6 months post-intervention). Parents in the intervention group were provided with access to the Food4toddlers' website for a period of six months after completing the baseline questionnaires. Log in instructions for the website were sent by email, and up to three reminders were sent to non-responders. Informed consent from the parents was obtained when they signed in online for participation in the study. A completed CONSORT- EHEALTH checklist is available in Additional file 1. Research clearance was obtained from the Norwegian Centre for Research Data, 08/06/2016, reference 48643.

Between August 2017 and January 2018, 404 parents of infants and toddlers from across Norway were recruited through a tailored advertisement on Facebook and accepted to participate by signing in at the study's homepage [26]. Parents of children born between June 2016 and May 2017 were eligible for participation if literate in Norwegian. In the case of twins, the parent reported on behalf of the oldest child. All sociodemographic and behavioral data were collected at baseline and follow-ups using the online survey software SurveyXact [27]. Up to three email reminders were sent in the absence of a response. Parents completing items concerning children's food intake, parental feeding practices, and demographic data were included in the analysis.

Participants were randomized and allocated to either an intervention or a control group after the baseline data collection. A randomization list was generated in SPSS by one of the researchers (NCØ) and implemented by the first author (MR). The follow-up questionnaires replicated the baseline questionnaires but included also questions on intervention website use (intervention group only at follow-up 1).

Intervention development

This Food4toddlers study was developed using the basic steps from the Model of Planned Promotion for Population Health [28]. The present intervention is in line with the Social Cognitive Theory,

119 targeting the linked relationship between the person, the behavior, and the environment [29] with
120 an emphasis on how to promote action rather than motivation only [28]. The participants were
121 encouraged to have core foods available (especially vegetables and fruit) both in their home and on
122 the child's plate. The opposite was encouraged for discretionary (non-core) foods and beverages.
123 Food4toddlers was developed in a co-creation process with health care nurses, parents of toddlers
124 and students and staff at the university. Key elements in this process were several individual and
125 group interviews with stakeholders and to include students in developing and pilot testing the
126 website. The Food4toddlers eHealth intervention included a website with four main elements: 1)
127 modules (including two to four lessons) covering an introduction and seven topics on promoting
128 healthy food and eating environments for the child 2) recipes, 3) a discussion forum, and 4)
129 highlighted information about food and beverages (called "Good to know"). In addition, when
130 accessing the Food4toddlers website, a video appeared with information about the study and focus
131 on how important just a small weekly increase in vegetable consumption may be for the child's long-
132 term health. Small behavioral changes were highlighted with the aim of making the messages easier
133 for the parent to accomplish [30]. The modules had elements of activities such as a quiz or a game,
134 and visual elements that supported the information. During the intervention period, the participants
135 received e-mails weekly with a link to a new lesson (20 times), thus expanding the content of the
136 intervention. Some lessons were more comprehensive than others, but the estimated time to
137 complete an average lesson was ten minutes. The Food4toddlers website was available on
138 smartphones and other tablets in the form of a mobile application (app), in addition to computers.

139 Measures and outcomes

140 The importance of fruit and vegetable intake for lifelong health is well documented [3, 4], and a diet
141 rich in fruits and vegetables and limited in discretionary foods are cornerstones of a high diet quality
142 [2, 31-34]. We wanted to measure the frequency of these foods along with the variety of fruits and
143 vegetables, which are less frequently measured [35] and have shown to be indicators of
144 preschoolers' overall diet quality [36]. Our previous research using baseline data from the

Food4toddlers intervention revealed different patterns in fruit versus vegetable consumption [37]. Therefore, we wanted to further examine this distinction for the intervention's effect and examine the intake of discretionary foods to elaborate on both core and non-core dietary effects. We constructed three separate scales to assess vegetables, fruits, and discretionary foods consumption frequency, respectively. Food variety scales were calculated separately for vegetables and fruits.

Child food intake

Child food intake in the current study was assessed by a food frequency questionnaire (FFQ), based on questionnaires previously used in the population-based Norwegian Mother, Father and Child Cohort Study (MoBa) [38] and the nationwide Norwegian diet survey among 12-month-old children [39]. These questionnaires have previously been validated in toddlers [40, 41]. Using both questionnaires, we were able to cover a more extensive selection of foods, but different scales made the comparison more difficult. Of the 59 FFQ items in the questionnaire, we used three food groups (in total 33 items).

Assessment of fruit and vegetable intake

Questions covering the intake of fruits and vegetables commonly consumed in Norway [42] were as follows: "How often does your child eat the following fruits/vegetables nowadays?". The food items presented included fresh, cooked, or squeezed fruits and vegetables and both homemade and commercially produced variants. In total 13 vegetables (*carrot, rutabaga, sweet potato, cauliflower, broccoli, green salad, spinach, cucumber, tomato, corn, sweet pepper, pea and other*) and 11 fruits (*orange, banana, apple, pear, plum, grapes, kiwi, melon, mango, berries and other*) were listed.

A 6-point scale, ranging from never to several times a day, was used with the following response options and recoded into times per week: never or less than once a week = 0, one to three times a week = 2, four to six times a week = 5, once a day = 7, two times a day = 14 and three times or more per day = 24.5. Similar recoding has been done by others [43-46]. We calculated a combined score of total vegetable intake and another for total fruit intake (frequency per day).

The same items, as previously described for the frequency of vegetables and fruits, were used to calculate variety scores of eaten (coded 1) and not eaten (coded 0) vegetables (13 items) and fruits (11 items), respectively.

Assessment of discretionary foods and beverages

The questions on the consumption frequency of discretionary foods were as follows: *"How often does your child eat the following foods nowadays?".* The following food groups were assessed 1) cakes, waffles, and sweet biscuits 2) dessert/ice-cream 3) chocolate 4) candy and such 5) chips. A 6-point scale was used, ranging from never to several times a day. The response options were recoded into times per week: never = 0, less than once a week= 0.5, one to three times a week = 2, four to six times a week = 5, 1-2 times a day = 10.5 and three times or more per day = 24.5.

Beverage intake was assessed by the following question: "How often does your child drink the following drinks nowadays." The response options were recoded to daily intake: never/seldom=0, one to three times a week = 0.29, four to six times a week = 0.71, one per day = 1, two per day = 2, three per day = 3, four per day = 4, five or more per day = 6. Then coded into times per week (multiplied by seven) to be consistent with the snack score. Subsequently, we calculated the sum of the combined frequency of intake of discretionary foods per week, including five snack items and two beverage items.

Assessment of demographics and use of the website

Parents reported the following at baseline: child gender, child's date of birth, if they lived together with the child's other parent, their own height, weight, date of birth, and educational level. Body Mass Index (BMI) was calculated from parental self-reported height and weight (kg/m^2). The categories for parental educational level were as follows: Primary school or less, primary school plus one year of e.g. folk high school, high school, vocational school, upper secondary school or less, college/university (≤ 4 years), college/university (> 4 years), other, don't know. These categories are similar to categories used by others in Norway [39]. The education level was dichotomized: none or

up to four years of higher-level education and more than four years of higher-level education. This cut-off was used since the groups without college/university education were very small (total 11.3%), and knowing that a healthy lifestyle increases for every year of education [47].

From the website, we registered the number of lessons (in total 22) the participants in the interventions group had completed. The lessons comprised two to four pages and all of them had to be visited to be registered as a completed lesson. Lesson number seven had an element only available at a computer, and all other lessons were available on different devices.

Statistics

The sample size was calculated for one of the primary outcomes, child diet quality. Because no data on healthy eating scores for Norwegian toddlers are available, the calculation for the current study was based on the study of Angelopoulos et al. [48]. They used a healthy diet score of 10 components to assess child diet and observed a mean score of 60.5 with SD 9.2. A 3-point difference in score between the control and intervention groups was considered relevant from a public health perspective. From this, we estimated that 142 children in each group would be required to demonstrate statistical significance with a statistical power of 80% and α of 5%. Assuming a 40% loss to follow-up, we aimed to recruit 237 parents in each group.

Means with standard deviations for continuous variables and frequencies and percentages for categorical variables are reported for baseline characteristics. Table 2 shows group comparisons of baseline characteristics between participants retained in this study at follow-up 1 (immediately after the intervention) and follow-up 2 (six months post-intervention) and those who were lost to follow-up or had missing data on outcome variables on these timepoints.

We used generalized estimating equations (GEE) to determine whether the intervention had an effect on child diet from baseline to follow-up 1 and follow-up 2, respectively. GEE is suited for identifying how much a sample's average response changes with a one-unit increase in a covariant, which means that all respondents can be included in the analyses even though there are missing

responses on the follow-ups [49]. This method also takes into account the problem with individual correlated data [49]. Frequency of intake (vegetables, fruits, and discretionary foods) and variety of intake (vegetables and fruits) were included as dependent variables in separate models. An interaction term between group (intervention vs. control) and time (baseline vs. post-intervention) was entered into all models to examine the possible effects of the intervention. Specifically, we investigated if changes in dietary intake from baseline to post-intervention periods (follow-up 1 or follow-up 2) differed significantly between the control and intervention groups. An unstructured covariance matrix and robust estimates of the standard error (SE) were used. All models were adjusted for child gender and age and parental BMI, education level, and age reported at baseline. We selected covariates based on previous research on determinants for vegetable and fruit intake [50] and in line with the protocol for the study [25]. We ran T-tests and Mann-Whitney U tests as sensitivity analyses, using complete cases and the difference between baseline and follow-up 1 values, and baseline and follow-up 2, respectively, for all outcome variables. The intention-to-treat principle was used in the analyses [51]. All analyses were conducted in IBM SPSS Version 25 except for GEE, which was run in STATA version 16. Statistically significance level was set to $P \leq 0.05$.

Results

Characteristics of the study sample

Figure *1* shows the flow of participants in the study. Of the 404 parents that signed in for participation, 298 (73.8%) parents completed the baseline questionnaire and were included in the study. After the baseline data collection, parents were randomized into an intervention (*n* = 148) or a control (*n* = 150) group. One child was erroneously included in the study (too young), and six participants had missing data on demographic variables at baseline (parental age, BMI, or education level) and were all excluded from the analyses in this paper.

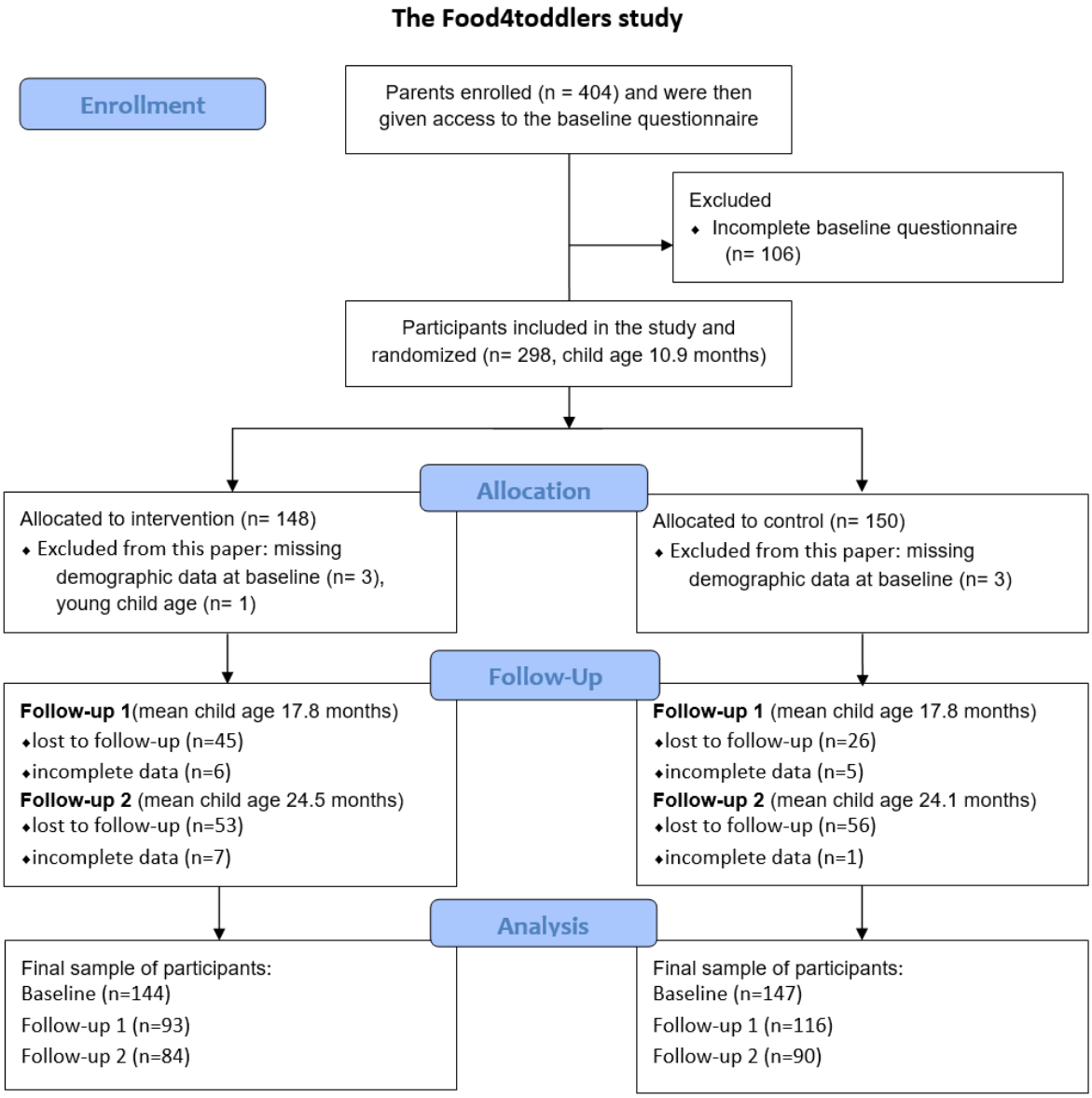

Figure 1**: Consolidated Standards of Reporting Trials diagram for the Food4toddlers RCT study**

At follow-up 1, 71 participants were lost to follow-up, and 11 had incomplete data on outcome variables. At follow-up 2, 109 were lost to follow-up, and 8 had incomplete outcome data. The

number of participants who completed the questionnaires was 291 at baseline, 209 (71.8%) at follow-up 1, and 174 at follow-up 2 (59.8%).

Table 1 **Baseline characteristics of parent and child in the intervention group and control group**

Demographic characteristics	**Total**	**Control**	**Intervention**
Parents	*(n = 291)*	*(n = 147)*	*(n = 144)*
Mother[1]/father (n)	287/4	147/0	140/4
Age (year), mean (SD)	31.7 (4.2)	31.8 (3.9)	31.5 (4.4)
Height, mean cm (SD)	168.4 (5.9)	168.1 (5.9)	168.7 (6.0)
Weight, mean kg (SD)	70.7 (14.2)	71.0 (14.8)	70.4 (13.7)
BMI, mean (SD)	24.9 (4.6)	25.1 (4.8)	24.7 (4.4)
Two-parent household n (%)[2]	288 (99.0)	144 (98.0)	144 (100.0)
Total number of household members, mean (SD)	3.6 (0.9)	3.7 (0.9)	3.6 (1.0)
Born in Norway, n (%)	250 (86.2) [3]	122 (83.0)[3]	128 (88.9)
Education			
College/university ≤ 4 years or less, n (%)	132 (45.4)	70 (47.6)	62 (43.1)
Children			
Age, months, mean (SD)	10.9 (1.23)	10.8 (1.2)	10.9 (1.2)
Child's sex: Female, n (%)	129 (44.3)	63 (42.9)	66 (45.8)
Children's food intake at baseline, mean (SD)			
Vegetables (13 items)			
Frequency (times/day)	3.2 (1.6)	3.1 (1.5)	3.2 (1.7)
Variation (number /week)	7.2 (2.6)	7.2 (2.5)	7.2 (2.7)
Fruits (11 items)			
Frequency (times/day)	2.8 (1.6)	2.7 (1.4)	2.9 (1.8)
Variation (number /week)	5.8 (2.2)	5.7 (2.2)	5.9 (2.2)
Discretionary foods (7 items)[4]			
Frequency (times/week)	0.8 (1.4)	0.8 (1.4)	0.8 (1.4)

SD: Standard deviation, BMI: Body Mass Index, Significance: There are no significant differences between the groups.

[1]Including co-mothers and foster mothers.

[2]Live together with the other parent

[3]One missing case

[4] Including five unhealthy snack items and two sugar-sweetened beverages

Mean parental age at baseline was 31.7 years (SD = 4.2) (Table 1). Most participants were mothers (98.0%), lived in two adult households (99.0%), and were born in Norway (86.2%). Other characteristics which are not listed in the table are as follows: The mean age of the child at baseline

was 10.9 months (SD = 1.23, *n*= 291), at follow-up 1, 17.8 months (SD = 1.23, *n* = 209) and 24.2 months (SD = 1.68, *n* = 174) at follow-up 2. All Norwegian 19 counties were represented in the study sample. We observed a higher proportion of participants from the south of Norway, compared to national population data [52].

The infants had a frequency of daily intake of 3.2 (SD:1.6) items of vegetables and 2.8 (SD: 1.6) items of fruit. For discretionary food, the weekly intake was less than one item (0.8 items/week, SD:1.4) at baseline. The participating children ate a more varied range of vegetables (7.2 number/week, SD:2.6) compared to fruits (5.8 number/week, SD: 2.2).

To get an overview of the baseline characteristics of participants who remained in the study and those who were lost to follow-up, table 2 presents the baseline characteristics of these participants on the two follow-ups. A comparison between all participants is presented and how many of those lost to follow-up adhered to the intervention or control group. Of those who did not respond to follow-up 1 (Table 2), 51 were from the intervention group and 31 from the control group.

Table 2 **Differences between participants who retained in the study and those lost to follow-up 1 and follow-up 2** (n=291) (Baseline characteristics)

Demographic characteristics	**At follow-up 1 (all participants)**		**Lost to follow-up 1 from intervention and control groups** (n = 82)	
	Retained in study	Lost to follow-up 1[1]	Control	Intervention
Parents	*(n = 209)*	*(n = 82)*	*(n = 31)**	*(n = 51)**
Mother[2]/father (n)	206/3	81/1	31/0	50/1
Age (year), mean (SD))	31.8 (4.1)	31.5 (4.4)	32.6 (4.2)	30.9 (4.4)
Height (cm), mean (SD)	168 (5.8)	168 (6.0)	168 (5.9)	169 (6.1)
Weight (kg), mean (SD)	71.0 (15.0)	69.8 (12.0)	67.6 (11.6)	71.2 (12.2)
BMI, mean (SD)	24.9 (4.9)	24.6 (3.8)	24.0 (3.6)	25.0 (3.9)
Two-parent household n (%)[3]	207 (99.0)	81 (98.8)	30 (98.6)	51 (100)
Total number of household members, mean (SD)	3.6 (1.0)	3.7 (0.8)	3.9 (0.8)	3.6 (0.8)

Born in Norway, n (%)	177 (84.7)	73 (90.1)[4]	26 (86.7)[4]	47 (92.2)
Education				
College/university ≤ 4 years or less, n (%)	93 (44.5)	39 (47.6)	15 (48.4)	24 (47.1)
Children				
Age, months, mean (SD)	10.8 (1.2)	11.0 (1.4)	10.8 (1.7)	11.2 (1.2)
Child's sex: Female, n (%)	90 (43.1)	39 (47.6)	12 (38.7)	27 (52.9)
Children*s food intake at baseline, mean(SD)				
Vegetables (13 items)				
Frequency (times/day)	3.2 (1.6)	3.0 (1.6)	2.9 (1.5)	3.1 (1.7)
Variation (number /week)	7.4 (2.5)	6.9 (2.7)	6.7 (2.6)	7.0 (2.8)
Fruits (11 items)				
Frequency (times/day)	2.9 (1.6)	2.7 (1.6)	2.9 (1.7)	2.6 (1.7)
Variation (number /week)	5.9 (2.2)	5.6 (2.2)	5.6 (2.0)	5.7 (2.4)
Discretionary foods 7 items)				
Frequency (times/day)	0.8 (1.4)	0.9 (1.4)	0.8 (1.2)	1.0 (1.5)

	At follow-up 2		**Lost to follow-up 2 (n = 117)**	
	Retained in study	Lost to follow-up 2[1]	Control	Intervention
Parents	*(n = 174)*	*(n = 117)*	*(n = 57)*	*(n = 60)*
Mother[2]/father (n)	171/3	116/1	57/0	59/1
Age (year), mean (SD))	32.0 (4.0)	31.2 (4.4)	32.0 (4.1)	30.5 (4.6)
Height (cm), mean (SD)	169 (5.8)	168 (6.0)	168 (6.2)	168 (5.8)
Weight (kg), mean (SD)	71.3 (14.7)	69.8 (13.4)	69.1 (13.6)	70.6 (13.4)
BMI, mean (SD)	25.0 (4.9)	24.8 (4.2)	24.4 (3.9)	25.1 (4.5)
Two-parent household n (%)[3]	173 (99.4)	115 (98.3)	55 (96.5)	60 (100)
Total number of household members, mean (SD)	3.6 (1.0)	3.7 (0.9)	3.8 (1.0)	3.6 (0.7)
Born in Norway, n (%)	154 (88.5)	96 (82.8)	42 (75.0)*	54 (90.0)*
Education				
College/university ≤ 4 years or less, n (%)	67 (38.5)*	65 (55.6)*	30 (52.6)	35 (58.3)
Children				
Age, months, mean (SD)	10.8 (1.2)	11.0 (1.2)	11.0 (1.4)	11.1 (1.1)
Child's sex: Female, n (%)	73 (42.0)	56 (47.9)	27 (47.4)	29 (48.3)
Children*s food intake at baseline, mean(SD)				
Vegetables (13 items)				
Frequency (times/day)	3.2 (1.6)	3.0 (1.5)	3.2 (1.4)	2.9 (1.6)
Variation (number /week)	7.3 (2.6)	7.1 (2.7)	7.3 (2.4)	6.9 (2.9)
Fruits (11 items)				
Frequency (times/day)	2.9 (1.6)	2.8 (1.7)	2.9 (1.4)	2.6 (1.9)
Variation (number /week)	5.9 (2.2)	5.7 (2.3)	5.8 (2.1)	5.6 (2.4)
Discretionary foods 7 items)				
Frequency (times/day)	0.7 (1.3)	0.9 (1.5)	*0.9 (1.4)*	*1.0 (1.6)*

SD: Standard deviation, BMI: Body Mass Index, * $p < 0.05$, and calculated by Pearson's chi-square test
[1] Participants who were lost to follow up or had incomplete outcome data at follow-up 1 or follow-up 2
[2] Including co-mothers and foster mothers
[3] Live together with the other parent
[4] One missing case

At follow-up 2, the number of non-responders was comparable in the two groups, i.e., 57 in the control group and 60 in the intervention group. Participants with a higher educational level were more likely to complete the follow-up 2 questionnaires ($p = 0.05$).

Figure 2 shows how many participants in the intervention group ($n = 144$) who completed the 22 lessons on the Food4toddlers website. The two first lessons were available when the participants got access to the website. After that, a new lesson was delivered every week. Lesson 1 was an information lesson (e.g., how to navigate the website and information about the study), and lesson seven had a gaming element included that was just possible to use from a computer (not on mobile devices). Few parents completed this lesson (14%). There was a range from 21 (14%) to 89 (61%) of completed lessons. We see a general drop in completing the lessons over time.

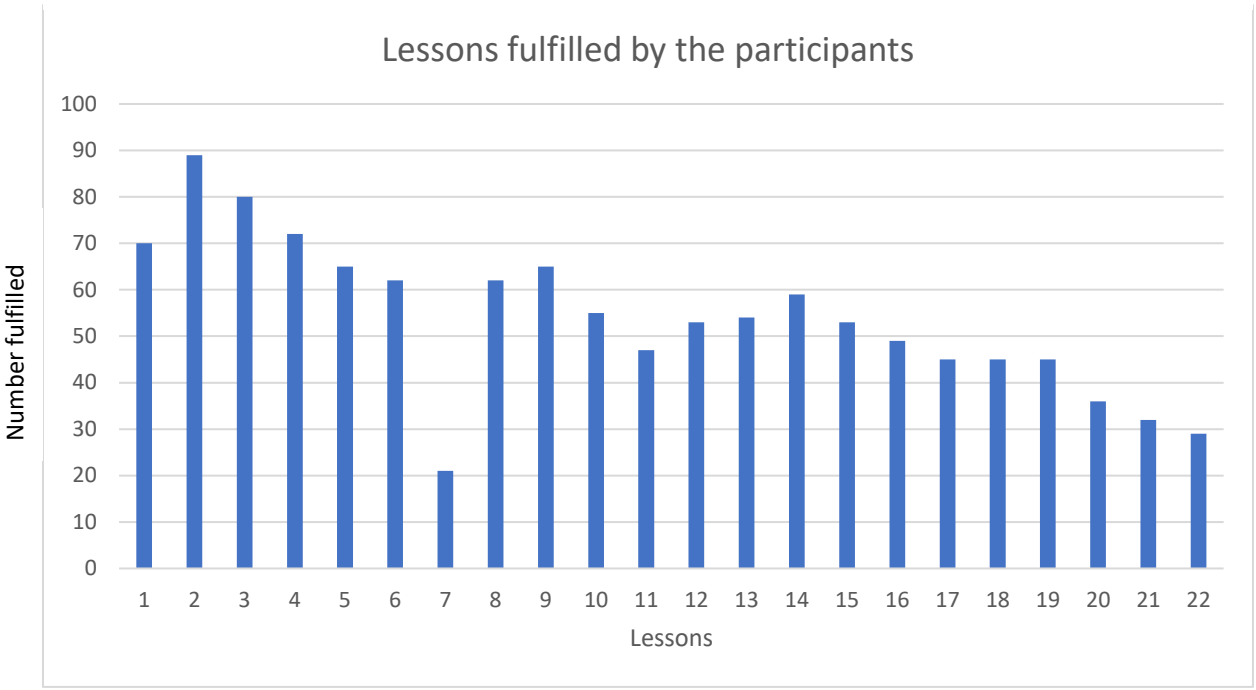

Figure 2 **Number of completed lessons by participants in the intervention group** (n=144).

296

297 ## Dietary outcomes

298 ### Time by group interactions

299 At follow-up 1, a significant time by group interaction was observed for frequency of vegetable
300 intake, $p = 0.02$ (Table 3, adjusted measures). The between-group difference in the change from
301 baseline to follow-up 1 was 0.46 items/day (CI = 0.06, 0.86), showing a larger increase in the
302 frequency of vegetable intake in the intervention group compared to the control group. No other
303 significant differences in dietary changes from baseline to follow-up 1 or follow-up 2 were observed
304 between the groups.

305

306

307 Table 3 **Intervention effects of the Foof4toddlers-study on vegetable, fruit, and discretionary food**
308 **frequency outcomes and fruit and vegetable variety outcomes from baseline to follow-up 1 and**
309 **from baseline to follow-up 2** (n = 291).

	Baseline to follow-up 1[a]		**Baseline to follow-up 2 [a]**	
	Estimate (95% CI)	*P* value	Estimate (95% CI)	*P* value
	Intervention effect (unadjusted)			
Vegetables				
Frequency (times/day)	0.44 (0.04, 0.84)	0.03	0.30 (-0.14, 0.74)	0.18
Variation (number/week)	0.56 (-0.08, 1.19)	0.09	0.69 (0.04, 1.43)	0.06
Fruits				
Frequency (times/day)	0.04 (-0.45, 0.54)	0.87	-0.07 (-0.62, 0.48)	0.81
Variation (number/week)	0.07 (-0.51, 0.66)	0.80	-0.17 (-0.82, 0.49)	0.62
Discretionary foods				
Frequency (times/day)	-0.10 (-1.20, 1.00)	0.85	0.05 (-1.02, 1.11)	0.93
	Intervention effect (adjusted[b])			
Vegetables				
Frequency (times/day)	0.46 (0.06, 0.86)	0.02	0.32 (-0.12, 0.75)	0.15
Variation (number/week)	0.60 (-0.04, 1.23)	0.07	0.73 (-0.01, 1.46)	0.05
Fruits				
Frequency (times/day)	0.03 (-0.47, 0.52)	0.91	-0.10 (-0.64, 0.44)	0.71
Variation (number/week)	0.09 (-0.50, 0.67)	0.78	-0.18 (-0.84, 0.48)	0.60
Discretionary foods				
Frequency (times/day)	-0.07 (-1.17, 1.02)	0.89	0.08 (-0.98, 1.14)	0.89

310 CI: Confidence Interval
311 [a]Mean change in frequency or variety of vegetables, fruits or discretionary foods from baseline to the post-
312 interventions (follow-up 1 or 2) between the control and intervention group.
313 [b]Adjusted for child age and gender and parental BMI, education level, and age at baseline.
314

315 The change in frequency of vegetable intake from baseline to the follow-ups for the intervention

316 group and the control group are presented in Figure *3*A.

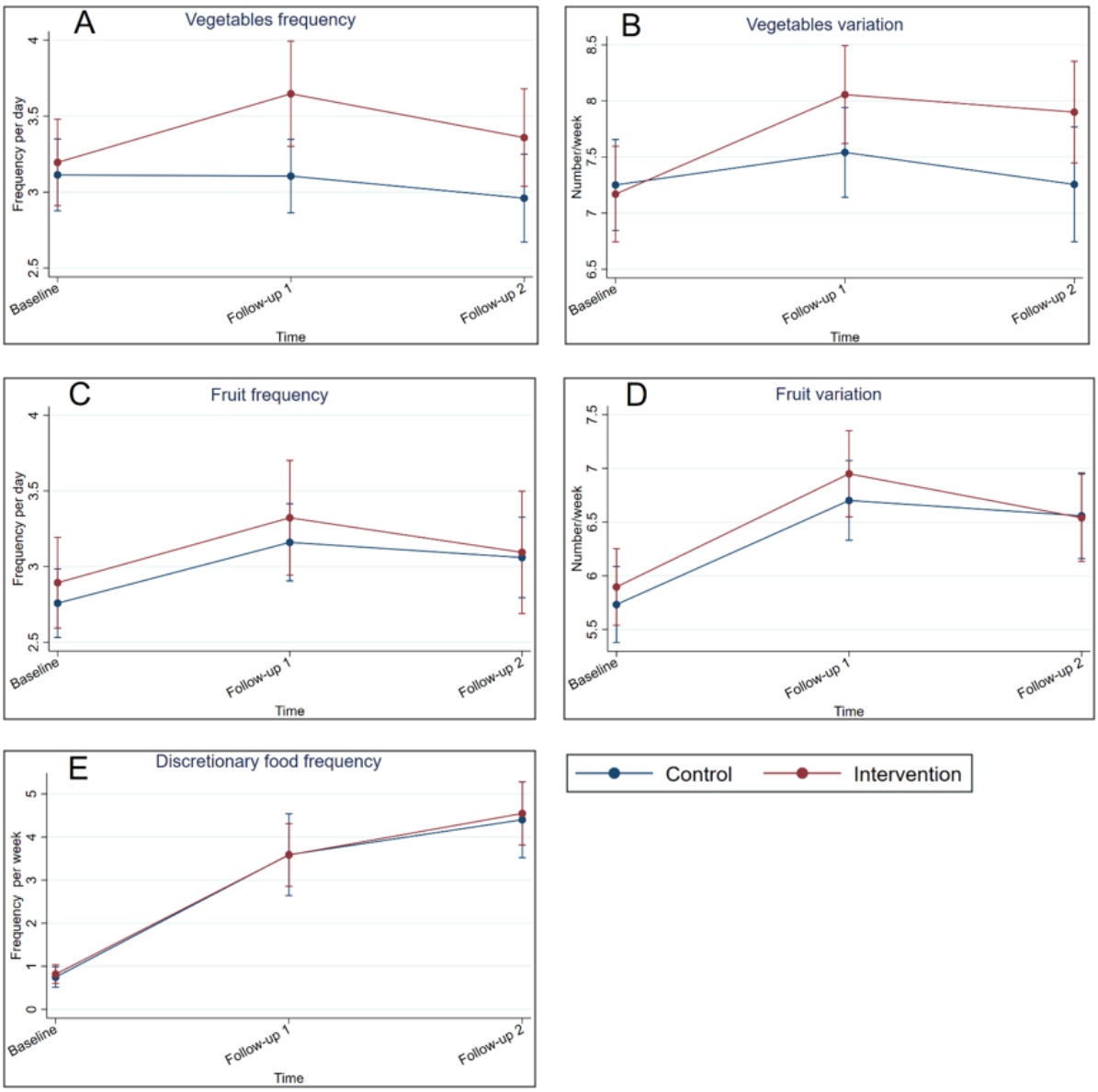

Figure 3**: Estimated marginal means for child's food intake at baseline, follow-up 1 and follow-up 2 for the frequency of vegetables, fruits, and discretionary foods, and variety of vegetables and fruits. Adjusted for child age and gender and parental BMI, education level, and age, reported at baseline**.

Estimated marginal means (EMM) for the intervention group, showed that the vegetable intake of 3.20 times/day (SE = 0.15) at baseline increased to 3.65 times/day (SE = 0.18) at follow-up 1. There was no change in frequency of vegetable intake in the control group from baseline (3.11 times/day, SE = 0.12), to follow-up 1 (3.11 times/day, SE = 0.12). A small decrease in frequency was observed

328 from follow-up 1 to follow-up 2 in both groups: a mean vegetable intake of 2.96 times/day (SE =
329 0.15) was observed for the control group and 3.36 (SE = 0.16) for the intervention group. There was
330 no significant time trend from baseline to the follow-ups.

331 A similar trend was observed for the variety score of vegetables (Figure *3*B), although the group-by-
332 time interactions were only borderline significant. Specifically, the group difference in the change
333 from baseline to follow-up 1 was 0.60 vegetables tasted/week (p = 0.07), and 0.73 number of
334 vegetables tasted/week from baseline to follow-up 2 (p = 0.05) (Table 3). Moreover, the EMM of the
335 control group's vegetable variety was 7.25 (SE = 0.21) at baseline, 7.54 (SE = 0.20) at follow-up 1 and
336 7.26 (SE = 0.26) at follow -up 2, whereas for the intervention group it was 7.17 (SE = 0.22) at baseline,
337 8.06 (SE = 0.22) at follow-up 1 and 7.90 (SE = 0.23) at follow-up 2. No significant time trend from
338 baseline to the follow-ups were observed.

339 There were no significant between-group differences in change in the frequency nor variety of fruit
340 intakes from baseline to follow-up 1 and follow-up 2, respectively (Figure *3*C/D). There is a significant
341 time trend for fruit frequency from baseline to follow up 1 (p=.002) and borderline significance from
342 baseline to follow up 2 (p=.052). For variety of fruit a significant time trend is seen from baseline to
343 both follow-ups, respectively (p<.001).

344 No intervention effect was observed for the intake of discretionary foods, as there was no significant
345 between-group difference in the change in intake frequency from baseline to either of the two
346 follow-ups. However, the intake of discretionary foods increased significantly (p<.001) over time
347 (Figure *3*E). In detail, at baseline, the intake was less than one item a week for both groups, which
348 increased to 3.6 items/week in both groups at follow-up 1 and later to 4.4 (SE = 0.45) items/week in
349 the control group and 4.5 (SE = 0.37) in the intervention group at follow-up 2.

350 The sensitivity analyses (T-tests and Mann-Whitney U tests) using complete cases, showed results in
351 line with the GEE analyses, except for the results for vegetable variation, which were no longer
352 borderline significant.

Discussion

In this study, we observed that giving parents access to an eHealth intervention during toddlerhood increased the child's vegetable consumption frequency. The intervention effect was attenuated and no longer significant six months post-intervention. A borderline significant effect for a variety of vegetable intake in favor of the intervention group was observed at both time points. For fruits and discretionary foods, there were no intervention effects.

Although the intervention promoted a higher consumption of both vegetables and fruits, and lower consumption of discretionary foods, the vegetable promotion was the main focus in the Food4toddlers study, which may explain our findings. Specifically, the intervention focused on vegetables from the start; on the front page and in the first lessons the participants got access to, vegetable promotion was central. Interest in the intervention website was highest at the start of the program, which is also seen in other web-based programs [53]. The video on the front page of the Food4toddlers website focused on how important just a small weekly increase in vegetable consumption may be for the child's long-term health. It is possible that those who accessed the website watched this video and that this may have motivated improved vegetable consumption. There may also be more room for improvement in vegetable intake relative to fruit or discretionary food intake in this age group. A British study found more variety of vegetables in commercially prepared dinners than in their home-cooked recipes counterpoints [54]. Parents tend to serve more commercially prepared dinners at the age of one than later [39, 55]. This may explain why the variety of vegetables is not increasing by age, even though children eat larger portions of foods by age [39, 55]. A known reason for lack of variety is the age-specific trait of rejection of new foods, food neophobia, that peaks around two years of age [56]. In order to create a healthy eating environment, the present study focused on the importance of repeated exposure as a means to enhance the acceptance of new foods before that age. There was a borderline significant difference between the groups for vegetable variety in our study, at both time points, that may indicate that children in the

intervention group obtained a higher acceptance of these foods before the age of two, which may persist over time [7]. While there are no studies directly comparable to the current study, some have reported dietary outcomes of eHealth interventions targeting older or younger children. The Swedish MINISTOP mHealth intervention [57] reported no effect on vegetable consumption. The MINISTOP study targeted parents of 4-year old's, and the intervention group got access to an app, for six months, focusing on a healthy diet and physical activity. The Australian Time2bHealthy study's results for vegetable consumption were in line with the MINISTOP study. Time2bHealthy delivered an 11-week web course on healthy lifestyle to the intervention group, followed by fortnightly emails for 3-months. They targeted parents of 2- to 5- years-old children with BMI at or above the 50th percentile for their age, and the participants got individual feedback from a dietitian. Our intervention targeted parents with younger children and in a period were dietary habits are established, which may explain the positive results for vegetables in our study. A Norwegian eHealth RCT intervention, Early food for future health, delivered monthly videos on child feeding to parents of infants (6-12 months) [58] and found an intervention effect for vegetable variation [58]. They made a composite score of fruit and vegetable frequency, which also showed improvement in intake [58]. A similar score was used in two studies targeting older children [59, 60] showing positive results, contrary to the no reported effect in a mHealth study targeting infants [20]. A composite healthy lifestyle score was assessed in the MINISTOP study which showed a positive intervention effect [57].

Both the intervention and the control group increase their intake of fruit by time, but no intervention effect between the groups were seen. The lack of effect for fruit intake contrary to vegetable intake may be explained by the differences between the two types of foods in terms of skills and time needed for preparation, consumption patterns, and the parents' readiness to make changes [61-63]. Few preparations are necessary to give the child a fruit as a snack or in a smoothie, and fruits are more easily accepted by children than vegetables due to sweet taste [64]. The children may have tasted and accepted a variety of fruits before the intervention period started, and improvements

403 may be hard to obtain. The lack of an intervention effect for fruit consumption has been observed in
404 comparable studies [57, 58, 65].

405 In contrast with our and other findings [58, 66], the Time2bHealthy study showed an effect on
406 discretionary foods in favor of the intervention group [65]. A review exploring both traditional and
407 eHealth interventions aiming to reduce sugar-sweetened beverages among young children (< 5
408 years), found that success was more likely if interventions were multicomponent, targeted
409 vulnerable populations, and had a high intervention intensity/contact time [67]. The Time2bHealthy
410 study was conducted in line with these success factors, which may explain the positive results. The
411 MINISTOP study found an intervention effect on sweetened beverage consumption in favor of the
412 intervention group [66]. The offering of discretionary foods was low at baseline in the Food4toddlers
413 study and increased at the-follow ups in both groups. However, the intake remained relatively low
414 when compared with other studies [68, 69]. The increase in both groups over time may be explained
415 by the fact that children tend to incorporate the rest of the families' eating patterns, including more
416 discretionary food, during the second year of life (e.g., ice cream in the summer and biscuit as
417 snacks).

418 Findings from the present study and other similar studies show that digital interventions may be
419 effective in improving some aspects of dietary intake. However, for most parent-focused eHealth
420 studies, long term retention of effects have not been observed [17, 57]. One interesting exception is
421 the long-term effect on discretionary foods in the Time 2bHealthy study [65]. The lack of long-term
422 effects is a challenge for eHealth interventions aimed at lifestyle behavior in general [70] and also
423 specifically for parent-focused (traditional and online) obesity prevention interventions [13, 71]. A
424 duration of six months or shorter is common in parent-focused eHealth interventions [13, 25, 72]. A
425 longer duration might contribute to maintained effects over time [13, 70, 73]. Further, including
426 short and thematically narrow "booster sessions" after the end of more intensive intervention
427 sessions have shown promising results [71], and may also maintain effects of the intervention. Such

short booster sessions have a low participant burden, can be important reminders, and can easily be conducted in eHealth interventions. A review showed that combining web-delivered interventions with other delivery modes such as SMS, telephone coaching, and emails had stronger effects on behavior changes over time [21]. The process evaluation of the present study [74] showed that 13 % of the invited participants did not enter the Food4toddlers website at all, indicating some challenges in engaging all participants. Other deliveries might have been valuable to better engagement. However, personal contact is cost- and time-consuming, which limits distribution to the population at large [70]. Digital tailoring based on information about diet and physical activity provided by parents on the website or app, as done in the MINISTOP study [75], may contribute to better adherence. Even though the effect did not last after follow-up 1 in the present study, there is still a possible public health benefit of increasing vegetable intake among children, even in small measures.

Strengths and limitations

Few parent-focused eHealth studies are exclusively web-based nor targeting young children [13]. The participants in the Food4toddlers study represented all Norwegian 19 counties, which was possible because we used Facebook as the recruitment platform and had no face-to-face components in the intervention. The possibility of reaching a large and widespread population is one of the main benefits of using eHealth approaches [21]; however, we aimed for a larger sample in this study. Separate analyses for fruits and vegetables could also be viewed as strength due to different consumption patterns and tastes [62-64], and recommended for studies targeting young children [76, 77]. A recently published review paper addresses the need to examine both variety and intake (quantity) of fruit and vegetables due to the different findings regarding health outcomes, and this review also revealed that such research was particularly lacking in young age groups [35].

A limitation of the study is the low generalizability of the findings due to the participants' education level, which is higher than national figures [78]. It is conceivable that a more representative sample might have resulted in a larger intervention effect, as indicated in other studies [79, 80]. Even though

both parents were invited to participate, 287 of 291 participants were mothers. We do not know if our findings would have been different if more fathers were included. We aimed at recruiting a larger sample, but time and cost (i.e., expensive Facebook advertisement), limited that. Therefore, we ended up with more restricted sample size, and hence lower statistical power than planned for. It turned out to be challenging to recruit parents through Facebook when the children were around ten months of age, possibly because parents in Norway often start working after the maternity leave around that time. Quantifying the dietary intake in grams and nutrient calculation might have added value to the assessments, however, portion size estimations were not recorded. Self-reported Food frequency questionnaires have limitations, especially in this age group where dietary habits are rapidly changing and the answers are solely dependent on the parents' observations and suggestions [81]. A potential bias in intervention group reporting could be answering according to the perceived intention of the intervention (e.g., higher intake of vegetables) [82]. The three questionnaires were delivered in different Nordic seasons (two in autumn/winter and one in winter/spring), which could have influenced the results, especially for fruit and vegetable intake. If so, the effect of the intervention would tend to be overrated. The digital approach limited the possibilities of collecting objective measurements leaving self-reported measures as the only option, which has limitations [83].

Conclusion

In this study, we investigated the effects of the Norwegian Food4toddlers randomized controlled trial. An intervention effect on the frequency of intake of vegetables was observed immediately after the six months intervention period ended. The difference was attenuated and no longer significant at follow-up 2, six months post-intervention. The consumption of discretionary food increased by time in both groups.

Despite the potential of reaching a large population with limited resources, few eHealth interventions seeking to enhance children's diet have targeted parents of toddlers at this key time in

children's food preference development. Our results show that there is a potential to improve aspects of young children's diets utilizing this kind of intervention. To obtain long term effects in eHealth interventions, longer duration should be considered along with tailoring in a digital or a personal form. Delivering short reminders after the end of the main content of the intervention may contribute to better adherence and are easily feasible in eHealth interventions.

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Abbreviations

RCT: Randomized Controlled Trial

BMI: Body Mass Index

EMM: Estimated marginal means

GEE: Generalized estimating equations

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Availability of data and materials

Dataset supporting the conclusions of this article will be available in the UiA Open Research repository https://dataverse.no/dataverse/uia.

Authors` contributions

MR, ERH, FNV, and NCØ initiated and designed the study and developed the intervention. MR performed the data collection supervised by ERH, FNV, and NCØ. MR and ACM performed the analyses. MR drafted the manuscript with substantial input from ACM, ERH, FNV, WVL, KC, and NCØ. All authors contributed to, read, and approved the final version of this manuscript.

Ethics approval and consent to participate

This trial was approved by the Norwegian Centre for Research Data, 29/06/2017, ref.: 48643. Written consent was obtained from all parents on the study's homepage [26] when they chose to sign up for participation.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Additional files

Title: CONSORT EHEALTH checklist for the Food4toddlers trial.

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Paper 4

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Original Paper

Process Evaluation of an eHealth Intervention (Food4toddlers) to Improve Toddlers' Diet: Randomized Controlled Trial

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Abstract

Background: Parents seek trustworthy information online to promote healthy eating for their toddlers. Such information must be perceived as relevant and easy to implement and use.

Objective: The objectives of this study were to conduct a process evaluation of the electronic health (eHealth) intervention (Food4toddlers) targeting food environment, parental feeding practices, and toddlers' diet and to examine possible differences in these areas according to education and family composition.

Methods: A 2-armed randomized controlled trial, including 298 parent–toddler dyads from Norway, was conducted in 2017. In total, 148 parents in the intervention group received access to an intervention website for 6 months. Data on website usage were retrieved from the learning management platform used (NEO). Participants' satisfaction with the intervention was asked for in a postintervention questionnaire. Chi-square and *t* tests were used to examine differences in usage and satisfaction between education and family composition groups.

Results: Most participants were mothers (144/148, 97.2%), lived in two-adult households (148/148, 100%), and were born in Norway (132/148, 89.1%). Mean parental age was 31.5 years (SD 4.2). More than 87.8% (129/147) had a university education degree and 56.5% (83/147) had over 4 years of university education. Most (128/148, 86.5%) intervention participants entered the website at least once (mean days of access 7.4 [SD 7.1]). Most parents reported the website as appropriate to the child's age (71/83, 86%) and self-explanatory (79/83, 95%) and appreciated the interface (52/83, 63%) and layout (46/83, 55%). In total, 61% (51/83) stated that they learned something new from the intervention. Parents with over 4 years of university education and in 1-child households used the intervention website more than those with 4 years or less of university education (8.4 vs 5.9 days in total, *P*=.04) and households with more than 1 child (8.3 vs 5.8 days in total, *P*=.04), respectively.

Conclusions: The Food4toddlers intervention website was found to be relevant by most participants in the intervention group, although usage of the website differed according to educational level and family composition. For eHealth interventions to be effective, intervention materials such as websites must be used by the target group. Our results highlight the need to include users from different groups when developing interventions.

Trial Registration: ISRCTN Registry ISRCTN92980420; http://www.isrctn.com/ISRCTN92980420

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KEYWORDS

toddler; mHealth; usability; eHealth; diet intervention; digital intervention; education difference

Introduction

A healthy diet is fundamental to preschoolers' health and development, for which parents are responsible. A high proportion of parents feel insecure and seek advice regarding food parenting practices via different sources [1]. Internet is a powerful and popular source for health information among parents [2-4]. Still, very few theory- and evidence-based websites or digital apps with trustworthy information exist for this group. Among the few electronic health (eHealth) interventions addressing food parenting practices and child diet that have been developed [5-7], most have been conducted in children older than 1 year of age [5]. Furthermore, interventions targeting parents of preschoolers have shown divergent effectiveness [8].

Mobile health (mHealth) and eHealth interventions are gaining popularity, as such interventions have the potential to reach a large target group, can easily be adapted to new groups, are available 24/7, and can be cost-effective [8-10]. However, for eHealth interventions targeting parents of preschoolers to be effective, one needs to take the interplay between parents' needs and the eHealth intervention's content into account. This means that the information provided has to fit with the child's age, be relevant, be easily accessible by the parents, and be perceived as engaging and meaningful [9]. Although the usage and parental satisfaction of eHealth interventions are crucial, little attention has been given to process evaluation of eHealth interventions targeting parents of young children, addressing intervention use and parental intervention satisfaction.

A few other studies have reported on parental use and satisfaction of eHealth interventions targeting young children. One is the Early Food for Future health study, in which Helle et al [11] found that a high proportion of parents used the intervention website and were well satisfied. A recent paper from the Growing Healthy Program in Australia reported both quantitative and interview data on how parents used and whether they were satisfied with an infant health app, concerning mode of delivery and how the quality of the app was perceived [12]. They found that factors such as previous knowledge and parity affected how the participants appreciated the app. This highlights the need for identifying whether there are differences in the use and satisfaction with the app according to group characteristics. Within public health, there is a focus on socioeconomic differences in health and how to reduce this gap [13]. eHealth interventions aim to improve health and should, ideally, work equally well in different socioeconomic groups, meaning that use and perceived satisfaction should be similar in different socioeconomic groups, including in groups with different educational levels.

We have previously developed and evaluated the effect of a dietary eHealth intervention called Food4toddlers in a randomized controlled trial, targeting parents of 12-18-month-old children [14]. The objectives of this study were to conduct a process evaluation of this eHealth intervention by examining the usage and perceived satisfaction of the intervention website among parents of toddlers and to explore whether this differed according to educational level and number of children in the household.

Methods

Study Design

Food4toddlers is a randomized controlled trial, aiming to promote healthy dietary habits among toddlers [14]. A total of 404 parents of 12-month-old children were recruited through a Facebook advertisement, who then responded to a baseline questionnaire and were randomized into an intervention group and a control group. Participants in the intervention group were given access to the Food4toddlers website for 6 months. Further, they responded to questionnaires immediately after the end of the intervention (follow-up 1) that included process evaluation measurements, and again 6 months postintervention (follow-up 2).

Eligible individuals were parents of children born between June 2016 and May 2017. The parents had to be literate in Norwegian. Of the 404 recruited parents, 298 (73.8%) filled in more than half of the baseline questionnaire which was the minimum requirement to be randomized into either the control or intervention group (n=148). Postintervention, at child age 18 months (follow-up 1), 220 participants completed all or parts of the questionnaire, with 99 of these from the intervention group. Details of the recruitment strategy, the development of the intervention, and the randomized trial are described in the study protocol [14]. The study was approved by the Norwegian Centre for Research Data on June 08, 2016 (reference number 48643). Informed consent from parents was obtained when they signed in online for participation. Data from the intervention group at baseline and follow-up 1 are reported in this study.

The Food4toddlers eHealth Intervention

The intervention group had 6 months of access to the Food4toddlers website which comprised 4 main elements: (1) lessons (n=22) on how to provide healthy food and create a healthy eating environment for the toddler, (2) recipes, (3) a discussion forum, and (4) basic information about food and beverages (called *Good to know*). Initially, the web page was limited to information relevant for the child's age at baseline and gradually expanded in 20 steps as the child got older. The participants received a weekly email with a link to the newly available information. Each module had elements of activities, such as quizzes, videos to watch, facts, and myth busting [14].

Data and Measurements

In this paper, we present the following elements from the process evaluation: (1) the exposure or usage of the intervention, (2) parental satisfaction with the intervention, and (3) parental perception of learning something new from the intervention. To assess the exposure or usage of the website we used data automatically registered by the Learning Management System NEO. NEO is a platform for managing digital classroom activities and tracking student achievement. It has an intuitive design, making it easy to obtain access to information. The user data were manually retrieved from NEO. The data accessible were (1) number of days the participants accessed the website, (2) the use of the 22 *Food4toddlers* lessons, and (3) activity on

a discussion forum. No data on the use of the recipes and the *Good to know* section were available. Some participants visited the website but had no reports on the use of any lessons. They were coded as *1-day users* because they theoretically could have used the rest of the website except the lessons (eg, recipes).

In addition to the automatically registered information on participant's use of the website, we used data from the postintervention questionnaires. The intervention group responded to questions about the use and satisfaction of the intervention's website at follow-up 1 (end of intervention). Parents were asked how many of the recipes they had tried, with response alternatives *none*; *none, but was inspired*; *1-5*; *6-10*; and *11 or more.* We further asked them which part of the intervention they found most useful (lessons, recipes, *Good to know* site, or whether they did not know what they preferred). Further, the parents graded statements about their satisfaction (1-7) with the intervention and perception of learning something new (8): Do you agree or disagree with these statements: *(1) The content was well adapted to my child's age, (2) The text was understandable, (3) The website was user-friendly, (4)The website had an appealing layout, (5) The recipes were easy to follow, (6) The recipes were easily adapted for the whole family, (7) The films for the recipes were useful,* and *(8) I learned something new.* The response alternatives were given by a 5-point scale from 1=*strongly disagree* to 5=*strongly agree* with an additional *I don't know* response alternative. The answers were recoded into 3 groups for the analyses in this paper (*agree, indifferent,* or *disagree*).

Other Measures

Parents' height and weight were self-reported. For their child, measures recorded at the health care centers were reported if available. The participants reported their age and their child's age at baseline. Further, they reported the number of persons in the household in 2 different questions: (1) number of adults and (2) number of children. They also reported county of residence and marital status (married, partnered, single, divorced/separated, widow/er, or other). The number of children in the household was dichotomized into those with 1-child households and those with more than 1 child in the household. Participants also reported on their level of education (primary school or less, primary schools plus 1 year of further education, high school, vocational school, upper secondary school or less, college/university [≤4 years], college/university [>4 years], other, and do not know). Only 18 persons were categorized with no higher education, which is a low number when doing subanalyses; therefore, we dichotomized the education variable as presented above. Consequently, the comparisons in this study were between parents with more than 4 years and those with 4 years or less of education, and between parents with 1-child households and those with more children in the household.

Statistical Analysis

Means with standard deviations for continuous variables and frequencies and percentages for categorical variables were reported. The chi-square tests were used to test potential differences in the perceived value of the intervention between the 2 education groups and according to the number of children in the household. Independent sample *t* tests were used to test potential group differences for continuous variables. All analyses were conducted in SPSS version 25 (IBM). Statistical significance was set to the $P \leq .05$ level.

Availability of Data and Materials

The data set supporting the conclusions of this article will be available in the UiA Open Research repository.

Results

Participant Characteristics

The characteristics of the participants included in the intervention are summarized in Table 1. Mean parental age was 31.5 years (SD 4.2; Table 1). Most participants were mothers (144/148, 97.2%), lived in 2-adult households (148/148, 100%), and were born in Norway (132/148, 89.1%). There were participants from all over Norway, originally reported by county of residence, with representation from all 19 Norwegian counties; however, these data are presented in Table 1 as numbers from each of the main parts of Norway. Of the participants in the intervention group, 56.4% (83/147) had more than 4 years of university education.

Table 1. Baseline characteristics of parents and toddlers in the intervention group (N=148).

Characteristic	Intervention group
Parent	
Mother/father (n)	144/4
Age (year), mean (SD)	31.5 (4.4)[a]
Height (cm), mean (SD)	169 (6.0)
Weight (kg), mean (SD)	70.8 (14.3)
BMI (kg/m^2), mean (SD)	24.9 (4.6)
Two-adult household[b], n (%)	148 (100)
Total number of household members, mean (SD)	3.6 (1.0)
Born in Norway, n (%)	132 (89.1)
Educational level[a]	
Less than college/university (≤4 years), n (%)	64 (43.5)
College/university (>4 years), n (%)	83 (56.4)
Geographic residence	
Northern Norway, n (%)	8 (5.4)
Central Norway, n (%)	16 (10.8)
Western Norway, n (%)	34 (22.9)
Southern Norway, n (%)	24 (16.2)
Eastern Norway (including Oslo), n (%)	66 (44.5)
Toddlers	
Age (months), mean (SD)	10.9 (1.3)
Child's sex: Female, n (%)	69 (46.6)

[a]One missing case in this variable.

[b]Live together with the other parent.

Participants' Use of the Intervention (Usage)

All 148 persons in the intervention group were included in the analyses based on data retrieved from NEO, including 1 person that first got access to the intervention and then decided to quit and 2 participants that did not get access mistakenly (all 3 with no access data). From the NEO data we found that 13.5% (20/148) of parents in the intervention group did not enter the website at any point (Table 2). The mean number of days of access was 7.4 (SD 7.1). Each of the 22 lessons comprised more than 1 webpage and we registered whether the participants had completed the entire lesson or not. On average, the participants completed 8 of 22 lessons (range 0-22; Table 2).

In the intervention group, 99/148 (66.9%) participants answered at least parts of the questionnaire at follow-up 1. However, only 83/148 (56.1%) participants answered the last questions in the questionnaire that concerned the website use. When evaluating the use of the individual components on the website, most participants in the intervention group reported having used *1-5 recipes* (38/83, 46%) or *none but was inspired* (27/83, 33%; Table 2).

Table 2. Participants' use of the intervention website and recipes tried.

Intervention use[a]	Value
Website use (N=148)	
Did not enter, n (%)	20 (13.5)
Days of access, mean (SD); min-max	7.4 (7.1); 0-32
Finalized lessons, mean (SD); min-max	8.0 (7.6); 0-22
Recipes (number) tried (N=83)[b]	
None, n (%)	8 (10)
None, but was inspired, n (%)	27 (33)
1-5, n (%)	38 (46)
6-10, n (%)	9 (11)
11 or more, n (%)	1 (1)

[a]Data were retrieved from the Food4toddlers website. One participant got access to the intervention but decided to quit. Two did not get access to the intervention mistakenly. These 3 are included in the reported numbers.

[b]Questions answered at follow-up 1 (postintervention at child age 18 months).

Use of the Intervention Website According to Parental Education and Number of Children in the Household

Participants with more than 4 years of university education accessed the website for significantly more days than those with a lower educational level (P=.04). In addition, those with more than 4 years of university education completed more lessons than those with fewer years of education (P<.05). There was also a difference in use between parents living in 1-child households and those living in a household with more than 1 child. Parents in 1-child households accessed the website for significantly more days compared to those with more children (P=.04; Table 3).

Table 3. Comparison of website use between education groups (N=147) and between 1-child and >1 child households (N=148).

Analyzed component	≤4 years of university education[a] (N=64)	>4 years of university education[a] (N=83)	P value[b]	Household with 1 child[c] (N=86)	Household with >1 child[c] (N=62)	P value[b]
Days of access in total, mean (SD)	5.9 (6.8)	8.4 (7.2)	.04	8.3 (7.8)	5.8 (5.7)	.04
Number of lessons finished, mean (SD)	6.6 (7.3)	9.1 (7.7)	<.05	8.9 (7.8)	6.7 (7.2)	.09

[a]Parents were divided based on educational level into those with 4 years or less of university education and those with more than 4 years of university education.

[b]Independent sample t test.

[c]Asked about how many children were included in the household, divided into 1 child versus more children.

Satisfaction of the Intervention Website's Modules and Topics

When asked about what part of the intervention website the participants found to be most useful, 43% (36/83) were most satisfied with the recipes, whereas 31% (26/83) valued the modules as the most useful part of the intervention. Participants also reported to which degree they agreed with different statements regarding how they found the intervention website. The majority of the participants agreed that the website content applied to their child's age (71/83, 86%) and that the texts were easy to understand (79/83, 95%). Most parents in the intervention group reported that they appreciated the interface (52/83, 63%) and layout (46/83, 55%). We also asked to which degree the participants valued the recipes and films. In total, 83% (62/75) found the recipes easy to follow, and 80% (60/75) found them easy to adjust to the whole family. Only 32% (24/75) found the films posted on the intervention website useful. There were no significant differences in how the intervention website and the recipes were valued between those with more than 4 years of university education and those with a lower educational level (data not shown).

There was low activity in the discussion forum including in the learning platform. The most active participant posed questions and responded 5 times, whereas 7 other participants posed a single question during the period when they had access to the forum. The first author (MR) of this paper responded to all questions.

Perceived Acquisition of New Knowledge From the Intervention Website According to Educational Level and Number of Children in the Household

In total, 61% (51/83) reported that they learned something new from the intervention website (Table 4). There was a borderline

significant difference between educational groups when asked whether the participants had learned something new (*P*=.052). More of the highly educated participants agreed that they had learned something new, whereas more participants with moderate education were indifferent to this statement (Table 4).

Table 4. Perceived acquisition of new knowledge among parents in the intervention group according to educational level and number of children in the household, through response to the prompt "Think of the Food4toddlers website in total, and indicate how strongly do you agree/disagree with the statement *I learned something new?*"

Statement	All (N=83)	≤4 years of university education[a] (N=33)	>4 years of university education[a] (N=50)	*P* value	One-child household[b] (N=52)	>1 child in household[b] (N=31)	*P* value
Agree, n (%)	51 (61)	17 (52)	34 (68)	—[c]	35 (67)	16 (52)	—[c]
Indifferent, n (%)	21 (25)	13 (39)	8 (16)	—[c]	12 (23)	9 (29)	—[c]
Disagree, n (%)	11 (13)	3 (9)	8 (16)	.05	5 (10)	6 (19)	.30

[a]Parents were divided based on educational level into those with 4 years or less of higher-level education and those with more than 4 years of higher-level education.

[b]Parents reported how many children were included in the household, divided into 1 child versus more children.

[c]Not applicable.

Discussion

Principal Findings

Most parents today use the internet to obtain information relevant to their child's health [15]; however, they report that they need more training to distinguish between trustworthy and not trustworthy sources [16]. In the Food4toddlers study, we developed a website with evidence-based information relevant to toddlers' diet, food environment, and parenting practices. More than 86.5% (128/148) of parents in the intervention group visited the website and most of them found the website useful, especially the modules and the recipes. The website content, texts, and interface were highly valued by most parents, which may have influenced parental engagement on the website. Besides, most parents in the intervention group found the content applicable to their child's age. This is an important result, as it is established that finding the information presented appropriate and given at the right time are essential to change behavior [9].

Although the participants rated the recipes as the most important part of the intervention, they did not find the films made for the recipes as useful as the other components. This may indicate that written recipes might be sufficient for use, or that our produced films did not quite suit the target group. Few participants used the discussion forum which was a part of the website. It might be that parents discuss in other online forums and that our forum seemed new and different, or of no need. Using a closed Facebook group, which is a common discussion forum type, might have increased the activity in the discussions. This is supported by a study by Boswell and collaborators [17] in which parents reported Facebook as the preferred digital platform for participating in an intervention. However, in the parent-focused Time2bHealthy study closed Facebook groups were made available, but less than 40% agreed or strongly agreed that the Facebook component was useful [18]. Our goal with including such a discussion forum was that participants could motivate each other and share experiences; however, as also others have found [18], the inclusion of such a forum might not be worth the effort of setting up.

A total of 13.5% (20/148) of parents who had access to the intervention website did not enter it at any point, which is higher than what is observed in other studies. The Swedish MINISTOP study had a very high website visitor rate [19], possibly because the investigators met the participants in person and called them on the phone 2 days after log-in instructions were delivered. Although we sent email reminders to the participants who did not log in, the adherence might have been higher by adding, for example, a phone call as in the MINISTOP study. Other studies have also emphasized personal contact (eg, the Australian Time2bHealthy study) [18]. However, the costs rise with more intensive follow-up of participants and will limit distribution to a large population. In addition, the website visitor rate in our study is probably more in line with what can be expected when offering access to a web-based learning tool outside a test situation. Boswell and collaborators [17] interviewed parents about their preferred mode of intervention participation and found that they preferred a combination of online sources (websites, email, or Facebook). Parents with lower education levels also preferred this combination; however, in this group, more parents wanted to combine the online scores with face-to-face components [17]. It is worth noting that the use of more advanced push notifications is increasingly being used in digital health interventions [20,21], and could have boosted both the participation and the parental engagement on the website.

There were differences in website use between education groups and between those with 1 or more children in the household. It is somewhat surprising that those with the highest education spent more time using the website, and also that there is a borderline difference in whether they found that they had learned something new from the website, with results in favor of the more educated parents. Taki and collaborators [12] reported that parents defined as knowledgeable in parenting skills found eHealth interventions less useful because they did not learn anything new from it. Having a higher education does not translate directly into parenting skills, and one could speculate that higher education creates a higher drive to learn more. However, in the light of public health efforts to reduce social

differences in health, this finding is not a positive one, as it indicates that interventions of this kind might increase the socioeconomic divide. It is worth noting that the cutoff between education groups in this study was set high, due to the educational characteristics of the sample. The findings of this study may, therefore, indicate that there are differences in the gain of health-related information as well between parents with higher education. Although we included a diversity of user groups in the development phase of the intervention, including mothers of lower socioeconomic group, we could have put even more emphasis to tailor the content and interface to different groups. A pilot study including parents with different socioeconomic groups or parents with different educational levels would probably have given valuable input, especially followed by interviews targeting both high and low adherent participants.

It was not surprising that those with more children in the household, and thereby more experience in feeding toddlers and potentially less time available, spent less time on the intervention than those in 1-child households. This is in line with what Taki et al [12] describe, that is, previously acquired knowledge about infant feeding yields lower engagement in eHealth intervention of that topic.

Strengths and Limitations

We obtained objective information about parental access to the intervention from the learning management system (NEO). This means we did not need to solely rely on participants' self-reported responses to the postintervention questions, which is a clear strength of this study. When interpreting the effect results of this intervention, it is a clear strength that a detailed process evaluation has been conducted.

The participants in our study had a substantially higher educational level compared with national figures [22]. This may compromise the generalizability of our findings. A different spread in educational level would probably have yielded different results, as indicated in other studies [23,24]. Our results highlight the importance of working hard to include not just highly educated groups in studies, as is the case with this study. The overall high educational level in this study influenced our educational level cutoff. Further, although participants were from all Norwegian counties, proportionally more participants were from the southern parts compared with national figures [25], which may hamper generalizability.

Conclusion

Few previous eHealth interventions focusing on diet have reported data from process evaluations, including parental usage and satisfaction with the intervention, as is the case with this study. We found that most participants used the intervention website during the intervention period, and that they found it relevant and useful. Parents with more than 4 years of university education used and learned more from this intervention than those with a lower educational level. Our findings highlight the utmost importance of including users from different groups when developing eHealth interventions and may inform future interventions to take particular care in matching intervention content to different educational and socioeconomic groups' needs.

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Authors' Contributions

FNV, ERH, and NCØ initiated and designed the study. ERH, FNV, NCØ, and MR developed the intervention. MR, ACM, FNV, MR, WVL, ERH, and NCØ initiated and developed the paper. MR performed the data collection supervised by ERH, FNV, and NCØ. MR and NCØ analyzed and drafted the first version of the paper. All authors gave substantial input to the paper. All authors contributed to, read, and approved the final version of this paper.

Conflicts of Interest

None declared.

Multimedia Appendix 1

CONSORT-eHEALTH checklist (V 1.6.1).
[PDF File (Adobe PDF File), 3302 KB-Multimedia Appendix 1]

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Abbreviations

eHealth: electronic health
mHealth: mobile health

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Appendix 1

Information letter to the parents.

Available at the studies website (https://www.uia.no/mattilminsten)

Forespørsel om deltagelse i forskningsprosjektet

Mat til minsten

Utvikling og evaluering av en E-helse intervensjon laget for å gjøre det enklere for foreldre å skape et godt mat- og spisemiljø for barna sine.

Bakgrunn og hensikt

Dette er en forespørsel til deg eller dere som forelder om å delta i en forskningsstudie som skal gjennomføres blant småbarnsforeldre med barn i alderen 12 – 18 måneder. Til sammen ønsker vi å rekruttere ca. 500 barn og foreldre.

Forskning viser at kost- og livsstilsvaner etableres tidlig, og at foreldre har svært stor betydning for hva slags grunnleggende mønstre som dannes. Videre viser forskning at disse tidlige mønstrene er viktige for barnets helse på lang sikt. Dette gjelder spesielt når en ser på risiko for livsstilssykdommer og utvikling av overvekt, lidelser som i økende grad også rammer store deler av barne- og ungdomsbefolkningen i Norge.

I dette prosjektet skal vi utvikle og evaluere effekten av et nettsted, Mat til minsten, som tilbys foreldre. Vi vil undersøke om dette digitale programmet, kan formidle kunnskap om gode og sunne matvaner i en periode som er viktig for barnet og gjerne veldig krevende for foreldrene.

Mat til minsten vil omhandle aldersbestemt mat- og spiseutvikling og gi tips og ideer til hvordan en kan legge til rette for et godt matmiljø for barnet i forhold til ernæring, måltidsrammer og praktisk matlaging. Det som formidles på nettstedet er i samsvar med helsemyndighetenes råd og anbefalinger om ernæring for denne gruppen. Det vil også bli registret og undersøkt hvordan dere foreldre bruker nettstedet. Det er en forskergruppe (Feed) ved Universitetet i Agder, Institutt for folkehelse, idrett og ernæring, som gjennomfører studien. Prosjektet er finansieres av Universitetet i Agder.

På studiens åpne nettside (https://www.uia.no/mattilminsten) kan du se en kort film som presenterer studien og melde deg på dersom du er interessert og har barn i riktig alder.

Hva innebærer studien?

Dere som takker ja til deltagelse blir spurt om å fylle ut to elektroniske spørreskjema: Ett når barnet er ca. 11 måneder gammelt og deretter ved 18 måneders alder. Skjemaet vil ta ca. 30 minutter å fylle ut. En av foreldrene svarer på spørreskjemaet, men begge kan få tilgang til nettstedet om de kommer i den aktuelle gruppen (se under).

Selve spørreskjemaet:

- Den første delen omhandler barnet. Det spørres om bakgrunnsinformasjon som kjønn, vekt og utvikling og i denne delen vil mange av spørsmålene handle om kost/matvaner, spiseatferd og barnets og familiens matmiljø.

- Andre del omhandler deg som forelder. Du blir spurt om bakgrunnsopplysninger som utdanning, arbeids- og boforhold. Det stilles også spørsmål om livsstil, kost og matvaner.

For å finne ut om nettstedet egner seg som informasjonskilde, må vi sammenlikne to grupper av foreldre og barn. Derfor vil deltakerne tilfeldig bli fordelt i to like store grupper:

- En *intervensjonsgruppe* som får tilgang til nettstedet.

- En *kontrollgruppe* som *ikke* får tilgang til nettstedet.

Det er like viktig for studien å få deltagere til kontrollgruppen som til intervensjonsgruppen. Foreldre både i intervensjons- og kontrollgruppe kan få fremtidige forespørsler om å delta i oppfølgingsundersøkelser.

Mulige fordeler og ulemper

Enten dere kommer i intervensjons- eller kontrollgruppen, bidrar du og barnet ditt til økt kunnskap om hvordan barns matvaner dannes og formes i tidlig alder. Dere bidrar også til kunnskap om hvordan foreldre på best mulig måte kan støtte barnets tidlige spiseutvikling og etablere gode, helsefremmende matvaner. Det er planlagt at denne intervensjonen skal være tilgjengelig for alle med barn i aktuell alder når studien er avsluttet. På sikt kan dette bedre befolkningens helse, særlig med tanke på å forebygge overvekt og livsstils-sykdommer.

Studien vil ikke medføre andre ulemper enn den tiden det tar å fylle ut det elektroniske spørreskjemaet når barnet er ca. 12 mnd. og 18 mnd. (ca. 30 min hver gang). Alle som svarer på begge spørreskjemaene er med i trekningen om 10 universalgavekort pålydende 1000 kr.

Hva skjer med informasjonen som samles inn?

Informasjonen som registreres om ditt barn og deg, skal kun brukes slik som beskrevet i hensikten med studien. Alle opplysningene vil bli behandlet uten navn, fødselsnummer eller andre direkte gjenkjennende opplysninger. En kode knytter foreldre og barn til opplysningene gjennom en navneliste. Det er kun forskningsteamet knyttet til prosjektet som har adgang til navnelisten og som kan finne tilbake til deg og ditt barn. Det vil ikke være mulig å identifisere noen av partene når resultatene av studien publiseres. Prosjektet skal etter planen avsluttes i løpet av 2022, og det vil da heller ikke være mulig for prosjektgruppen å knytte informasjon til deltakere. Studien er meldt til Personvernombudet for forskning, NSD - Norsk senter for forskningsdata AS.

Frivillig deltakelse

Det er frivillig å delta i studien. Du kan når som helst og uten å oppgi noen grunn trekke ditt

samtykke til å delta i studien. Dersom du har spørsmål knyttet til studien, kan du kontakte Margrethe Røed på epost margretr@uia.no eller telefon 38 14 18 86.

Du samtykker til deltagelse ved å fylle ut påmeldings-feltene med barnets fødselsdato og din epost (https://www.uia.no/mattilminsten)

Vennlig hilsen

Margrethe Røed
Stipendiat

Nina Øverby
Professor ved Universitetet i Agder

Prosjektleder

Appendix 2

Baseline questionnaire (child age 10.9 months)

Tusen takk for at du vil delta i studien **Mat til minsten**

Spørreskjemaet vil ta ca 30. minutter å besvare. Hvis du ikke har tid til å fylle ut hele skjemaet på en gang, kan du stoppe underveis og gå tilbake til skjemaet senere. Noen spørsmål kan virke like, men de danner en helhet til slutt.

Du kan når som helst bruke knappene nedenfor for å navigere deg frem og tilbake i spørreskjemaet.

Trykk på neste for å komme i gang.

Lykke til!

Med vennlig hilsen Mat til minsten teamet

Universitetet i Agder

Dato for utfylling av skjema. Må skrives år-måned-dag. For eksempel 2017-09-21

_____

Hva er din relasjon til barnet som deltar i studien?

- ☐ Jeg er mor
- ☐ Jeg er far
- ☐ Jeg er ingen av delene, beskriv_____

Bor du sammen med far/mor til barnet?

- ☐ Ja
- ☐ Nei

Spørsmålene i denne delen gjelder barnet ditt som nå er ca. ett år. De omhandler bakgrunnsopplysninger, vekst og utvikling og barnets spisevaner. Til slutt kommer noen spørsmål om barneoppdragelse.

Er barnet ditt tvilling/trilling?

- ☐ Nei
- ☐ Ja. Fyll da ut skjemaet for det eldste barnet

Hva er barnets fødselsdato? Må skrives år-måned-dag. For eksempel 2016-09-30

_____

Hva er barnets kjønn?

- ☐ Jente
- ☐ Gutt

Hva var barnets vekt og lengde ved fødsel?

Vekt (gram) _____

Lengde (cm) _____

Hvor passes barnet på dagtid nå?

- ☐ Hjemme med mor/far
- ☐ Hjemme med dagmamma/praktikant
- ☐ Hos dagmamma
- ☐ I familiebarnehage
- ☐ I barnehage
- ☐ Annet, beskriv _____

Hvor ofte pleier barnet ditt å spise følgende måltider i løpet av en uke? (ganger per uke(g/uke))

	Aldri/sjeldnere enn hver uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Frokost	☐	☐	☐	☐	☐	☐	☐	☐
Formiddagsmat/lunsj	☐	☐	☐	☐	☐	☐	☐	☐
Mellommåltid før middag	☐	☐	☐	☐	☐	☐	☐	☐
Middag	☐	☐	☐	☐	☐	☐	☐	☐
Kveldsmat	☐	☐	☐	☐	☐	☐	☐	☐
Andre måltider/mellommåltider	☐	☐	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende måltider **sammen med familien** nå? (ganger per uke(g/uke))

	Aldri/sjeldnere enn hver uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Frokost	☐	☐	☐	☐	☐	☐	☐	☐
Formiddagsmat/lunsj	☐	☐	☐	☐	☐	☐	☐	☐
Mellommåltid før middag	☐	☐	☐	☐	☐	☐	☐	☐
Middag	☐	☐	☐	☐	☐	☐	☐	☐
Kveldsmat	☐	☐	☐	☐	☐	☐	☐	☐
Andre måltider/mellommåltider	☐	☐	☐	☐	☐	☐	☐	☐

Har barnet utfordringer i forhold til spising/mat? Kan sette flere kryss

- ☐ Nei, har ingen utfordringer
- ☐ Ja, dårlig matlyst/småspist
- ☐ Ja, liker få matvarer
- ☐ Ja, vanskelig med tilvenning til familiens kosthold
- ☐ Ja, allergi/intoleranse mot enkelte matvarer
- ☐ Ja, andre problemer - beskriv _____

Hvor ofte får barnet følgende drikker nå for tiden?

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g/døgn	5 g eller mer/døgn
Morsmelk	☐	☐	☐	☐	☐	☐	☐	☐
Morsmelkerstatning	☐	☐	☐	☐	☐	☐	☐	☐
Vanlig søt melk, alle typer (skummet, lett, helmelk)	☐	☐	☐	☐	☐	☐	☐	☐

Surmelk, alle typer (yoghurt, biola, cultura o.l.)	☐	☐	☐	☐	☐	☐	☐	☐
Sjokolademelk, alle typer	☐	☐	☐	☐	☐	☐	☐	☐
Vann	☐	☐	☐	☐	☐	☐	☐	☐

Hvor ofte får barnet følgende drikker nå for tiden?

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g/døgn	5 g eller mer/døgn
Saft, sukret	☐	☐	☐	☐	☐	☐	☐	☐
Saft, kunstig søtet	☐	☐	☐	☐	☐	☐	☐	☐
Juice	☐	☐	☐	☐	☐	☐	☐	☐
Brus, sukret	☐	☐	☐	☐	☐	☐	☐	☐
Lettbrus, kunstig søtet	☐	☐	☐	☐	☐	☐	☐	☐
Smoothie, kjøpt	☐	☐	☐	☐	☐	☐	☐	☐
Smoothie, hjemmelaget	☐	☐	☐	☐	☐	☐	☐	☐
Annet	☐	☐	☐	☐	☐	☐	☐	☐

Får barnet hjemmelaget middagsmat eller ferdigkjøpt (industrifremstilt) barnemat på glass/klemmeposer?

- ☐ Bare hjemmelaget
- ☐ Mest hjemmelaget
- ☐ Omtrent halvparten av hvert
- ☐ Mest ferdigkjøpt
- ☐ Bare ferdigkjøpt

Hvor ofte spiser barnet følgende mat nå for tiden?

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g/døgn	5 g eller mer/døgn
Industrifremstilt grøt, alle typer	☐	☐	☐	☐	☐	☐	☐	☐
Hjemmelaget grøt av grovt/sammalt mel eller havregryn/havremel	☐	☐	☐	☐	☐	☐	☐	☐
Hjemmelaget grøt av fint/hvitt mel, kavring, semule, ris, eller mais	☐	☐	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende mat nå for tiden?

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Industrifremstilt middag på glass/klemmepose med bare grønnsaker	☐	☐	☐	☐	☐	☐
Industrifremstilt middag på glass/klemmepose med grønnsaker og kjøtt/kylling/kalkun	☐	☐	☐	☐	☐	☐
Industrifremstilt middag på glass/klemmepose med grønnsaker og fisk	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende mat nå for tiden? Industrifremstilt middagsmat på glass/klemmeposer skal ikke regnes med her

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Kjøtt, kjøttdeig, kjøttboller, pølse o.	☐	☐	☐	☐	☐	☐
Fisk, fiskeboller/-kaker, fiskepudding o.l.	☐	☐	☐	☐	☐	☐
Pannekaker	☐	☐	☐	☐	☐	☐
Pizza	☐	☐	☐	☐	☐	☐

Pasta	☐	☐	☐	☐	☐	☐
Ris	☐	☐	☐	☐	☐	☐
Brødskiver	☐	☐	☐	☐	☐	☐

Hvor grovt er brødet du vanligvis serverer til barnet ditt ifølge brødskalaen nedenfor?

☐ ☐ ☐ ☐

Hvor mange brødskiver spiser barnet ditt på en vanlig dag?

Antall brødskiver (stk): _____

Hvor ofte spiser barnet følgende mat nå for tiden? Industrifremstilt middagsmat på glass/klemmeposer regnes ikke med her

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Poteter	☐	☐	☐	☐	☐	☐
Kokte grønnsaker	☐	☐	☐	☐	☐	☐
Rå grønnsaker (også salat/råkost)	☐	☐	☐	☐	☐	☐
Frukt	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende mat nå for tiden?

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Kaker, vafler, søt kjeks	☐	☐	☐	☐	☐	☐
Dessert/iskrem	☐	☐	☐	☐	☐	☐
Sjokolade	☐	☐	☐	☐	☐	☐
Smågodt, seigmenn, annet godteri	☐	☐	☐	☐	☐	☐
Chips o.l.	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet disse grønnsakene nå for tiden? Ta med både rå, kokte og mosede grønnsaker (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Gulrot	☐	☐	☐	☐	☐	☐
Kålrot	☐	☐	☐	☐	☐	☐
Søtpotet	☐	☐	☐	☐	☐	☐
Blomkål	☐	☐	☐	☐	☐	☐
Brokkoli	☐	☐	☐	☐	☐	☐
Grønn salat	☐	☐	☐	☐	☐	☐
Spinat	☐	☐	☐	☐	☐	☐
Grønnsaksmoothie	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet disse grønnsakene nå for tiden? Ta med både rå, kokte og mosede grønnsaker (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Agurk	☐	☐	☐	☐	☐	☐
Tomat	☐	☐	☐	☐	☐	☐
Mais	☐	☐	☐	☐	☐	☐
Paprika	☐	☐	☐	☐	☐	☐
Erter/bønner	☐	☐	☐	☐	☐	☐
Grønnsaksblanding	☐	☐	☐	☐	☐	☐
Annet	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende typer frukt nå for tiden? (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Appelsin/klementin o.l.	☐	☐	☐	☐	☐	☐
Banan	☐	☐	☐	☐	☐	☐
Eple	☐	☐	☐	☐	☐	☐
Pære	☐	☐	☐	☐	☐	☐
Plomme	☐	☐	☐	☐	☐	☐
Druer	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende typer frukt og bær nå for tiden? (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Kiwi	☐	☐	☐	☐	☐	☐
Melon	☐	☐	☐	☐	☐	☐
Mango	☐	☐	☐	☐	☐	☐
Bær, friske eller frosne	☐	☐	☐	☐	☐	☐
Annet	☐	☐	☐	☐	☐	☐

Får barnet tran, vitaminer eller annet kosttilskudd?

☐ Ja

☐ Nei

Tenk på hvordan det pleier å være under et vanlig måltid når du svarer. I hvilken grad er du enig i følgende påstander?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Barnet mitt prøver stadig ny og ulik type mat	☐	☐	☐	☐	☐
Barnet mitt stoler ikke på ukjent mat	☐	☐	☐	☐	☐
Hvis barnet mitt ikke vet hva som er i maten vil han/hun ikke smake	☐	☐	☐	☐	☐
Barnet mitt er redd for å spise ting han/hun ikke har spist før	☐	☐	☐	☐	☐
Barnet mitt er veldig kresen på hva slags mat han/hun vil spise	☐	☐	☐	☐	☐
Barnet mitt spiser nesten all slags mat	☐	☐	☐	☐	☐

De neste spørsmålene dreier seg om mat og matvaner. Marker det svaralternativet du synes passer best. Noen av spørsmålene passer ikke helt

til en ettåring, men svar så godt du kan.

	Aldri	Sjelden	Noen ganger	Som oftest	Alltid
I hvilken grad følger du med på hva barnet ditt spiser av søtsaker (godterier, is, kaker, kjeks, boller, etc.)?	❑	❑	❑	❑	❑
I hvilken grad følger du med på hva barnet ditt spiser av snacks (potetchips, doritos, ostepop, etc.)?	❑	❑	❑	❑	❑
I hvilken grad følger du med på hvor mye fet mat barnet ditt spiser?	❑	❑	❑	❑	❑
I hvilken grad følger du med på din sønns/datters inntak av sukkerholdig drikke (brus, saft, iste, etc.)?	❑	❑	❑	❑	❑
Lar du barnet ditt spise hva han/hun vil?	❑	❑	❑	❑	❑
Tenk deg et middagsmåltid: Lar du barnet ditt velge den maten han/hun vil ha blant matvarene som serveres til middag?	❑	❑	❑	❑	❑

	Aldri	Sjelden	Noen ganger	Som oftest	Alltid
Når barnet ditt blir masete, er det første du gjør å gi han/henne noe å spise eller drikke?	❑	❑	❑	❑	❑
Gir du barnet ditt noe å spise eller drikke når han/hun kjeder seg, selv om du ikke tror han/hun er sulten?	❑	❑	❑	❑	❑
Når barnet ditt er sint eller lei seg, gir du ham/henne noe å drikke selv om du ikke tror han/hun er tørst?	❑	❑	❑	❑	❑
Hvis barnet ditt ikke liker det som serveres (for eksempel til middag), lager du da noe annet til ham/henne?	❑	❑	❑	❑	❑
Lar du barnet ditt spise snacks når han/hun selv vil?	❑	❑	❑	❑	❑
Får barnet ditt lov til å gå fra bordet når han/hun er mett, selv om resten av familien ikke er ferdige med å spise?	❑	❑	❑	❑	❑
Oppmuntrer du barnet ditt til å spise sunn mat i stedet for usunn mat?	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Mesteparten av maten jeg har i huset er sunn	❑	❑	❑	❑	❑
Jeg har mye snacks (potetchips, doritos, ostepop, etc.) i huset	❑	❑	❑	❑	❑
Barnet mitt må alltid spise opp all maten på tallerkenen sin	❑	❑	❑	❑	❑
Jeg må forsikre meg om at barnet mitt ikke spiser for mye fet mat	❑	❑	❑	❑	❑
Jeg tilbyr barnet mitt hans/hennes favorittmat dersom han/hun lover å oppføre seg fint	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg lar barnet mitt "hjelpe til" med matlaging	❑	❑	❑	❑	❑
Hvis jeg ikke passet på eller satte noen begrensinger for min sønns/datters matinntak, ville han/hun spise for mye av sin favorittmat	❑	❑	❑	❑	❑
Flere ulike sunne matvarer er tilgjengelig for barnet mitt til hvert av måltidene som serveres hjemme	❑	❑	❑	❑	❑
Jeg tilbyr barnet mitt søtsaker (godterier, is, kaker, kjeks, boller, etc.) som belønning for god oppførsel	❑	❑	❑	❑	❑
Jeg oppmuntrer barnet mitt til å prøve ny mat	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg snakker med barnet mitt om hvorfor det er viktig å spise sunn mat	❑	❑	❑	❑	❑
Jeg forteller barnet mitt at sunn mat smaker godt	❑	❑	❑	❑	❑
Hvis jeg ikke passet på eller satte noen begrensninger for mitt barns matinntak, ville han/hun spise for mye junk food (gatekjøkkenmat, snacks	❑	❑	❑	❑	❑

og søtsaker)

Jeg gir barnet mitt små porsjoner til måltidene for at han/hun ikke skal bli overvektig eller fet	❑ ❑ ❑ ❑ ❑
Hvis barnet mitt sier at han/hun ikke er sulten, prøver jeg å overtale ham/henne til å spise likevel	❑ ❑ ❑ ❑ ❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Hvis barnet mitt spiser uvanlig mye til et måltid, prøver jeg å begrense hans/hennes matinntak ved neste måltid	❑	❑	❑	❑	❑
Jeg begrenser mitt barns inntak av mat som kan medføre at han/hun blir overvektig eller fet	❑	❑	❑	❑	❑
Det er visse matvarer barnet mitt ikke bør spise, da disse matvarene vil gjøre at han/hun blir overvektig eller fet	❑	❑	❑	❑	❑
Jeg holder tilbake søtsaker/dessert som reaksjon på dårlig oppførsel	❑	❑	❑	❑	❑
Jeg har mye søtsaker (godterier, is, kaker, kjeks, boller, etc.) i huset	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg oppmuntrer barnet mitt til å spise variert (dvs. mange ulike matvarer og retter)	❑	❑	❑	❑	❑
Hvis barnet mitt kun spiser en liten porsjon, prøver jeg å overtale ham/henne til å spise mer	❑	❑	❑	❑	❑
Jeg må forsikre meg om at barnet mitt ikke spiser for mye av sin favorittmat	❑	❑	❑	❑	❑
Jeg vil ikke at barnet mitt skal bli overvektig eller fet, derfor tillater jeg ikke at han/hun spiser mellom måltidene	❑	❑	❑	❑	❑
Jeg sier hva barnet mitt skal spise og hva han/hun ikke skal spise uten å gi noen forklaring på hvorfor	❑	❑	❑	❑	❑
Jeg må forsikre meg om at barnet mitt ikke spiser for mye søtsaker (godterier, is, kaker, kjeks, boller, etc.)	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg er et forbilde for barnet mitt ved selv å spise sunn mat	❑	❑	❑	❑	❑
Jeg prøver å spise sunn mat når jeg er sammen med min sønn/datter, selv om denne maten ikke er min favorittmat	❑	❑	❑	❑	❑
Jeg prøver å vise entusiasme når jeg spiser sunn mat	❑	❑	❑	❑	❑
Jeg viser barnet mitt at jeg virkelig liker å spise sunn mat	❑	❑	❑	❑	❑
Når barnet mitt sier hun/han er ferdig med å spise prøver jeg å få det til å spise en bit eller to til	❑	❑	❑	❑	❑

Hvor trygg føler du deg på følgende:

	Svært utrygg	Noe utrygg	Både-og	Noe trygg	Svært trygg
At den maten du gir barnet ditt er sunn	❑	❑	❑	❑	❑
At du kan få barnet ditt til å spise nok	❑	❑	❑	❑	❑
At du kan få barnet ditt til å smake på ulike grønnsaker	❑	❑	❑	❑	❑
At du gir barnet ditt riktig mengde mat	❑	❑	❑	❑	❑
At du kan få barnet ditt til å smake på ny mat	❑	❑	❑	❑	❑

Hvor enig er du i følgende påstander?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Det er rolig når vi spiser middag	❑	❑	❑	❑	❑
Middagen hos oss er variert	❑	❑	❑	❑	❑

Jeg tilbyr mat til barnet selv om han/hun tidligere ikke har likt denne maten	❑	❑	❑	❑	❑
Jeg ser ofte på mobilen under måltidene	❑	❑	❑	❑	❑

Hvor mange timer per dag sitter barnet ditt vanligvis foran TV, PC/nettbrett eller smarttelefon?

- ❑ Mer enn 4 timer
- ❑ 4 timer
- ❑ 3 timer
- ❑ 1-2 timer
- ❑ Mindre enn 1 time

Del 2
Nå følger noen spørsmål om deg som er mor eller far.

Hvilket år er du født (for eksempel 1989): _____

I hvilken måned er du født (fra 1-12): _____

Hvilken sivilstand har du nå?

- ❑ Gift
- ❑ Samboer
- ❑ Enslig
- ❑ Skilt/separert
- ❑ Enke/enkemann
- ❑ Annet, beskriv_____

Hvor mange personer er det totalt i din husholdning(vanligvis)?

Antall voksne _____

Antall barn _____

Hva er alderen på barn som ikke deltar i studien (som vanligvis bor hjemme). Svar i hele år og del med komma; f.eks. 3, 5

_____

Hva er din hovedaktivitet nå?

- ❑ Arbeid heltid
- ❑ Arbeid deltid
- ❑ Hjemmeværende
- ❑ Sykemeldt
- ❑ Permisjon
- ❑ Uføretrygdet
- ❑ Under attføring/rehabilitering
- ❑ Student/skoleelev
- ❑ Arbeidsledig

- [ ] Annet

Hvilken utdannelse har du? Sett kun ett kryss for høyeste fullførte utdannelse.

- [ ] 9/10-årig grunnskole eller kortere
- [ ] 9/10-årig grunnskole og folkehøgskole eller annen ett-årig utdanning
- [ ] Videregående opplæring (videregående skole/gymnas/fagbrev)
- [ ] Fagskoleutdanning
- [ ] Høgskole- eller universitetsutdanning på 4 år eller mindre
- [ ] Høgskole- eller universitetsutdanning på mer enn 4 år
- [ ] Annet
- [ ] Vet ikke

Hvilken utdannelse har barnets andre forelder? Sett kun ett kryss for høyeste fullførte utdannelse.

- [ ] 9/10-årig grunnskole eller kortere
- [ ] 9/10-årig grunnskole og folkehøgskole eller annen ett-årig utdanning
- [ ] Videregående opplæring (videregående skole/gymnas/fagbrev)
- [ ] Fagskoleutdanning
- [ ] Høgskole- eller universitetsutdanning på 4 år eller mindre
- [ ] Høgskole- eller universitetsutdanning på mer enn 4 år
- [ ] Annet
- [ ] Vet ikke

I hvilket fylke bor du i?

- [ ] Akershus
- [ ] Aust-Agder
- [ ] Buskerud
- [ ] Finnmark
- [ ] Hedmark
- [ ] Hordaland
- [ ] Møre og Romsdal
- [ ] Nord-Trøndelag
- [ ] Nordland
- [ ] Oppland
- [ ] Oslo
- [ ] Rogaland
- [ ] Sogn og Fjordane
- [ ] Sør-Trøndelag
- [ ] Telemark
- [ ] Troms
- [ ] Vest-Agder
- [ ] Vestfold
- [ ] Østfold

Har det i løpet av det siste halve året hendt at du/dere har hatt vansker med

å klare løpende utgifter til mat, transport, husleie og liknende?

- ☐ Nei, aldri
- ☐ Ja, en sjelden gang
- ☐ Ja, av og til
- ☐ Ja, ofte

Hvor høy er du? Svar i antall centimeter

_____

Hvor mye veier du nå? Svar i antall kg

_____

Røyker du?

- ☐ Nei, har aldri røykt regelmessig
- ☐ Nei, har sluttet
- ☐ Ja, men ikke daglig
- ☐ Ja, daglig

I en vanlig uke, hvor mange dager er du fysisk aktiv i minst 30 minutter?

- ☐ Ingen
- ☐ En dag
- ☐ To dager
- ☐ Tre dager
- ☐ Fire dager
- ☐ Fem dager
- ☐ Seks dager
- ☐ Hver dag

På fritiden; omtrent hvor mye tid bruker du daglig tilsammen ved en TV, PC/nettbrett eller smarttelefon?

- ☐ Mer enn 4 timer
- ☐ 4 timer
- ☐ 3 timer
- ☐ 1-2 timer
- ☐ Mindre enn en time
- ☐ Sjelden/aldri

Hva er din etniske bakgrunn?

	Ja	Nei	Vet ikke
Ble du født i Norge?	☐	☐	☐
Ble din mor født i Norge?	☐	☐	☐
Ble din far født i Norge?	☐	☐	☐
Ble barnet som deltar i undersøkelsen født i Norge?	☐	☐	☐
Ble barnets andre forelder født i Norge?	☐	☐	☐

Nå følger noen spørsmål om kost og matvaner.
Vi spør om dine spisevaner slik de vanligvis er. Vi er klar over at kostholdet varierer fra dag til dag, prøv derfor så godt du kan å gi et "gjennomsnitt" av dine spisevaner slik de har vært det siste året.

Hvor ofte pleier du å spise følgende måltider i løpet av en uke?

	Aldri/sjeldnere enn hver uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Frokost	☐	☐	☐	☐	☐	☐	☐	☐
Formiddagsmat/lunsj	☐	☐	☐	☐	☐	☐	☐	☐
Mellommåltid før middag	☐	☐	☐	☐	☐	☐	☐	☐
Middag	☐	☐	☐	☐	☐	☐	☐	☐
Kveldsmat	☐	☐	☐	☐	☐	☐	☐	☐
Andre måltider/mellommåltider	☐	☐	☐	☐	☐	☐	☐	☐

Hvor mye drikker du vanligvis av følgende drikker?

	Drikker aldri/sjelden	1-3 glass/mnd	1-3 glass/uke	4-6 glass/uke	1-3 glass/dag	4-6 glass/dag	7 glass eller mer daglig
Brus/saft med sukker	☐	☐	☐	☐	☐	☐	☐
Brus/saft, kunstig søtet	☐	☐	☐	☐	☐	☐	☐
Kaffe	☐	☐	☐	☐	☐	☐	☐
Te	☐	☐	☐	☐	☐	☐	☐
Alkohol	☐	☐	☐	☐	☐	☐	☐
Vann	☐	☐	☐	☐	☐	☐	☐
Melk (alle typer)	☐	☐	☐	☐	☐	☐	☐

Hvor mange ganger spiser du følgende matvarer?

	Aldri/sjeldnere enn hver uke	1-3 g/måned	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g eller mer/døgn
Frukt	☐	☐	☐	☐	☐	☐	☐	☐
Bær	☐	☐	☐	☐	☐	☐	☐	☐
Grønnsaker	☐	☐	☐	☐	☐	☐	☐	☐
Kaker, kjeks o.l.	☐	☐	☐	☐	☐	☐	☐	☐
Desserter, iskrem o.l.	☐	☐	☐	☐	☐	☐	☐	☐
Godterier/sjokolade/potetgull o.l.	☐	☐	☐	☐	☐	☐	☐	☐

Hvor enig er du i følgende?

	Svært uenig	Noe uenig	Noe enig	Svært enig
Jeg prøver stadig ny og ulik type mat	☐	☐	☐	☐
Jeg stoler ikke på ukjent mat	☐	☐	☐	☐
Hvis jeg ikke vet hva som er i maten, vil jeg ikke smake	☐	☐	☐	☐
Jeg liker mat fra ulike land	☐	☐	☐	☐

Hvor enig er du i følgende?

	Svært uenig	Noe uenig	Noe enig	Svært enig
I middagsselskaper prøver jeg gjerne ny mat	☐	☐	☐	☐
Jeg er redd for å spise ting jeg ikke har spist før	☐	☐	☐	☐

Jeg er veldig kresen på hva slags mat jeg vil spise	☐	☐	☐	☐
Jeg spiser nesten all slags mat	☐	☐	☐	☐

Hvor ofte gjør du følgende?

	Aldri	Mindre enn 1 g/uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Kutter opp grønnsaker	☐	☐	☐	☐	☐	☐	☐	☐	☐
Kutter opp frukt	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lager middag fra bunnen	☐	☐	☐	☐	☐	☐	☐	☐	☐
Baker brød o.l.	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lager hjemmelaget smoothie	☐	☐	☐	☐	☐	☐	☐	☐	☐
Finner oppskrifter på nettet når du lager mat	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bruker matlagingsfilmer el.l. på nettet når du lager mat	☐	☐	☐	☐	☐	☐	☐	☐	☐

Har du hovedansvaret for matlagingen hjemme?

☐ Ja

☐ Nei

☐ Ansvaret er delt

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
er lett å tilberede	☐	☐	☐	☐	☐	☐	☐
smaker godt	☐	☐	☐	☐	☐	☐	☐
ikke er dyr	☐	☐	☐	☐	☐	☐	☐
er kjent	☐	☐	☐	☐	☐	☐	☐
inneholder mye fiber	☐	☐	☐	☐	☐	☐	☐
er næringsrik	☐	☐	☐	☐	☐	☐	☐

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
er lett tilgjengelig i butikken	☐	☐	☐	☐	☐	☐	☐
gir mye igjen for pengene	☐	☐	☐	☐	☐	☐	☐
lukter godt	☐	☐	☐	☐	☐	☐	☐
kan tilberedes enkelt	☐	☐	☐	☐	☐	☐	☐
har en behagelig konsistens	☐	☐	☐	☐	☐	☐	☐
er som maten jeg spiste da jeg var barn	☐	☐	☐	☐	☐	☐	☐

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
inneholder mye vitaminer og mineraler	☐	☐	☐	☐	☐	☐	☐
ser god ut	☐	☐	☐	☐	☐	☐	☐
er proteinrik	☐	☐	☐	☐	☐	☐	☐
tar minimal tid å forberede	☐	☐	☐	☐	☐	☐	☐
holder meg frisk	☐	☐	☐	☐	☐	☐	☐
er bra for hud / tenner / hår / negler osv.							

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
er det jeg pleier å spise							
kan kjøpes i butikker i nærheten av der jeg bor eller arbeider							
er billig							

Nå følger noen spørsmål om den butikken du vanligvis handler i.

Marker det som beskriver den generelle tilgjengeligeten i butikken:

	Ikke tilgjengelig	Litt tilgjengelig	Moderat tilgjengelig	Svært tilgjengelig
Bær				
Frukt				
Grønnsaker				
Klemmeposer(barnemat)				
Barnekjeks, fullkorn				
Barnekjeks, vanlige				
Middagsglass beregnet til barn				
Godterier/sjokolade/potetgull o.l.				

Hvor enig er du i følgende påstander?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg har vanligvis med meg handleliste					
Jeg blir påvirket av reklame for mat					
Jeg kjøper ofte barnemat på glass og klemmeposer selv om jeg ikke hadde planlagt det					
Jeg lar meg påvirke av barnematens emballasje					
I vår husholdning benytter vi oss av mat-kasser med middagsmat som vi får tilkjørt					

Hvor enig er du i følgende?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg tar ofte med meg matvarer som er godt synlig i butikken, selv om jeg ikke hadde tenkt å kjøpe de					
Jeg kjøper mer om det er ryddig og ordentlig i butikken					
Jeg benytter meg ofte av 3 for 2 tilbud o.l.					
Hvis butikken har plassert mange matvarer i store stabler, kjøper jeg mer av varen					
Jeg søker bevisst etter tilbud der jeg får mye for pengene					
Jeg kjøper det jeg trenger og blir ikke påvirket av hvor varen står i butikken					

Nå følger noen spørsmål om maten som er tilgjengelig hjemme og måltidsplanlegging.

Hvor mye av følgende matvarer har du vanligvis tilgjengelig hjemme? (Gjelder både friske og fryste).

	Ingenting	Lite	Noe	Mye	Veldig mye

Bær	❑	❑	❑	❑	❑
Frukt	❑	❑	❑	❑	❑
Grønnsaker	❑	❑	❑	❑	❑
Godterier/sjokolade/potetgull o.l.	❑	❑	❑	❑	❑
Brus	❑	❑	❑	❑	❑
Fisk/skalldyr	❑	❑	❑	❑	❑
Kylling	❑	❑	❑	❑	❑
Kjøtt	❑	❑	❑	❑	❑

Marker det som beskriver den generelle tilgjengeligheten av matvarer hjemme:

	Lett tilgjengelig på kjøkkenbenken el.l.	Tilgjengelig i skapet/kjøleskapet/frysen el.l.	Lite tilgjengelig langt inne i skapet/kjelleren/frysen el.l.
Bær	❑	❑	❑
Frukt	❑	❑	❑
Grønnsaker	❑	❑	❑
Godterier/sjokolade/potetgull o.l.	❑	❑	❑
Brus	❑	❑	❑
Kaker/kjeks o.l.	❑	❑	❑

I løpet av den siste måneden, har du gjort følgende med din familie?

	Aldri	Sjelden	Noen ganger	Ofte	Svært ofte
Spist på en familie-restaurant (for eksempel Egon eller Big Horn)	❑	❑	❑	❑	❑
Spist på en "fast food" restaurant (for eksempel McDonalds eller Burger King)?	❑	❑	❑	❑	❑
Spist take-away mat hjemme (for eksempel Pizzabakeren eller sushi take away)?	❑	❑	❑	❑	❑
Spist ferdigretter hjemme (type frosne/hermetiserte, for eksempel frossen pizza eller Fjordland)?	❑	❑	❑	❑	❑

På hvilken måte stemmer disse uttalelsene for deg?

	Stemmer absolutt ikke	Stemmer delvis	Stemmer ganske godt	Stemmer godt	Stemmer veldig godt
Jeg planlegger menyen i forkant for uken som kommer	❑	❑	❑	❑	❑
Jeg lager handleliste for en uke av gangen	❑	❑	❑	❑	❑
Jeg lager sunne måltider også når jeg har få ingredienser tilgjengelig	❑	❑	❑	❑	❑
Jeg lager måltider ferdig på forhånd (i helgen eller på fritiden)	❑	❑	❑	❑	❑
Jeg lager dobbel porsjon av maten for å spare til senere (fryser ned eller oppbevarer i kjøleskapet)	❑	❑	❑	❑	❑

Hvor har du fått informasjon om kosthold og ernæring til barnet fra det var 6 måneder gammelt og frem til nå, og hvordan vurderer du denne informasjonen?

	Har ikke fått info	Svært nyttig	Nyttig	Lite nyttig	Unyttig
Helsestasjonen	❑	❑	❑	❑	❑
Helsepersonell utenfor helsestasjonen	❑	❑	❑	❑	❑
Familie/kjente	❑	❑	❑	❑	❑

Offentlige nettsteder: (Eks. Helsedirektoratet og Matportalen)	❑	❑	❑	❑	❑
Blogger	❑	❑	❑	❑	❑
Andre nettsteder	❑	❑	❑	❑	❑

Til slutt ønsker vi at du tar utgangspunkt i barnets helsekort og fyller inn barnets vekt og lengde

ved 6-7 måneders alder

Dato målingene ble gjort (For eksempel 2017-01-31) _____

Vekt (gram) _____

Lengde (cm) _____

ved 9-10 måneders alder

Dato målingene ble gjort (For eksempel 2017-07-30) _____

Vekt (gram) _____

Lengde (cm) _____

ved ca et års alder

Dato målingene ble gjort (For eksempel 2017-08-31) _____

Vekt (gram) _____

Lengde (cm) _____

Takk for dine svar!

De er nå lagret.

Med vennlig hilsen Mat til minsten teamet

Universitet i Agder

Appendix 3

Follow-up 1 questionnaire (child age 18 months)

Tusen takk for at du deltar i studien **Mat til Minsten**

Spørreskjemaet vil ta ca 30. minutter å besvare. Hvis du ikke har tid til å fylle ut hele skjemaet på en gang, kan du stoppe underveis og gå tilbake til skjemaet senere. Noen spørsmål kan virke like, men de danner en helhet til slutt.

Husk at alle som besvarer dette skjemaet er med i trekning av **10 gavekort på 1000 kroner.**

Du kan når som helst bruke knappene nedenfor for å navigere deg frem og tilbake i spørreskjemaet.

Trykk på neste for å komme i gang.

Lykke til!

Med vennlig hilsen Margrethe Røed (stipendiat) og Professor Nina Øverby (prosjektleder)

Universitetet i Agder

Dato for utfylling av skjema. Må skrives år-måned-dag. For eksempel 2017-09-21

_____

Hva er din relasjon til barnet som deltar i studien?

- ☐ Jeg er mor
- ☐ Jeg er far
- ☐ Jeg er ingen av delene, beskriv_____

Bor du sammen med far/mor til barnet?

- ☐ Ja
- ☐ Nei

Spørsmålene i denne delen gjelder barnet ditt som nå er ca. 18 måneder. De omhandler bakgrunnsopplysninger, vekst og utvikling og barnets spisevaner. Til slutt kommer noen spørsmål om barneoppdragelse.

Er barnet ditt tvilling/trilling?

- ☐ Nei
- ☐ Ja. Fyll da ut skjemaet for det eldste barnet

Hva er barnets fødselsdato? Må skrives år-måned-dag. For eksempel 2016-09-30

_____

Hva er barnets kjønn?

- ☐ Jente
- ☐ Gutt

Hvor passes barnet på dagtid nå?

- ☐ Hjemme med mor/far
- ☐ Hjemme med dagmamma/praktikant
- ☐ Hos dagmamma
- ☐ I familiebarnehage
- ☐ I barnehage
- ☐ Annet, beskriv _____

Hvor ofte pleier barnet ditt å spise følgende måltider i løpet av en uke? (ganger per uke(g/uke))

	Aldri/sjeldnere enn hver uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Frokost	☐	☐	☐	☐	☐	☐	☐	☐
Formiddagsmat/lunsj	☐	☐	☐	☐	☐	☐	☐	☐
Mellommåltid før middag	☐	☐	☐	☐	☐	☐	☐	☐
Middag	☐	☐	☐	☐	☐	☐	☐	☐
Kveldsmat	☐	☐	☐	☐	☐	☐	☐	☐
Andre måltider/mellommåltider	☐	☐	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende måltider **sammen med familien** nå? (ganger per uke(g/uke))

	Aldri/sjeldnere enn hver uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Frokost	☐	☐	☐	☐	☐	☐	☐	☐
Formiddagsmat/lunsj	☐	☐	☐	☐	☐	☐	☐	☐
Mellommåltid før middag	☐	☐	☐	☐	☐	☐	☐	☐
Middag	☐	☐	☐	☐	☐	☐	☐	☐
Kveldsmat	☐	☐	☐	☐	☐	☐	☐	☐
Andre måltider/mellommåltider	☐	☐	☐	☐	☐	☐	☐	☐

Har barnet utfordringer i forhold til spising/mat? Kan sette flere kryss

- ☐ Nei, har ingen utfordringer
- ☐ Ja, dårlig matlyst/småspist
- ☐ Ja, liker få matvarer
- ☐ Ja, vanskelig med tilvenning til familiens kosthold
- ☐ Ja, allergi/intoleranse mot enkelte matvarer
- ☐ Ja, andre problemer - beskriv _____

Hvor ofte får barnet følgende drikker nå for tiden?

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g/døgn	5 g eller mer/døgn
Morsmelk	☐	☐	☐	☐	☐	☐	☐	☐
Morsmelkerstatning	☐	☐	☐	☐	☐	☐	☐	☐
Vanlig søt melk, alle typer (skummet, lett, helmelk)	☐	☐	☐	☐	☐	☐	☐	☐

Surmelk, alle typer (yoghurt, biola, cultura o.l.)	☐	☐	☐	☐	☐	☐	☐	☐
Sjokolademelk, alle typer	☐	☐	☐	☐	☐	☐	☐	☐
Vann	☐	☐	☐	☐	☐	☐	☐	☐

Hvor ofte får barnet følgende drikker nå for tiden?

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g/døgn	5 g eller mer/døgn
Saft, sukret	☐	☐	☐	☐	☐	☐	☐	☐
Saft, kunstig søtet	☐	☐	☐	☐	☐	☐	☐	☐
Juice	☐	☐	☐	☐	☐	☐	☐	☐
Brus, sukret	☐	☐	☐	☐	☐	☐	☐	☐
Lettbrus, kunstig søtet	☐	☐	☐	☐	☐	☐	☐	☐
Smoothie, kjøpt	☐	☐	☐	☐	☐	☐	☐	☐
Smoothie, hjemmelaget	☐	☐	☐	☐	☐	☐	☐	☐
Annet	☐	☐	☐	☐	☐	☐	☐	☐

Får barnet hjemmelaget middagsmat eller ferdigkjøpt (industrifremstilt) barnemat på glass/klemmeposer?

- ☐ Bare hjemmelaget
- ☐ Mest hjemmelaget
- ☐ Omtrent halvparten av hvert
- ☐ Mest ferdigkjøpt
- ☐ Bare ferdigkjøpt

Hvor ofte spiser barnet følgende mat nå for tiden?

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g/døgn	5 g eller mer/døgn
Industrifremstilt grøt, alle typer	☐	☐	☐	☐	☐	☐	☐	☐
Hjemmelaget grøt av grovt/sammalt mel eller havregryn/havremel	☐	☐	☐	☐	☐	☐	☐	☐
Hjemmelaget grøt av fint/hvitt mel, kavring, semule, ris, eller mais	☐	☐	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende mat nå for tiden?

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Industrifremstilt middag på glass/klemmepose med bare grønnsaker	☐	☐	☐	☐	☐	☐
Industrifremstilt middag på glass/klemmepose med grønnsaker og kjøtt/kylling/kalkun	☐	☐	☐	☐	☐	☐
Industrifremstilt middag på glass/klemmepose med grønnsaker og fisk	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende mat nå for tiden? Industrifremstilt middagsmat på glass/klemmeposer skal ikke regnes med her

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Kjøtt, kjøttdeig, kjøttboller, pølse o.	☐	☐	☐	☐	☐	☐
Fisk, fiskeboller/-kaker, fiskepudding o.l.	☐	☐	☐	☐	☐	☐
Pannekaker	☐	☐	☐	☐	☐	☐
Pizza	☐	☐	☐	☐	☐	☐

Pasta	☐	☐	☐	☐	☐	☐
Ris	☐	☐	☐	☐	☐	☐
Brødskiver	☐	☐	☐	☐	☐	☐

Hvor grovt er brødet du vanligvis serverer til barnet ditt ifølge brødskalaen nedenfor?

☐ ☐ ☐ ☐

Hvor mange brødskiver spiser barnet ditt på en vanlig dag?

Antall brødskiver (stk): _____

Hvor ofte spiser barnet følgende mat nå for tiden? Industrifremstilt middagsmat på glass/klemmeposer regnes ikke med her

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Poteter	☐	☐	☐	☐	☐	☐
Kokte grønnsaker	☐	☐	☐	☐	☐	☐
Rå grønnsaker (også salat/råkost)	☐	☐	☐	☐	☐	☐
Frukt	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende mat nå for tiden?

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Kaker, vafler, søt kjeks	☐	☐	☐	☐	☐	☐
Dessert/iskrem	☐	☐	☐	☐	☐	☐
Sjokolade	☐	☐	☐	☐	☐	☐
Smågodt, seigmenn, annet godteri	☐	☐	☐	☐	☐	☐
Chips o.l.	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet disse grønnsakene nå for tiden? Ta med både rå, kokte og mosede grønnsaker (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Gulrot	☐	☐	☐	☐	☐	☐
Kålrot	☐	☐	☐	☐	☐	☐
Søtpotet	☐	☐	☐	☐	☐	☐
Blomkål	☐	☐	☐	☐	☐	☐
Brokkoli	☐	☐	☐	☐	☐	☐
Grønn salat	☐	☐	☐	☐	☐	☐
Spinat	☐	☐	☐	☐	☐	☐
Grønnsaksmoothie	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet disse grønnsakene nå for tiden? Ta med både rå, kokte og mosede grønnsaker (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Agurk	☐	☐	☐	☐	☐	☐
Tomat	☐	☐	☐	☐	☐	☐
Mais	☐	☐	☐	☐	☐	☐
Paprika	☐	☐	☐	☐	☐	☐
Erter/bønner	☐	☐	☐	☐	☐	☐
Grønnsaksblanding	☐	☐	☐	☐	☐	☐
Annet	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende typer frukt nå for tiden? (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Appelsin/klementin o.l.	☐	☐	☐	☐	☐	☐
Banan	☐	☐	☐	☐	☐	☐
Eple	☐	☐	☐	☐	☐	☐
Pære	☐	☐	☐	☐	☐	☐
Plomme	☐	☐	☐	☐	☐	☐
Druer	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende typer frukt og bær nå for tiden? (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Kiwi	☐	☐	☐	☐	☐	☐
Melon	☐	☐	☐	☐	☐	☐
Mango	☐	☐	☐	☐	☐	☐
Bær, friske eller frosne	☐	☐	☐	☐	☐	☐
Annet	☐	☐	☐	☐	☐	☐

Får barnet tran, vitaminer eller annet kosttilskudd?

☐ Ja

☐ Nei

Tenk på hvordan det pleier å være under et vanlig måltid når du svarer. I hvilken grad er du enig i følgende påstander?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Barnet mitt prøver stadig ny og ulik type mat	☐	☐	☐	☐	☐
Barnet mitt stoler ikke på ukjent mat	☐	☐	☐	☐	☐
Hvis barnet mitt ikke vet hva som er i maten vil han/hun ikke smake	☐	☐	☐	☐	☐
Barnet mitt er redd for å spise ting han/hun ikke har spist før	☐	☐	☐	☐	☐
Barnet mitt er veldig kresen på hva slags mat han/hun vil spise	☐	☐	☐	☐	☐
Barnet mitt spiser nesten all slags mat	☐	☐	☐	☐	☐

De neste spørsmålene dreier seg om mat og matvaner. Marker det svaralternativet du synes passer best. Noen av spørsmålene passer ikke helt

til en ettåring, men svar så godt du kan.

	Aldri	Sjelden	Noen ganger	Som oftest	Alltid
I hvilken grad følger du med på hva barnet ditt spiser av søtsaker (godterier, is, kaker, kjeks, boller, etc.)?	❑	❑	❑	❑	❑
I hvilken grad følger du med på hva barnet ditt spiser av snacks (potetchips, doritos, ostepop, etc.)?	❑	❑	❑	❑	❑
I hvilken grad følger du med på hvor mye fet mat barnet ditt spiser?	❑	❑	❑	❑	❑
I hvilken grad følger du med på din sønns/datters inntak av sukkerholdig drikke (brus, saft, iste, etc.)?	❑	❑	❑	❑	❑
Lar du barnet ditt spise hva han/hun vil?	❑	❑	❑	❑	❑
Tenk deg et middagsmåltid: Lar du barnet ditt velge den maten han/hun vil ha blant matvarene som serveres til middag?	❑	❑	❑	❑	❑

	Aldri	Sjelden	Noen ganger	Som oftest	Alltid
Når barnet ditt blir masete, er det første du gjør å gi han/henne noe å spise eller drikke?	❑	❑	❑	❑	❑
Gir du barnet ditt noe å spise eller drikke når han/hun kjeder seg, selv om du ikke tror han/hun er sulten?	❑	❑	❑	❑	❑
Når barnet ditt er sint eller lei seg, gir du ham/henne noe å drikke selv om du ikke tror han/hun er tørst?	❑	❑	❑	❑	❑
Hvis barnet ditt ikke liker det som serveres (for eksempel til middag), lager du da noe annet til ham/henne?	❑	❑	❑	❑	❑
Lar du barnet ditt spise snacks når han/hun selv vil?	❑	❑	❑	❑	❑
Får barnet ditt lov til å gå fra bordet når han/hun er mett, selv om resten av familien ikke er ferdige med å spise?	❑	❑	❑	❑	❑
Oppmuntrer du barnet ditt til å spise sunn mat i stedet for usunn mat?	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Mesteparten av maten jeg har i huset er sunn	❑	❑	❑	❑	❑
Jeg har mye snacks (potetchips, doritos, ostepop, etc.) i huset	❑	❑	❑	❑	❑
Barnet mitt må alltid spise opp all maten på tallerkenen sin	❑	❑	❑	❑	❑
Jeg må forsikre meg om at barnet mitt ikke spiser for mye fet mat	❑	❑	❑	❑	❑
Jeg tilbyr barnet mitt hans/hennes favorittmat dersom han/hun lover å oppføre seg fint	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg lar barnet mitt "hjelpe til" med matlaging	❑	❑	❑	❑	❑
Hvis jeg ikke passet på eller satte noen begrensinger for min sønns/datters matinntak, ville han/hun spise for mye av sin favorittmat	❑	❑	❑	❑	❑
Flere ulike sunne matvarer er tilgjengelig for barnet mitt til hvert av måltidene som serveres hjemme	❑	❑	❑	❑	❑
Jeg tilbyr barnet mitt søtsaker (godterier, is, kaker, kjeks, boller, etc.) som belønning for god oppførsel	❑	❑	❑	❑	❑
Jeg oppmuntrer barnet mitt til å prøve ny mat	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg snakker med barnet mitt om hvorfor det er viktig å spise sunn mat	❑	❑	❑	❑	❑
Jeg forteller barnet mitt at sunn mat smaker godt	❑	❑	❑	❑	❑
Hvis jeg ikke passet på eller satte noen begrensninger for mitt barns matinntak, ville han/hun spise for mye junk food (gatekjøkkenmat, snacks	❑	❑	❑	❑	❑

og søtsaker)

Jeg gir barnet mitt små porsjoner til måltidene for at han/hun ikke skal bli overvektig eller fet	❑	❑	❑	❑	❑
Hvis barnet mitt sier at han/hun ikke er sulten, prøver jeg å overtale ham/henne til å spise likevel	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Hvis barnet mitt spiser uvanlig mye til et måltid, prøver jeg å begrense hans/hennes matinntak ved neste måltid	❑	❑	❑	❑	❑
Jeg begrenser mitt barns inntak av mat som kan medføre at han/hun blir overvektig eller fet	❑	❑	❑	❑	❑
Det er visse matvarer barnet mitt ikke bør spise, da disse matvarene vil gjøre at han/hun blir overvektig eller fet	❑	❑	❑	❑	❑
Jeg holder tilbake søtsaker/dessert som reaksjon på dårlig oppførsel	❑	❑	❑	❑	❑
Jeg har mye søtsaker (godterier, is, kaker, kjeks, boller, etc.) i huset	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg oppmuntrer barnet mitt til å spise variert (dvs. mange ulike matvarer og retter)	❑	❑	❑	❑	❑
Hvis barnet mitt kun spiser en liten porsjon, prøver jeg å overtale ham/henne til å spise mer	❑	❑	❑	❑	❑
Jeg må forsikre meg om at barnet mitt ikke spiser for mye av sin favorittmat	❑	❑	❑	❑	❑
Jeg vil ikke at barnet mitt skal bli overvektig eller fet, derfor tillater jeg ikke at han/hun spiser mellom måltidene	❑	❑	❑	❑	❑
Jeg sier hva barnet mitt skal spise og hva han/hun ikke skal spise uten å gi noen forklaring på hvorfor	❑	❑	❑	❑	❑
Jeg må forsikre meg om at barnet mitt ikke spiser for mye søtsaker (godterier, is, kaker, kjeks, boller, etc.)	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg er et forbilde for barnet mitt ved selv å spise sunn mat	❑	❑	❑	❑	❑
Jeg prøver å spise sunn mat når jeg er sammen med min sønn/datter, selv om denne maten ikke er min favorittmat	❑	❑	❑	❑	❑
Jeg prøver å vise entusiasme når jeg spiser sunn mat	❑	❑	❑	❑	❑
Jeg viser barnet mitt at jeg virkelig liker å spise sunn mat	❑	❑	❑	❑	❑
Når barnet mitt sier hun/han er ferdig med å spise prøver jeg å få det til å spise en bit eller to til	❑	❑	❑	❑	❑

Hvor trygg føler du deg på følgende:

	Svært utrygg	Noe utrygg	Både-og	Noe trygg	Svært trygg
At den maten du gir barnet ditt er sunn	❑	❑	❑	❑	❑
At du kan få barnet ditt til å spise nok	❑	❑	❑	❑	❑
At du kan få barnet ditt til å smake på ulike grønnsaker	❑	❑	❑	❑	❑
At du gir barnet ditt riktig mengde mat	❑	❑	❑	❑	❑
At du kan få barnet ditt til å smake på ny mat	❑	❑	❑	❑	❑

Hvor enig er du i følgende påstander?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Det er rolig når vi spiser middag	❑	❑	❑	❑	❑
Middagen hos oss er variert	❑	❑	❑	❑	❑

Jeg tilbyr mat til barnet selv om han/hun tidligere ikke har likt denne maten	❑	❑	❑	❑	❑
Jeg ser ofte på mobilen under måltidene	❑	❑	❑	❑	❑

Hvor mange timer per dag sitter barnet ditt vanligvis foran TV, PC/nettbrett eller smarttelefon?

- ❑ Mer enn 4 timer
- ❑ 4 timer
- ❑ 3 timer
- ❑ 1-2 timer
- ❑ Mindre enn 1 time

Del 2
Nå følger noen spørsmål om deg som er mor eller far.

Hvilken sivilstand har du nå?

- ❑ Gift
- ❑ Samboer
- ❑ Enslig
- ❑ Skilt/separert
- ❑ Enke/enkemann
- ❑ Annet, beskriv_____

Hvor mange personer er det totalt i din husholdning(vanligvis)?

Antall voksne _____

Antall barn _____

Hva er alderen på barn som ikke deltar i studien (som vanligvis bor hjemme). Svar i hele år og del med komma; f.eks. 3, 5

_____

Hva er din hovedaktivitet nå?

- ❑ Arbeid heltid
- ❑ Arbeid deltid
- ❑ Hjemmeværende
- ❑ Sykemeldt
- ❑ Permisjon
- ❑ Uføretrygdet
- ❑ Under attføring/rehabilitering
- ❑ Student/skoleelev
- ❑ Arbeidsledig
- ❑ Annet

Hvilken utdannelse har du? Sett kun ett kryss for høyeste fullførte utdannelse.

- [ ] 9/10-årig grunnskole eller kortere
- [ ] 9/10-årig grunnskole og folkehøgskole eller annen ett-årig utdanning
- [ ] Videregående opplæring (videregående skole/gymnas/fagbrev)
- [ ] Fagskoleutdanning
- [ ] Høgskole- eller universitetsutdanning på 4 år eller mindre
- [ ] Høgskole- eller universitetsutdanning på mer enn 4 år
- [ ] Annet
- [ ] Vet ikke

Hvilken utdannelse har barnets andre forelder? Sett kun ett kryss for høyeste fullførte utdannelse.

- [ ] 9/10-årig grunnskole eller kortere
- [ ] 9/10-årig grunnskole og folkehøgskole eller annen ett-årig utdanning
- [ ] Videregående opplæring (videregående skole/gymnas/fagbrev)
- [ ] Fagskoleutdanning
- [ ] Høgskole- eller universitetsutdanning på 4 år eller mindre
- [ ] Høgskole- eller universitetsutdanning på mer enn 4 år
- [ ] Annet
- [ ] Vet ikke

I hvilket fylke bor du i?

- [ ] Akershus
- [ ] Aust-Agder
- [ ] Buskerud
- [ ] Finnmark
- [ ] Hedmark
- [ ] Hordaland
- [ ] Møre og Romsdal
- [ ] Nord-Trøndelag
- [ ] Nordland
- [ ] Oppland
- [ ] Oslo
- [ ] Rogaland
- [ ] Sogn og Fjordane
- [ ] Sør-Trøndelag
- [ ] Telemark
- [ ] Troms
- [ ] Vest-Agder
- [ ] Vestfold
- [ ] Østfold

Har det i løpet av det siste halve året hendt at du/dere har hatt vansker med å klare løpende utgifter til mat, transport, husleie og liknende?

- [ ] Nei, aldri
- [ ] Ja, en sjelden gang

- ☐ Ja, av og til
- ☐ Ja, ofte

Hvor høy er du? Svar i antall centimeter

_____

Hvor mye veier du nå? Svar i antall kg

_____

Røyker du?

- ☐ Nei, har aldri røykt regelmessig
- ☐ Nei, har sluttet
- ☐ Ja, men ikke daglig
- ☐ Ja, daglig

I en vanlig uke, hvor mange dager er du fysisk aktiv i minst 30 minutter?

- ☐ Ingen
- ☐ En dag
- ☐ To dager
- ☐ Tre dager
- ☐ Fire dager
- ☐ Fem dager
- ☐ Seks dager
- ☐ Hver dag

På fritiden; omtrent hvor mye tid bruker du daglig tilsammen ved en TV, PC/nettbrett eller smarttelefon?

- ☐ Mer enn 4 timer
- ☐ 4 timer
- ☐ 3 timer
- ☐ 1-2 timer
- ☐ Mindre enn en time
- ☐ Sjelden/aldri

Nå følger noen spørsmål om kost og matvaner.
Vi spør om dine spisevaner slik de vanligvis er. Vi er klar over at kostholdet varierer fra dag til dag, prøv derfor så godt du kan å gi et "gjennomsnitt" av dine spisevaner slik de har vært det siste året.

Hvor ofte pleier du å spise følgende måltider i løpet av en uke?

	Aldri/sjeldnere enn hver uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Frokost	☐	☐	☐	☐	☐	☐	☐	☐
Formiddagsmat/lunsj	☐	☐	☐	☐	☐	☐	☐	☐
Mellommåltid før middag	☐	☐	☐	☐	☐	☐	☐	☐

Middag	❑	❑	❑	❑	❑	❑	❑	❑
Kveldsmat	❑	❑	❑	❑	❑	❑	❑	❑
Andre måltider/mellommåltider	❑	❑	❑	❑	❑	❑	❑	❑

Hvor mye drikker du vanligvis av følgende drikker?

	Drikker aldri/sjelden	1-3 glass/mnd	1-3 glass/uke	4-6 glass/uke	1-3 glass/dag	4-6 glass/dag	7 glass eller mer daglig
Brus/saft med sukker	❑	❑	❑	❑	❑	❑	❑
Brus/saft, kunstig søtet	❑	❑	❑	❑	❑	❑	❑
Kaffe	❑	❑	❑	❑	❑	❑	❑
Te	❑	❑	❑	❑	❑	❑	❑
Alkohol	❑	❑	❑	❑	❑	❑	❑
Vann	❑	❑	❑	❑	❑	❑	❑
Melk (alle typer)	❑	❑	❑	❑	❑	❑	❑

Hvor mange ganger spiser du følgende matvarer?

	Aldri/sjeldnere enn hver uke	1-3 g/måned	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g eller mer/døgn
Frukt	❑	❑	❑	❑	❑	❑	❑	❑
Bær	❑	❑	❑	❑	❑	❑	❑	❑
Grønnsaker	❑	❑	❑	❑	❑	❑	❑	❑
Kaker, kjeks o.l.	❑	❑	❑	❑	❑	❑	❑	❑
Desserter, iskrem o.l.	❑	❑	❑	❑	❑	❑	❑	❑
Godterier/sjokolade/potetgull o.l.	❑	❑	❑	❑	❑	❑	❑	❑

Hvor enig er du i følgende?

	Svært uenig	Noe uenig	Noe enig	Svært enig
Jeg prøver stadig ny og ulik type mat	❑	❑	❑	❑
Jeg stoler ikke på ukjent mat	❑	❑	❑	❑
Hvis jeg ikke vet hva som er i maten, vil jeg ikke smake	❑	❑	❑	❑
Jeg liker mat fra ulike land	❑	❑	❑	❑

Hvor enig er du i følgende?

	Svært uenig	Noe uenig	Noe enig	Svært enig
I middagsselskaper prøver jeg gjerne ny mat	❑	❑	❑	❑
Jeg er redd for å spise ting jeg ikke har spist før	❑	❑	❑	❑
Jeg er veldig kresen på hva slags mat jeg vil spise	❑	❑	❑	❑
Jeg spiser nesten all slags mat	❑	❑	❑	❑

Hvor ofte gjør du følgende?

	Aldri	Mindre enn 1 g/uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Kutter opp grønnsaker	❑	❑	❑	❑	❑	❑	❑	❑	❑
Kutter opp frukt	❑	❑	❑	❑	❑	❑	❑	❑	❑
Lager middag fra bunnen	❑	❑	❑	❑	❑	❑	❑	❑	❑
Baker brød o.l.	❑	❑	❑	❑	❑	❑	❑	❑	❑
Lager hjemmelaget smoothie	❑	❑	❑	❑	❑	❑	❑	❑	❑
Finner oppskrifter på nettet når du lager mat	❑	❑	❑	❑	❑	❑	❑	❑	❑
Bruker matlagingsfilmer el.l. på nettet når du									

lager mat

Har du hovedansvaret for matlagingen hjemme?

- Ja
- Nei
- Ansvaret er delt

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
er lett å tilberede							
smaker godt							
ikke er dyr							
er kjent							
inneholder mye fiber							
er næringsrik							

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
er lett tilgjengelig i butikken							
gir mye igjen for pengene							
lukter godt							
kan tilberedes enkelt							
har en behagelig konsistens							
er som maten jeg spiste da jeg var barn							

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
inneholder mye vitaminer og mineraler							
ser god ut							
er proteinrik							
tar minimal tid å forberede							
holder meg frisk							
er bra for hud / tenner / hår / negler osv.							

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
er det jeg pleier å spise							
kan kjøpes i butikker i nærheten av der jeg bor eller arbeider							
er billig							

Nå følger noen spørsmål om den butikken du vanligvis handler i.

Marker det som beskriver den generelle tilgjengeligeten i butikken:

Ikke tilgjengelig Litt tilgjengelig Moderat tilgjengelig Svært tilgjengelig

Bær	❑	❑	❑	❑
Frukt	❑	❑	❑	❑
Grønnsaker	❑	❑	❑	❑
Klemmeposer(barnemat)	❑	❑	❑	❑
Barnekjeks, fullkorn	❑	❑	❑	❑
Barnekjeks, vanlige	❑	❑	❑	❑
Middagsglass beregnet til barn	❑	❑	❑	❑
Godterier/sjokolade/potetgull o.l.	❑	❑	❑	❑

Hvor enig er du i følgende påstander?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg har vanligvis med meg handleliste	❑	❑	❑	❑	❑
Jeg blir påvirket av reklame for mat	❑	❑	❑	❑	❑
Jeg kjøper ofte barnemat på glass og klemmeposer selv om jeg ikke hadde planlagt det	❑	❑	❑	❑	❑
Jeg lar meg påvirke av barnematens emballasje	❑	❑	❑	❑	❑
I vår husholdning benytter vi oss av mat-kasser med middagsmat som vi får tilkjørt	❑	❑	❑	❑	❑

Hvor enig er du i følgende?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg tar ofte med meg matvarer som er godt synlig i butikken, selv om jeg ikke hadde tenkt å kjøpe de	❑	❑	❑	❑	❑
Jeg kjøper mer om det er ryddig og ordentlig i butikken	❑	❑	❑	❑	❑
Jeg benytter meg ofte av 3 for 2 tilbud o.l.	❑	❑	❑	❑	❑
Hvis butikken har plassert mange matvarer i store stabler, kjøper jeg mer av varen	❑	❑	❑	❑	❑
Jeg søker bevisst etter tilbud der jeg får mye for pengene	❑	❑	❑	❑	❑
Jeg kjøper det jeg trenger og blir ikke påvirket av hvor varen står i butikken	❑	❑	❑	❑	❑

Nå følger noen spørsmål om maten som er tilgjengelig hjemme og måltidsplanlegging.

Hvor mye av følgende matvarer har du vanligvis tilgjengelig hjemme? (Gjelder både friske og fryste).

	Ingenting	Lite	Noe	Mye	Veldig mye
Bær	❑	❑	❑	❑	❑
Frukt	❑	❑	❑	❑	❑
Grønnsaker	❑	❑	❑	❑	❑
Godterier/sjokolade/potetgull o.l.	❑	❑	❑	❑	❑
Brus	❑	❑	❑	❑	❑
Fisk/skalldyr	❑	❑	❑	❑	❑
Kylling	❑	❑	❑	❑	❑
Kjøtt	❑	❑	❑	❑	❑
Kaker/kjeks o.l.	❑	❑	❑	❑	❑

Marker det som beskriver den generelle tilgjengeligheten av matvarer

hjemme:

	Lett tilgjengelig på kjøkkenbenken el.l.	Tilgjengelig i skapet/kjøleskapet/frysen el.l.	Lite tilgjengelig langt inne i skapet/kjelleren/frysen el.l.
Bær	☐	☐	☐
Frukt	☐	☐	☐
Grønnsaker	☐	☐	☐
Godterier/sjokolade/potetgull o.l.	☐	☐	☐
Brus	☐	☐	☐
Kaker/kjeks o.l.	☐	☐	☐

I løpet av den siste måneden, har du gjort følgende med din familie?

	Aldri	Sjelden	Noen ganger	Ofte	Svært ofte
Spist på en familie-restaurant (for eksempel Egon eller Big Horn)	☐	☐	☐	☐	☐
Spist på en "fast food" restaurant (for eksempel McDonalds eller Burger King)?	☐	☐	☐	☐	☐
Spist take-away mat hjemme (for eksempel Pizzabakeren eller sushi take away)?	☐	☐	☐	☐	☐
Spist ferdigretter hjemme (type frosne/hermetiserte, for eksempel frossen pizza eller Fjordland)?	☐	☐	☐	☐	☐

På hvilken måte stemmer disse uttalelsene for deg?

	Stemmer absolutt ikke	Stemmer delvis	Stemmer ganske godt	Stemmer godt	Stemmer veldig godt
Jeg planlegger menyen i forkant for uken som kommer	☐	☐	☐	☐	☐
Jeg lager handleliste for en uke av gangen	☐	☐	☐	☐	☐
Jeg lager sunne måltider også når jeg har få ingredienser tilgjengelig	☐	☐	☐	☐	☐
Jeg lager måltider ferdig på forhånd (i helgen eller på fritiden)	☐	☐	☐	☐	☐
Jeg lager dobbel porsjon av maten for å spare til senere (fryser ned eller oppbevarer i kjøleskapet)	☐	☐	☐	☐	☐

Har du vært inne på Mat til minsten nettstedet?

☐ Ja, en god del

☐ Ja, litt

☐ Nei

Hvilken del av Mat til minsten synes du var mest nyttig?

☐ Informasjonene som kom med hvert tema

☐ Oppskriftene

☐ Informasjonssiden "Kjekt å vite"

☐ Vet ikke

Hva var årsaken til at du ikke benyttet deg av Mat til minsten nettstedet?

☐ Hadde ikke tid

☐ Hadde tekniske problemer

☐ Mistet interessen

☐ Annet_____

Nå følger noen spørsmål om dine erfaringer med nettstedet Mat til minsten. Vi setter stor pris på dine tilbakemeldinger, og tar gjerne imot både ros og ris.

Når du tenker på hele Mat til minsten nettstedet; hvor enig eller uenig er du i følgende:

	svært uenig	uenig	hverken enig eller uenig	enig	svært enig	vet ikke
Innholdet var godt tilpasset barnets alder	☐	☐	☐	☐	☐	☐
Tekstene var lett å forstå	☐	☐	☐	☐	☐	☐
Nettstedet var brukervennlig	☐	☐	☐	☐	☐	☐
Nettstedet hadde en tiltalende layout	☐	☐	☐	☐	☐	☐
Jeg lærte noe nytt	☐	☐	☐	☐	☐	☐

Hvor mange av oppskriftene (ca) fra Mat til minsten har dere laget hjemme?

- ☐ Ingen
- ☐ Ingen, men fikk inspirasjon
- ☐ 1-5
- ☐ 6-10
- ☐ 11 eller flere

Se for deg oppskriftene, hvor enig eller uenig er du i følgende:

	svært uenig	uenig	enig	hverken enig eller uenig	svært enig	vet ikke
Oppskriftene var lett å følge	☐	☐	☐	☐	☐	☐
Oppskriftene passet for hele familien	☐	☐	☐	☐	☐	☐
Filmene til oppskriftene var nyttige	☐	☐	☐	☐	☐	☐

Har du kommentarer til Mat til minsten?

Hvor har du fått informasjon om kosthold og ernæring til barnet fra det var 12 måneder gammelt og frem til nå, og hvordan vurderer du denne informasjonen?

	Har ikke fått info	Svært nyttig	Nyttig	Lite nyttig	Unyttig
Helsestasjonen	☐	☐	☐	☐	☐
Helsepersonell utenfor helsestasjonen	☐	☐	☐	☐	☐
Familie/kjente	☐	☐	☐	☐	☐
Offentlige nettsteder: (Eks. Helsedirektoratet og Matportalen)	☐	☐	☐	☐	☐
Blogger	☐	☐	☐	☐	☐
Mat til minsten	☐	☐	☐	☐	☐
Andre nettsteder	☐	☐	☐	☐	☐

Til slutt ønsker vi at du tar utgangspunkt i barnets helsekort og fyller inn barnets vekt og lengde

ved ca et års alder

Dato målingene ble gjort (For eksempel 2017-09-31) _____

Vekt (gram) _____

Lengde (cm) _____

ved ca 18 måneders alder (hvis det er tilgjengelig)

Dato målingene ble gjort (For eksempel 2018-02-28) _____

Vekt (gram) _____

Lengde (cm) _____

Takk for dine svar!

De er nå lagret.

Med vennlig hilsen Mat til minsten teamet

Universitet i Agder

Appendix 4

Follow-up 2 questionnaire (child age 24 months)

Takk for at du fortsatt er med i Mat til minsten.

Hvis du ikke har tid til å fylle ut hele skjemaet på en gang, kan du stoppe underveis og gå tilbake til skjemaet senere. Noen spørsmål kan virke like, men de danner en helhet til slutt.

Du kan når som helst bruke knappene nedenfor for å navigere deg frem og tilbake i spørreskjemaet.
Trykk på neste for å komme i gang.

Lykke til!

Med vennlig hilsen Margrethe Røed (stipendiat) og Professor Nina Øverby (prosjektleder)

Universitetet i Agder

Dato for utfylling av skjema. Må skrives år-måned-dag. For eksempel 2017-09-21

_____

Hva er din relasjon til barnet som deltar i studien?

- ☐ Jeg er mor
- ☐ Jeg er far
- ☐ Jeg er ingen av delene, beskriv_____

Bor du sammen med far/mor til barnet?

- ☐ Ja
- ☐ Nei

Spørsmålene i denne delen gjelder barnet ditt som nå er 2 år. De omhandler bakgrunnsopplysninger, vekst og utvikling og barnets spisevaner. Til slutt kommer noen spørsmål om barneoppdragelse.

Er barnet ditt tvilling/trilling?

- ☐ Nei
- ☐ Ja. Fyll da ut skjemaet for det eldste barnet

Hva er barnets fødselsdato? Må skrives år-måned-dag. For eksempel 2016-09-30

_____

Hva er barnets kjønn?

- ☐ Jente
- ☐ Gutt

Hvor passes barnet på dagtid nå?

- ☐ Hjemme med mor/far
- ☐ Hjemme med dagmamma/praktikant
- ☐ Hos dagmamma
- ☐ I familiebarnehage
- ☐ I barnehage
- ☐ Annet, beskriv _____

Hvor ofte pleier barnet ditt å spise følgende måltider i løpet av en uke? (ganger per uke(g/uke))

	Aldri/sjeldnere enn hver uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Frokost	☐	☐	☐	☐	☐	☐	☐	☐
Formiddagsmat/lunsj	☐	☐	☐	☐	☐	☐	☐	☐
Mellommåltid før middag	☐	☐	☐	☐	☐	☐	☐	☐
Middag	☐	☐	☐	☐	☐	☐	☐	☐
Kveldsmat	☐	☐	☐	☐	☐	☐	☐	☐
Andre måltider/mellommåltider	☐	☐	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende måltider **sammen med familien** nå? (ganger per uke(g/uke))

	Aldri/sjeldnere enn hver uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Frokost	☐	☐	☐	☐	☐	☐	☐	☐
Formiddagsmat/lunsj	☐	☐	☐	☐	☐	☐	☐	☐
Mellommåltid før middag	☐	☐	☐	☐	☐	☐	☐	☐
Middag	☐	☐	☐	☐	☐	☐	☐	☐
Kveldsmat	☐	☐	☐	☐	☐	☐	☐	☐
Andre måltider/mellommåltider	☐	☐	☐	☐	☐	☐	☐	☐

Har barnet utfordringer i forhold til spising/mat? Kan sette flere kryss

- ☐ Nei, har ingen utfordringer
- ☐ Ja, dårlig matlyst/småspist
- ☐ Ja, liker få matvarer
- ☐ Ja, vanskelig med tilvenning til familiens kosthold
- ☐ Ja, allergi/intoleranse mot enkelte matvarer
- ☐ Ja, andre problemer - beskriv _____

Hvor ofte får barnet følgende drikker nå for tiden?

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g/døgn	5 g eller mer/døgn
Morsmelk	☐	☐	☐	☐	☐	☐	☐	☐
Morsmelkerstatning	☐	☐	☐	☐	☐	☐	☐	☐
Vanlig søt melk, alle typer (skummet, lett, helmelk)	☐	☐	☐	☐	☐	☐	☐	☐
Surmelk, alle typer (yoghurt, biola, cultura o.l.)	☐	☐	☐	☐	☐	☐	☐	☐
Sjokolademelk, alle typer	☐	☐	☐	☐	☐	☐	☐	☐
Vann	☐	☐	☐	☐	☐	☐	☐	☐

Hvor ofte får barnet følgende drikker nå for tiden?

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g/døgn	5 g eller mer/døgn
Saft, sukret	☐	☐	☐	☐	☐	☐	☐	☐
Saft, kunstig søtet	☐	☐	☐	☐	☐	☐	☐	☐
Juice	☐	☐	☐	☐	☐	☐	☐	☐
Brus, sukret	☐	☐	☐	☐	☐	☐	☐	☐
Lettbrus, kunstig søtet	☐	☐	☐	☐	☐	☐	☐	☐
Smoothie, kjøpt	☐	☐	☐	☐	☐	☐	☐	☐
Smoothie, hjemmelaget	☐	☐	☐	☐	☐	☐	☐	☐
Annet	☐	☐	☐	☐	☐	☐	☐	☐

Får barnet hjemmelaget middagsmat eller ferdigkjøpt (industrifremstilt) barnemat på glass/klemmeposer?

- ☐ Bare hjemmelaget
- ☐ Mest hjemmelaget
- ☐ Omtrent halvparten av hvert
- ☐ Mest ferdigkjøpt
- ☐ Bare ferdigkjøpt

Hvor ofte spiser barnet følgende mat nå for tiden?

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g/døgn	5 g eller mer/døgn
Industrifremstilt grøt, alle typer	☐	☐	☐	☐	☐	☐	☐	☐
Hjemmelaget grøt av grovt/sammalt mel eller havregryn/havremel	☐	☐	☐	☐	☐	☐	☐	☐
Hjemmelaget grøt av fint/hvitt mel, kavring, semule, ris, eller mais	☐	☐	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende mat nå for tiden?

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Industrifremstilt middag på glass/klemmepose med bare grønnsaker	☐	☐	☐	☐	☐	☐
Industrifremstilt middag på glass/klemmepose med grønnsaker og kjøtt/kylling/kalkun	☐	☐	☐	☐	☐	☐
Industrifremstilt middag på glass/klemmepose med grønnsaker og fisk	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende mat nå for tiden? Industrifremstilt middagsmat på glass/klemmeposer skal ikke regnes med her

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Kjøtt, kjøttdeig, kjøttboller, pølse o.l	☐	☐	☐	☐	☐	☐
Fisk, fiskeboller/-kaker, fiskepudding o.l.	☐	☐	☐	☐	☐	☐
Pannekaker	☐	☐	☐	☐	☐	☐
Pizza	☐	☐	☐	☐	☐	☐
Pasta	☐	☐	☐	☐	☐	☐
Ris	☐	☐	☐	☐	☐	☐
Brødskiver	☐	☐	☐	☐	☐	☐

Hvor grovt er brødet du vanligvis serverer til barnet ditt ifølge brødskalaen nedenfor?

☐ ☐ ☐ ☐

Hvor mange brødskiver spiser barnet ditt på en vanlig dag?

Antall brødskiver (stk): _____

Hvor ofte spiser barnet følgende mat nå for tiden? Industrifremstilt middagsmat på glass/klemmeposer regnes ikke med her

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Poteter	☐	☐	☐	☐	☐	☐
Kokte grønnsaker	☐	☐	☐	☐	☐	☐
Rå grønnsaker (også salat/råkost)	☐	☐	☐	☐	☐	☐
Frukt	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende mat nå for tiden?

	Aldri	Mindre enn 1 g/uke	1-3 g/uke	4-6 g/uke	1-2 g/døgn	3 g eller mer/døgn
Kaker, vafler, søt kjeks	☐	☐	☐	☐	☐	☐
Dessert/iskrem	☐	☐	☐	☐	☐	☐
Sjokolade	☐	☐	☐	☐	☐	☐
Smågodt, seigmenn, annet godteri	☐	☐	☐	☐	☐	☐
Chips o.l.	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet disse grønnsakene nå for tiden? Ta med både rå, kokte og mosede grønnsaker (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Gulrot	☐	☐	☐	☐	☐	☐
Kålrot	☐	☐	☐	☐	☐	☐
Søtpotet	☐	☐	☐	☐	☐	☐
Blomkål	☐	☐	☐	☐	☐	☐
Brokkoli	☐	☐	☐	☐	☐	☐
Grønn salat	☐	☐	☐	☐	☐	☐
Spinat	☐	☐	☐	☐	☐	☐
Grønnsaksmoothie	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet disse grønnsakene nå for tiden? Ta med både rå, kokte og mosede grønnsaker (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Agurk	☐	☐	☐	☐	☐	☐
Tomat	☐	☐	☐	☐	☐	☐
Mais	☐	☐	☐	☐	☐	☐
Paprika	☐	☐	☐	☐	☐	☐

Erter/bønner	☐	☐	☐	☐	☐	☐
Grønnsaksblanding	☐	☐	☐	☐	☐	☐
Annet	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende typer frukt nå for tiden? (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Appelsin/klementin o.l.	☐	☐	☐	☐	☐	☐
Banan	☐	☐	☐	☐	☐	☐
Eple	☐	☐	☐	☐	☐	☐
Pære	☐	☐	☐	☐	☐	☐
Plomme	☐	☐	☐	☐	☐	☐
Druer	☐	☐	☐	☐	☐	☐

Hvor ofte spiser barnet følgende typer frukt og bær nå for tiden? (både hjemmelaget og industrifremstilt)

	Aldri/sjeldnere enn hver uke	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn el. mer
Kiwi	☐	☐	☐	☐	☐	☐
Melon	☐	☐	☐	☐	☐	☐
Mango	☐	☐	☐	☐	☐	☐
Bær, friske eller frosne	☐	☐	☐	☐	☐	☐
Annet	☐	☐	☐	☐	☐	☐

Får barnet tran, vitaminer eller annet kosttilskudd?

☐ Ja

☐ Nei

Tenk på hvordan det pleier å være under et vanlig måltid når du svarer. I hvilken grad er du enig i følgende påstander?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Barnet mitt prøver stadig ny og ulik type mat	☐	☐	☐	☐	☐
Barnet mitt stoler ikke på ukjent mat	☐	☐	☐	☐	☐
Hvis barnet mitt ikke vet hva som er i maten vil han/hun ikke smake	☐	☐	☐	☐	☐
Barnet mitt er redd for å spise ting han/hun ikke har spist før	☐	☐	☐	☐	☐
Barnet mitt er veldig kresen på hva slags mat han/hun vil spise	☐	☐	☐	☐	☐
Barnet mitt spiser nesten all slags mat	☐	☐	☐	☐	☐

De neste spørsmålene dreier seg om mat og matvaner. Marker det svaralternativet du synes passer best. Noen av spørsmålene passer ikke helt til en ettåring, men svar så godt du kan.

	Aldri	Sjelden	Noen ganger	Som oftest	Alltid
I hvilken grad følger du med på hva barnet ditt spiser av søtsaker (godterier, is, kaker, kjeks, boller, etc.)?	☐	☐	☐	☐	☐
I hvilken grad følger du med på hva barnet ditt spiser av snacks (potetchips, doritos, ostepop, etc.)?	☐	☐	☐	☐	☐
I hvilken grad følger du med på hvor mye fet mat barnet ditt spiser?	☐	☐	☐	☐	☐

I hvilken grad følger du med på din sønns/datters inntak av sukkerholdig drikke (brus, saft, iste, etc.)?	❑	❑	❑	❑	❑
Lar du barnet ditt spise hva han/hun vil?	❑	❑	❑	❑	❑
Tenk deg et middagsmåltid: Lar du barnet ditt velge den maten han/hun vil ha blant matvarene som serveres til middag?	❑	❑	❑	❑	❑

	Aldri	Sjelden	Noen ganger	Som oftest	Alltid
Når barnet ditt blir masete, er det første du gjør å gi han/henne noe å spise eller drikke?	❑	❑	❑	❑	❑
Gir du barnet ditt noe å spise eller drikke når han/hun kjeder seg, selv om du ikke tror han/hun er sulten?	❑	❑	❑	❑	❑
Når barnet ditt er sint eller lei seg, gir du ham/henne noe å drikke selv om du ikke tror han/hun er tørst?	❑	❑	❑	❑	❑
Hvis barnet ditt ikke liker det som serveres (for eksempel til middag), lager du da noe annet til ham/henne?	❑	❑	❑	❑	❑
Lar du barnet ditt spise snacks når han/hun selv vil?	❑	❑	❑	❑	❑
Får barnet ditt lov til å gå fra bordet når han/hun er mett, selv om resten av familien ikke er ferdige med å spise?	❑	❑	❑	❑	❑
Oppmuntrer du barnet ditt til å spise sunn mat i stedet for usunn mat?	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Mesteparten av maten jeg har i huset er sunn	❑	❑	❑	❑	❑
Jeg involverer barnet mitt i å planlegge familiemåltider	❑	❑	❑	❑	❑
Jeg har mye snacks (potetchips, doritos, ostepop, etc.) i huset	❑	❑	❑	❑	❑
Barnet mitt må alltid spise opp all maten på tallerkenen sin	❑	❑	❑	❑	❑
Jeg må forsikre meg om at barnet mitt ikke spiser for mye fet mat	❑	❑	❑	❑	❑
Jeg tilbyr barnet mitt hans/hennes favorittmat dersom han/hun lover å oppføre seg fint	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg lar barnet mitt "hjelpe til" med matlaging	❑	❑	❑	❑	❑
Hvis jeg ikke passet på eller satte noen begrensinger for min sønns/datters matinntak, ville han/hun spise for mye av sin favorittmat	❑	❑	❑	❑	❑
Flere ulike sunne matvarer er tilgjengelig for barnet mitt til hvert av måltidene som serveres hjemme	❑	❑	❑	❑	❑
Jeg tilbyr barnet mitt søtsaker (godterier, is, kaker, kjeks, boller, etc.) som belønning for god oppførsel	❑	❑	❑	❑	❑
Jeg oppmuntrer barnet mitt til å prøve ny mat	❑	❑	❑	❑	❑
Jeg snakker med barnet mitt om hvorfor det er viktig å spise sunn mat	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg forteller barnet mitt at sunn mat smaker godt	❑	❑	❑	❑	❑
Jeg oppmuntrer barnet mitt til å spise mindre slik at hun/han ikke blir fet	❑	❑	❑	❑	❑
Hvis jeg ikke passet på eller satte noen begrensninger for mitt barns matinntak, ville han/hun spise for mye junk food (gatekjøkkenmat, snacks og søtsaker)	❑	❑	❑	❑	❑
Jeg gir barnet mitt små porsjoner til måltidene for at han/hun ikke skal bli overvektig eller fet	❑	❑	❑	❑	❑
Hvis barnet mitt sier at han/hun ikke er sulten, prøver jeg å overtale ham/henne til å spise likevel	❑	❑	❑	❑	❑

Jeg diskuterer med barnet mitt næringsverdien av mat	❑ ❑ ❑ ❑ ❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg oppmuntrer barnet mitt til å delta i å handle matvarer	❑	❑	❑	❑	❑
Hvis barnet mitt spiser uvanlig mye til et måltid, prøver jeg å begrense hans/hennes matinntak ved neste måltid	❑	❑	❑	❑	❑
Jeg begrenser mitt barns inntak av mat som kan medføre at han/hun blir overvektig eller fet	❑	❑	❑	❑	❑
Det er visse matvarer barnet mitt ikke bør spise, da disse matvarene vil gjøre at han/hun blir overvektig eller fet	❑	❑	❑	❑	❑
Jeg holder tilbake søtsaker/dessert som reaksjon på dårlig oppførsel	❑	❑	❑	❑	❑
Jeg har mye søtsaker (godterier, is, kaker, kjeks, boller, etc.) i huset	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg oppmuntrer barnet mitt til å spise variert (dvs. mange ulike matvarer og retter)	❑	❑	❑	❑	❑
Hvis barnet mitt kun spiser en liten porsjon, prøver jeg å overtale ham/henne til å spise mer	❑	❑	❑	❑	❑
Jeg må forsikre meg om at barnet mitt ikke spiser for mye av sin favorittmat	❑	❑	❑	❑	❑
Jeg vil ikke at barnet mitt skal bli overvektig eller fet, derfor tillater jeg ikke at han/hun spiser mellom måltidene	❑	❑	❑	❑	❑
Jeg sier hva barnet mitt skal spise og hva han/hun ikke skal spise uten å gi noen forklaring på hvorfor	❑	❑	❑	❑	❑
Jeg må forsikre meg om at barnet mitt ikke spiser for mye søtsaker (godterier, is, kaker, kjeks, boller, etc.)	❑	❑	❑	❑	❑

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg er et forbilde for barnet mitt ved selv å spise sunn mat	❑	❑	❑	❑	❑
Jeg setter ofte barnet mitt på diet for å kontrollere vekten	❑	❑	❑	❑	❑
Jeg prøver å spise sunn mat når jeg er sammen med min sønn/datter, selv om denne maten ikke er min favorittmat	❑	❑	❑	❑	❑
Jeg prøver å vise entusiasme når jeg spiser sunn mat	❑	❑	❑	❑	❑
Jeg viser barnet mitt at jeg virkelig liker å spise sunn mat	❑	❑	❑	❑	❑
Når barnet mitt sier hun/han er ferdig med å spise prøver jeg å få det til å spise en bit eller to til	❑	❑	❑	❑	❑

Hvor trygg føler du deg på følgende:

	Svært utrygg	Noe utrygg	Både-og	Noe trygg	Svært trygg
At den maten du gir barnet ditt er sunn	❑	❑	❑	❑	❑
At du kan få barnet ditt til å spise nok	❑	❑	❑	❑	❑
At du kan få barnet ditt til å smake på ulike grønnsaker	❑	❑	❑	❑	❑
At du gir barnet ditt riktig mengde mat	❑	❑	❑	❑	❑
At du kan få barnet ditt til å smake på ny mat	❑	❑	❑	❑	❑

Hvor enig er du i følgende påstander?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Det er rolig når vi spiser middag	❑	❑	❑	❑	❑
Middagen hos oss er variert	❑	❑	❑	❑	❑
Jeg tilbyr mat til barnet selv om han/hun tidligere ikke har likt denne maten	❑	❑	❑	❑	❑

Jeg ser ofte på mobilen under måltidene ❑ ❑ ❑ ❑ ❑

Hvor mange timer per dag sitter barnet ditt vanligvis foran TV, PC/nettbrett eller smarttelefon?

- ❑ Mer enn 4 timer
- ❑ 4 timer
- ❑ 3 timer
- ❑ 1-2 timer
- ❑ Mindre enn 1 time

Del 2
Nå følger noen spørsmål om deg som er mor eller far.

Hvilken sivilstand har du nå?

- ❑ Gift
- ❑ Samboer
- ❑ Enslig
- ❑ Skilt/separert
- ❑ Enke/enkemann
- ❑ Annet, beskriv_____

Hvor mange personer er det totalt i din husholdning(vanligvis)?

Antall voksne _____

Antall barn _____

Hva er din hovedaktivitet nå?

- ❑ Arbeid heltid
- ❑ Arbeid deltid
- ❑ Hjemmeværende
- ❑ Sykemeldt
- ❑ Permisjon
- ❑ Uføretrygdet
- ❑ Under attføring/rehabilitering
- ❑ Student/skoleelev
- ❑ Arbeidsledig
- ❑ Annet

Hvilken utdannelse har du? Sett kun ett kryss for høyeste fullførte utdannelse.

- ❑ 9/10-årig grunnskole eller kortere
- ❑ 9/10-årig grunnskole og folkehøgskole eller annen ett-årig utdanning
- ❑ Videregående opplæring (videregående skole/gymnas/fagbrev)
- ❑ Fagskoleutdanning
- ❑ Høgskole- eller universitetsutdanning på 4 år eller mindre
- ❑ Høgskole- eller universitetsutdanning på mer enn 4 år

- [ ] Annet
- [ ] Vet ikke

Hvilken utdannelse har barnets andre forelder? Sett kun ett kryss for høyeste fullførte utdannelse.

- [ ] 9/10-årig grunnskole eller kortere
- [ ] 9/10-årig grunnskole og folkehøgskole eller annen ett-årig utdanning
- [ ] Videregående opplæring (videregående skole/gymnas/fagbrev)
- [ ] Fagskoleutdanning
- [ ] Høgskole- eller universitetsutdanning på 4 år eller mindre
- [ ] Høgskole- eller universitetsutdanning på mer enn 4 år
- [ ] Annet
- [ ] Vet ikke

Har det i løpet av det siste halve året hendt at du/dere har hatt vansker med å klare løpende utgifter til mat, transport, husleie og liknende?

- [ ] Nei, aldri
- [ ] Ja, en sjelden gang
- [ ] Ja, av og til
- [ ] Ja, ofte

Hvor høy er du? Svar i antall centimeter

_____

Hvor mye veier du nå? Svar i antall kg

_____

Røyker du?

- [ ] Nei, har aldri røykt regelmessig
- [ ] Nei, har sluttet
- [ ] Ja, men ikke daglig
- [ ] Ja, daglig

I en vanlig uke, hvor mange dager er du fysisk aktiv i minst 30 minutter?

- [ ] Ingen
- [ ] En dag
- [ ] To dager
- [ ] Tre dager
- [ ] Fire dager
- [ ] Fem dager
- [ ] Seks dager
- [ ] Hver dag

På fritiden; omtrent hvor mye tid bruker du daglig tilsammen ved en TV, PC/nettbrett eller smarttelefon?

- ☐ Mer enn 4 timer
- ☐ 4 timer
- ☐ 3 timer
- ☐ 1-2 timer
- ☐ Mindre enn en time
- ☐ Sjelden/aldri

Nå følger noen spørsmål om kost og matvaner.
Vi spør om dine spisevaner slik de vanligvis er. Vi er klar over at kostholdet varierer fra dag til dag, prøv derfor så godt du kan å gi et "gjennomsnitt" av dine spisevaner slik de har vært det siste året.

Hvor ofte pleier du å spise følgende måltider i løpet av en uke?

	Aldri/sjeldnere enn hver uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Frokost	☐	☐	☐	☐	☐	☐	☐	☐
Formiddagsmat/lunsj	☐	☐	☐	☐	☐	☐	☐	☐
Mellommåltid før middag	☐	☐	☐	☐	☐	☐	☐	☐
Middag	☐	☐	☐	☐	☐	☐	☐	☐
Kveldsmat	☐	☐	☐	☐	☐	☐	☐	☐
Andre måltider/mellommåltider	☐	☐	☐	☐	☐	☐	☐	☐

Hvor mye drikker du vanligvis av følgende drikker?

	Drikker aldri/sjelden	1-3 glass/mnd	1-3 glass/uke	4-6 glass/uke	1-3 glass/dag	4-6 glass/dag	7 glass eller mer daglig
Brus/saft med sukker	☐	☐	☐	☐	☐	☐	☐
Brus/saft, kunstig søtet	☐	☐	☐	☐	☐	☐	☐
Kaffe	☐	☐	☐	☐	☐	☐	☐
Te	☐	☐	☐	☐	☐	☐	☐
Alkohol	☐	☐	☐	☐	☐	☐	☐
Vann	☐	☐	☐	☐	☐	☐	☐
Melk (alle typer)	☐	☐	☐	☐	☐	☐	☐

Hvor mange ganger spiser du følgende matvarer?

	Aldri/sjeldnere enn hver uke	1-3 g/måned	1-3 g/uke	4-6 g/uke	1 g/døgn	2 g/døgn	3 g/døgn	4 g eller mer/døgn
Frukt	☐	☐	☐	☐	☐	☐	☐	☐
Bær	☐	☐	☐	☐	☐	☐	☐	☐
Grønnsaker	☐	☐	☐	☐	☐	☐	☐	☐
Kaker, kjeks o.l.	☐	☐	☐	☐	☐	☐	☐	☐
Desserter, iskrem o.l.	☐	☐	☐	☐	☐	☐	☐	☐
Godterier/sjokolade/potetgull o.l.	☐	☐	☐	☐	☐	☐	☐	☐

Hvor enig er du i følgende?

	Svært uenig	Noe uenig	Noe enig	Svært enig
Jeg prøver stadig ny og ulik type mat	☐	☐	☐	☐

Jeg stoler ikke på ukjent mat	☐	☐	☐	☐
Hvis jeg ikke vet hva som er i maten, vil jeg ikke smake	☐	☐	☐	☐
Jeg liker mat fra ulike land	☐	☐	☐	☐

Hvor enig er du i følgende?

	Svært uenig	Noe uenig	Noe enig	Svært enig
I middagsselskaper prøver jeg gjerne ny mat	☐	☐	☐	☐
Jeg er redd for å spise ting jeg ikke har spist før	☐	☐	☐	☐
Jeg er veldig kresen på hva slags mat jeg vil spise	☐	☐	☐	☐
Jeg spiser nesten all slags mat	☐	☐	☐	☐

Hvor ofte gjør du følgende?

	Aldri	Mindre enn 1 g/uke	1 g/uke	2 g/uke	3 g/uke	4 g/uke	5 g/uke	6 g/uke	Hver dag
Kutter opp grønnsaker	☐	☐	☐	☐	☐	☐	☐	☐	☐
Kutter opp frukt	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lager middag fra bunnen	☐	☐	☐	☐	☐	☐	☐	☐	☐
Baker brød o.l.	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lager hjemmelaget smoothie	☐	☐	☐	☐	☐	☐	☐	☐	☐
Finner oppskrifter på nettet når du lager mat	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bruker matlagingsfilmer el.l. på nettet når du lager mat	☐	☐	☐	☐	☐	☐	☐	☐	☐

Har du hovedansvaret for matlagingen hjemme?

☐ Ja

☐ Nei

☐ Ansvaret er delt

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
er lett å tilberede	☐	☐	☐	☐	☐	☐	☐
smaker godt	☐	☐	☐	☐	☐	☐	☐
ikke er dyr	☐	☐	☐	☐	☐	☐	☐
er kjent	☐	☐	☐	☐	☐	☐	☐
inneholder mye fiber	☐	☐	☐	☐	☐	☐	☐
er næringsrik	☐	☐	☐	☐	☐	☐	☐

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
er lett tilgjengelig i butikken	☐	☐	☐	☐	☐	☐	☐
gir mye igjen for pengene	☐	☐	☐	☐	☐	☐	☐
lukter godt	☐	☐	☐	☐	☐	☐	☐
kan tilberedes enkelt	☐	☐	☐	☐	☐	☐	☐
har en behagelig konsistens	☐	☐	☐	☐	☐	☐	☐
er som maten jeg spiste da jeg var barn	☐	☐	☐	☐	☐	☐	☐

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
inneholder mye vitaminer og mineraler	❑	❑	❑	❑	❑	❑	❑
ser god ut	❑	❑	❑	❑	❑	❑	❑
er proteinrik	❑	❑	❑	❑	❑	❑	❑
tar minimal tid å forberede	❑	❑	❑	❑	❑	❑	❑
holder meg frisk	❑	❑	❑	❑	❑	❑	❑
er bra for hud / tenner / hår / negler osv.	❑	❑	❑	❑	❑	❑	❑

Ranger på en skala fra 1-7, der 1 er lite viktig og 7 er meget viktig. Det er viktig for meg at maten jeg spiser på en vanlig dag:

	Lite viktig						Meget viktig
er det jeg pleier å spise	❑	❑	❑	❑	❑	❑	❑
kan kjøpes i butikker i nærheten av der jeg bor eller arbeider	❑	❑	❑	❑	❑	❑	❑
er billig	❑	❑	❑	❑	❑	❑	❑

Nå følger noen spørsmål om den butikken du vanligvis handler i.

Hvor enig er du i følgende påstander?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg har vanligvis med meg handleliste	❑	❑	❑	❑	❑
Jeg blir påvirket av reklame for mat	❑	❑	❑	❑	❑
Jeg kjøper ofte barnemat på glass og klemmeposer selv om jeg ikke hadde planlagt det	❑	❑	❑	❑	❑
Jeg lar meg påvirke av barnematens emballasje	❑	❑	❑	❑	❑
I vår husholdning benytter vi oss av mat-kasser med middagsmat som vi får tilkjørt	❑	❑	❑	❑	❑

Hvor enig er du i følgende?

	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig
Jeg tar ofte med meg matvarer som er godt synlig i butikken, selv om jeg ikke hadde tenkt å kjøpe de	❑	❑	❑	❑	❑
Jeg kjøper mer om det er ryddig og ordentlig i butikken	❑	❑	❑	❑	❑
Jeg benytter meg ofte av 3 for 2 tilbud o.l.	❑	❑	❑	❑	❑
Hvis butikken har plassert mange matvarer i store stabler, kjøper jeg mer av varen	❑	❑	❑	❑	❑
Jeg søker bevisst etter tilbud der jeg får mye for pengene	❑	❑	❑	❑	❑
Jeg kjøper det jeg trenger og blir ikke påvirket av hvor varen står i butikken	❑	❑	❑	❑	❑

Nå følger noen spørsmål om maten som er tilgjengelig hjemme og måltidsplanlegging.

Hvor mye av følgende matvarer har du vanligvis tilgjengelig hjemme? (Gjelder både friske og fryste).

	Ingenting	Lite	Noe	Mye	Veldig mye
Bær	❑	❑	❑	❑	❑
Frukt	❑	❑	❑	❑	❑
Grønnsaker					

Godterier/sjokolade/potetgull o.l.	❑	❑	❑	❑	❑
Brus	❑	❑	❑	❑	❑
Fisk/skalldyr	❑	❑	❑	❑	❑
Kylling	❑	❑	❑	❑	❑
Kjøtt	❑	❑	❑	❑	❑
Kaker/kjeks o.l.	❑	❑	❑	❑	❑

Marker det som beskriver den generelle tilgjengeligheten av matvarer hjemme:

	Lett tilgjengelig på kjøkkenbenken el.l.	Tilgjengelig i skapet/kjøleskapet/frysen el.l.	Lite tilgjengelig langt inne i skapet/kjelleren/frysen el.l.
Bær	❑	❑	❑
Frukt	❑	❑	❑
Grønnsaker	❑	❑	❑
Godterier/sjokolade/potetgull o.l.	❑	❑	❑
Brus	❑	❑	❑
Kaker/kjeks o.l.	❑	❑	❑

I løpet av den siste måneden, har du gjort følgende med din familie?

	Aldri	Sjelden	Noen ganger	Ofte	Svært ofte
Spist på en familie-restaurant (for eksempel Egon eller Big Horn)	❑	❑	❑	❑	❑
Spist på en "fast food" restaurant (for eksempel McDonalds eller Burger King)?	❑	❑	❑	❑	❑
Spist take-away mat hjemme (for eksempel Pizzabakeren eller sushi take away)?	❑	❑	❑	❑	❑
Spist ferdigretter hjemme (type frosne/hermetiserte, for eksempel frossen pizza eller Fjordland)?	❑	❑	❑	❑	❑

På hvilken måte stemmer disse uttalelsene for deg?

	Stemmer absolutt ikke	Stemmer delvis	Stemmer ganske godt	Stemmer godt	Stemmer veldig godt
Jeg planlegger menyen i forkant for uken som kommer	❑	❑	❑	❑	❑
Jeg lager handleliste for en uke av gangen	❑	❑	❑	❑	❑
Jeg lager sunne måltider også når jeg har få ingredienser tilgjengelig	❑	❑	❑	❑	❑
Jeg lager måltider ferdig på forhånd (i helgen eller på fritiden)	❑	❑	❑	❑	❑
Jeg lager dobbel porsjon av maten for å spare til senere (fryser ned eller oppbevarer i kjøleskapet)	❑	❑	❑	❑	❑

Hvor har du fått informasjon om kosthold og ernæring til barnet fra det var 18 måneder gammelt og frem til nå, og hvordan vurderer du denne informasjonen?

	Har ikke fått info	Svært nyttig	Nyttig	Lite nyttig	Unyttig
Helsestasjonen	❑	❑	❑	❑	❑
Helsepersonell utenfor helsestasjonen	❑	❑	❑	❑	❑
Familie/kjente	❑	❑	❑	❑	❑
Offentlige nettsteder: (Eks. Helsedirektoratet og Matportalen)	❑	❑	❑	❑	❑

Blogger	❑	❑	❑	❑	❑
Andre nettsteder	❑	❑	❑	❑	❑

Skriv ned barnets vekt og høyde ved ca 2 års alder (hvis det er tilgjengelig)

Dato målingene ble gjort (For eksempel 2018-02-28) _____

Vekt (gram) _____

Lengde (cm) _____

Takk for dine svar!

De er nå lagret.

Med vennlig hilsen Mat til minsten teamet

Universitet i Agder

Appendix 5

Search string for a systematic search

Search string for parent focused eHealth interventions

#	Query	Limiters/Expanders	Last Run Via	Results
S9	S6 NOT S7	Limiters - Published Date: 20050101- Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - Academic Search Complete;CINAHL;MEDLINE	666
S8	S6 NOT S7	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - Academic Search Complete;CINAHL;MEDLINE	677
S7	TI (youth* or adolescent* or school*)	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - Academic Search Complete;CINAHL;MEDLINE	769,446
S6	S1 AND S2 AND S3 AND S4 AND S5	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - Academic Search Complete;CINAHL;MEDLINE	812
S5	Diet* or nutrition* or fruit* or vegetable* or SSB* or "sugar-sweetened beverages" or "discretionary" or snack* or "non-core" or eating*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - Academic Search Complete;CINAHL;MEDLINE	2,835,555
S4	eHealth or mHealth or "web based" or web-based or digital or app or apps "mobile application*" or smartphone* or internet	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - Academic Search Complete;CINAHL;MEDLINE	1,531,109
S3	Random* or intervention* or trial*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - Academic Search Complete;CINAHL;MEDLINE	5,330,193
S2	Child* or infant* or preschooler* or toddler* or kid* or boy* or girl*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - Academic Search Complete;CINAHL;MEDLINE	7,498,193
S1	Parent* or mother* or father* or caregiver*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - Academic Search Complete;CINAHL;MEDLINE	1,893,461

Appendix 6

Thesis supplement to paper III: Table 4 Between-group comparison of dietary outcomes at baseline, follow-up 1 and follow-up 2

This supplementary table, exclusively made for this thesis, complements the dietary findings in paper III.

Table 4 Between-group comparison of dietary outcomes at baseline, follow-up 1 and follow-up 2

Mean score with standard deviation (SD) and median with 25% (Q1) and 75% (Q3) quartile for dietary outcomes at baseline, follow-up 1, and follow-up 2 are presented. Mann-Whitney U-test or independent sample t-test (marked with [1]) are used to measure the differences between the two groups. The first part of the table works as a sensitivity test for the dietary effect outcomes in paper III (frequency and variation of vegetables and fruit, and frequency of discretionary foods).

Time points / **Food groups**	**Baseline**	**Follow-up 1**	**Follow-up 2**
	N= control (147), intervention (144)	*N*= control (116-117), intervention (93-94)	*N*= control (90), intervention (84-86)
For all items	Mean (SD) Median (Q1, Q3)	Mean (SD) Median (Q1, Q3)	Mean (SD) Median (Q1, Q3)
Vegetables[2] (times/day)			
Control	3.1 (1.5) 3.0 (2.0, 4.0)	3.1 (1.4) 3.0 (2.0, 3.9)	2.9 (1.5) 2.9 (1.7, 3.7)
Intervention	3.2 (1.7) 2.7 (2.0, 4.3)	3.7 (1.9) * 3.4 (2.4, 4.7)	3.5 (1.7) * 3.1 (2.3, 4.3)
Vegetables variation[3] (number /week) [1]			
Control	7.2 (2.5) 7.0 (6.0, 9.0)	7.6 (2.3) 8.0 (6.0, 9.0)	7.4 (2.6) 7.5 (6.0, 9.3)
Intervention	7.2 (2.7) 8.0 (6.0, 9.0)	8.1 (2,3) 8.0 (7.0, 10.0)	8.1 (2.2) * 8.0 (7.0, 10.0)
Fruit (times/day) [4]			
Control	2.7 (1.4) 2.6 (1.7, 3.6)	3.1 (1.5) 2.9 (2.0, 3.9)	3.0 (1.3) 2.9 (2.0, 3.6)
Intervention	2.9 (1.8) 2.4 (1.7, 3.6)	3.4 (1.9) 3.1 (2.4, 4.1)	3.2 (2.1) 3.0 (2.1, 3.7)
Fruit variation[5] (number /week) [1]			
Control	5.7 (2.2) 6.0 (4.0, 7.0)	6.7 (2.2) 7.0 (5.0, 8.0)	6.4 (2.0) 7.0 (5.0, 8.0)
Intervention	5.9 (2.2) 6.0 (4.0, 7.0)	7.0 (2.1) 7.0 (5.0, 9.0)	6.7 (2.0) 7.0 (5.3, 8.0)
Discretionary foods[6] (times/week)			
Control	0.8 (1.4) 0.0 (0.0, 1.0)	3.6 (5.4) 2.5 (1.0, 4.5)	4.1 (3.1) 3.8 (1.5, 6.0)
Intervention	0.8 (1.4) 0.5 (0.0, 1.0)	3.5 (3.9) 2.3 (1.0, 4.6)	4.5 (3.9) 3.5 (1.5, 6.5)
Breast milk (times/day)			
Control	2.8 (2.5)	1.1 (2.0)	0.5 (1.4)

	3.0 (0.0, 6.0)	0.0 (0.0, 2.0)	0.0 (0.0, 0.0)
Intervention	2.7 (2.5) 3.0 (0.0, 6.0)	0.9 (1.7) 0.0 (0.0, 1.0)	0.5 (1.2) 0.0 (0.0, 0.0)
Infant formula (times/day)			
Control	0.8 (1.2) 0.0 (0.0, 1.0)	0.2 (0.6) 0.0 (0.0, 0.0)	0.1 (0.4) 0.0 (0.0, 0.0)
Intervention	0.9 (1.5) 0.0 (0.0, 1.0)	0.2 (0.6) 0.0 (0.0, 0.0)	0.1 (0.3) 0.0 (0.0, 0.0)
Milk[7] (times/day)			
Control	0.4 (0.7) 0.3 (0.0, 0.6)	1.9 (1.8) 1.4 (0.6, 2.7)	2.5 (2.3) 1.3 (1.0, 3.0)
Intervention	0.5 (0.9) 0.1 (0.0, 0.6)	2.1 (1.4) 2.0 (1.3, 3.0)	2.5 (1.7) 2.3 (1.4, 3.0)
Water (times/day)			
Control	5.1 (1.6) 6.0 (4.0, 6.0)	5.4 (1.1) 6.0 (6.0, 6.0)	4.8 (1.4) 6.0 (4.0, 6.0)
Intervention	5.9 (1.4) 6.0 (4.0, 6.0)	5.1 (1.4) 6.0 (4.0, 6.0)	4.8 (1.5) 6.0 (4.0, 6.0)
Artificially sweetened beverages[8] (times/day)			
Control	0.01 (0.1) 0.0 (0.0, 0.0)	0.2 (0.7) 0.0 (0.0, 0.0)	0.1(0.5) 0.0 (0.0, 0.0)
Intervention	0.00 (0.03) 0.0 (0.0, 0.0)	0.1 (0.2) 0.0 (0.0, 0.0)	0. 1(0.2) 0.0 (0.0, 0.0)
Juice (times/day)			
Control	0.1 (0.2) 0.0 (0.0, 0.0)	0.2 (0.2) 0.3 (0.0, 0.3)	0.3 (0.3) 0.3 (0.0, 0.3)
Intervention	0.07 (0.2) 0.0 (0.0, 0.0)	0.2 (0.2) 0.3 (0.0, 0.3)	0.3 (0.4) 0.3 (0.0, 0.3)
Smoothie[9] (times/day)			
Control	0.8 (0.8) 0.6 (0.3, 1.0)	0.6 (0.9) 0.3 (0.3, 0.7)	0.4 (0.7) 0.3 (0.0, 0.3)
Intervention	1.0 (1.1) 0.7 (0.3, 1.0)	0.5 (0.3) 0.3 (0.3, 0.7)	0.3 (0.3) 0.3 (0.0, 0.6)
Porridge, industrial made (times/day)			
Control	1.3 (1.1) 1.0 (0.3, 2.0)	0.3 (0.5) 0.0 (0.0, 0.3)	0.09 (0.3) 0.0 (0.0, 0.0)
Intervention	1.4 (1.3) 1.0 (0.3, 2.0)	0.4 (0.9) 0.0 (0.0, 0.3)	0.1 (0.2) 0.0 (0.0, 0.0)
Porridge, homemade whole grain (times/day)			
Control	0.4 (1.0) 0.0 (0.0, 0.3)	0.4 (0.7) 0.3 (0.0, 0.3)	0.4 (0.5) 0.3 (0.0, 0.7)
Intervention	0.3 (0.7) 0.0 (0.0, 0.3)	0.3 (0.4) 0.3 (0.0, 0.7)	0.4 (0.3) 0.3 (0.3, 0.7)
Porridge, homemade sifted (times/day)			
Control	0.02(0.1) 0.0 (0.0, 0.0)	0.01(0.1) 0.0 (0.0, 0.0)	0.02 (0.1) 0.0 (0.0, 0.0)

Intervention	0.02(0.2) 0.0 (0.0, 0.0)	0.02 (0.1) 0.0 (0.0, 0.0)	0.03 (0.1) 0.0 (0.0, 0.0)
Meat[9] (times/week)			
Control	3.9 (2.6) 2.5 (2.0, 5.0)	3.2 (2.0) 2.0 (2.0, 5.0)	3.0 (1.9) 2.0 (2.0, 5.0)
Intervention	4.1 (3.9) 4.0 (2.0, 5.0)	2.9 (1.9) 2.0 (2.0, 4.0)	2.6 (1.4) 2.0 (2.0, 2.5)
Fish[9] (times/week)			
Control	2.8 (1.9) 2.0 (2.0, 4.0)	2.3 (1.0) 2.0 (2.0, 2.5)	2.2 (1.0) 2.0 (2.0, 2.0)
Intervention	3.0 (2.5) 2.5 (2.0, 4.0)	2.5 (1.2) 2.0 (2.0, 2.5)	2.3 (1.1) 2.0 (2.0, 2.0)
Potato [10] (times/week)			
Control	2.0 (1.7) 2.0 (0.5, 2.0)	2.0 (1.6) 2.0 (0.5, 2.0)	1.8 (1.2) 2.0 (0.5, 2.0)
Intervention	2.1 (1.8) 2.0 (2.0, 2.0)	1.8 (1.3) 2.0 (0.5, 2.0)	2.0 (1.6) 2.0 (2.0, 2.0)
Rice (times/week)			
Control	0.8 (0.9) 0.5 (0.0, 2.0)	1.4 (1.4) 1.3 (0.5, 2.0)	1.4 (0.8) 2.0 (0.5, 2.0)
Intervention	1.0 (0.9) 0.5 (0.5, 2.0)	1.3 (0.9) 2.0 (0.5, 2.0)	1.4 (0.9) 2.0 (0.5, 2.0)
Bread (times/week)			
Control	9.6 (3.9) 10.5 (10.5, 10.5)	12.1 (5.9) 10.5 (10.5, 10.5)	13.8 (7.2) 10.5 (10.5, 24.5)
Intervention	9.75(5.0) 10.5 (5.0, 10.5)	11.8 (6.3) 10.5 (10.5, 10.5)	11.9 (6.1) 10.5 (10.5, 10.5)

*Significant differences at $p<0.05$

[1] Independent sample T-test (normally distributed data)

[2] Sum score of frequency of intake of carrot, rutabaga, sweet potato, cauliflower, broccoli, green salad, spinach, cucumber, tomato, corn, sweet pepper, pea and other

[3]Sum score of eaten (1) or not eaten (0) carrot, rutabaga, sweet potato, cauliflower, broccoli, green salad, spinach, cucumber, tomato, corn, sweet pepper, pea and other

[4] Sum score of frequency of intake of orange, banana, apple, pear, plum, grapes, kiwi, melon, mango, berries and other

[5]Sum score of eaten (1) or not eaten (0) orange, banana, apple, pear, plum, grapes, kiwi, melon, mango, berries and other

[6] Sum score of five unhealthy snack items and two sugar-sweetened beverages

[7] Sweet and sour milk and yoghurt

[8] Artificially sweetened soda and lemonade

[9] Homemade and industry made

[10] Homemade only

Appendix 7

Thesis supplement to paper III: Table 5 Baseline dietary differences between high and low fruit and vegetable consumers

This supplementary table, exclusively made for this thesis, complements the dietary findings in paper III.

Table 5 Baseline dietary differences between high and low fruit and vegetable consumers

To justify that fruit and vegetable consumption is a good measure for diet quality we assessed potential differences in dietary intake between high and low fruit and vegetable consumers in our sample. A potential association of high fruit and vegetable consumption and consumption of other healthy foods are of interest. Dichotomous categories were made between participants with the highest intake (close to the highest quartile, 25%) and the other participants for the scores of frequency and variety of fruit and vegetables (four categories). Because many participants had the same score, the high consumers were not exactly 25% of the participants but the cut off was as close as possible, see row 2 in the table for exact numbers. Further, table 5 shows the difference in intake of high and low consumers for 16 food and beverage items. Mean score with standard deviation (SD) and median with 25% (Q1) and 75% (Q3) quartile for dietary intake at baseline are presented. Mann-Whitney U-test is used to measure differences between the groups and significant differences are marked with *. Total number of participants, *N*= 291.

Categories / **Food and beverage frequency**	**Vegetables frequency[1] (times/day)**	**Vegetables variation[2] (number /week)**	**Fruit frequency[3] (times/day)**	**Fruit variation[4] (number /week)**
The number and % of participants in the high intake group	High intake *n*(%) =74(25,4)	High intake *n*(%) = 56 (19.2)	High intake *n*(%) = 76 (26.1)	High intake *n*(%) = 59(20.3)
For all numbers	Mean (SD) Median (Q1, Q3)	Mean (SD) Median (Q1, Q3)	Mean (SD) Median (Q1, Q3)	Mean (SD) Median (Q1, Q3)
Discretionary foods[3] (times/week)				
Low intake group	0.9 (1.5) 0.5 (0.0, 1.0)	0.8 (1.5) 0.5 (0.0, 1.0)	0.8 (1.5) 0.5 (0.0, 1.0)	0.9 (1.5) 0.5 (0.0, 1.0)
High intake group	0.6 (0.9) 0.0 (0.0, 0.6)	0.7 (1.1) 0.0 (0.0, 1.0)	0.7 (1.2) 0.0 (0.0, 1.0)	0.6 (1.1) 0.0 (0.0, 1.0)
Breast milk (times/day)				
Low intake group	2.7 (2.5) 3.0 (0.0, 6.0)	2.7 (2.5) 3.0 (0.0, 6.0)	2.7 (2.5) 3.0 (0.0, 6.0)	2.7 (2.5) 3.0 (0.0, 6.0)
High intake group	2.9 (2.7) 3.5 (0.0, 6.0)	2.9 (2.5) 3.0 (0.0, 6.0)	2.8 (2.5) 3.0 (0.0, 6.0)	2.7 (2.5) 3.0 (0.0, 6.0)
Infant formula (times/day)				
Low intake group	0.8 (1.3) 0.0 (0.0, 1.0)	0.8 (1.3) 0.0 (0.0, 1.0)	0.8 (1.3) 0.0 (0.0, 1.0)	0.8 (1.3) 0.0 (0.0, 1.0)
High intake group	1.0 (1.6) 0.0 (0.0, 2.0)	0.9 (1.5) 0.0 (0.0, 1.8)	0.8 (1.4) 0.0 (0.0, 2.0)	0.9 (1.4) 0.0 (0.0, 1.0)
Milk[4] (times/day)				

Low intake	0.4 (0.7)	0.4 (0.8)	0.4 (0.7)	0.4 (0.7)
group	0.0 (0.0, 0.6)	0.3 (0.0, 0.6)	0.0 (0.0, 0.6)	0.3 (0.0, 0.6)
High intake	0.6 (1.0)	0.5 (1.0)	0.6 (1.0)	0.5 (1.0)
group	0.3 (0.0, 0.7)	0.3 (0.0, 0.6)	0.1 (0.0, 0.7)	0.3 (0.0, 0.6)
Water (times/day)				
Low intake	4.8 (1.6)	5.0 (1.6)	4.9 (1.6)	5.0 (1.6)
group	6.0 (4.0, 6.0)	6.0 (4.0, 6.0)	6.0 (4.0, 6.0)	6.0 (4.0, 6.0)
High intake	5.5 (0.9) *	5.1 (1.2)	5.1 (1.3)	5.1 (1.5)
group	6.0 (6.0, 6.0)	6.0 (4.0, 6.0)	6.0 (4.0, 6.0)	6.0 (4.0, 6.0)
Artificially sweetened beverages [5] (times/day)				
Low intake	0.01 (0.0)	0.01 (0.0)	0.01 (0.04)	0.01 (0.04)
group	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)
High intake	0.01 (0.06)	0.01 (0.1)	0.01 (0.1)	0.0 (0.04)
group	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)
Juice (times/day)				
Low intake	0.1 (0.2)	0.1 (0.2)	0.1 (0.2)	0.1 (0.2)
group	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)
High intake	0.1 (0.2)	0.03 (0.1)	0.1 (0.2)	0.1 (0.2)
group	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)
Smoothie[6] (times/day)				
Low intake	0.8 (0.9)	0.9 (1.0)	0.7 (0.8)	0.8 (1.0)
group	0.6 (0.3, 1.0)	0.6 (0.3, 1.0)	0.6 (0.3, 1.0)	0.6 (0.3, 1.0)
High intake	1.1 (1.1) *	0.9 (1.0)	1.3 (1.4)*	1.0(1.1)
group	1.0 (0.6, 1.3)	0.6 (0.4, 1.0)	1.0 (0.6, 1.3)	0.7 (0.6, 1.0)
Porridge, industrially made (times/day)				
Low intake	1.3 (1.1)	1.4 (1.3)	1.3 (1.2)	1.3 (1.2)
group	1.0 (0.3, 2.0)	1.0 (0.3, 2.0)	1.0 (0.3, 2.0)	1.0 (0.3, 2.0)
High intake	1.4 (1.4)	1.0 (0.8)	1.3 (1.2)	1.3 (1.2)
group	1.0 (0.3, 2.0)	1.0 (0.0, 2.0)	1.0 (0.3, 2.0)	1.0 (0.7, 2.0)
Porridge, homemade whole grain (times/day)				
Low intake	0.3 (0.7)	0.3 (0.8)	0.3 (0.7)	0.4 (0.9)
group	0.0 (0.0, 0.3)	0.0 (0.0, 0.3)	0.0 (0.0, 0.3)	0.0 (0.0, 0.3)
High intake	0.6 (1.1)*	0.5 (0.9)*	0.6 (1.1)**	0.4 (0.6)*
group	0.3 (0.0, 0.7)	0.3 (0.0, 0.7)	0.3 (0.0, 1.0)	0.3 (0.0, 0.7)
Porridge, homemade sifted (times/day)				
Low intake	0.01(0.7)	0.02(0.2)	0.01 (0.1)	0.01 (0.1)
group	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)
High intake	0.05(0.3)	0.03 (0.1) *	0.1 (0.3)	0.05 (0.3)
group	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)
Meat[6] (times/week)				
Low intake	3.8 (3.1)	4.1 (3.5)	3.8 (2.7)	4.0 (3.5)
group	2.5 (2.0, 5.0)	4.0 (2.0, 5.0)	2.5 (2.0, 5.0)	4.0 (2.0, 5.0)
High intake	4.4 (3.5)	3.3 (2.2)	4.5 (4.5)	3.9 (2.2)
group	4.0 (2.0, 5.0)	3.3 (2.0, 5.0)	4.0 (2.0, 5.0)	4.0 (2.0, 5.0)
Fish[6] (times/week)				

Low intake group	2.7 (1.8) 2.0 (2.0, 4.0)	2.9 (2.3) 2.5 (2.0, 4.0)	2.8 (2.3) 2.5 (2.0, 4.0)	2.8 (2.2) 2.0 (2.0, 4.0)
High intake group	3.5 (3.1)* 2.5 (2.0, 4.0)	2.8 (1.5) 2.0 (2.0, 4.0)	3.0 (2.1) 2.5 (2.0, 4.0)	3.2 (2.1) 2.5 (2.0, 4.0)
Potato[7] (times/week)				
Low intake group	2.0 (1.6) 2.0 (0.5, 2.0)	2.0 (1.7) 2.0 (0.5, 2.0)	2.0 (1.6) 2.0 (0.5, 2.0)	2.0 (1.8) 2.0 (0.5, 2.0)
High intake group	2.3 (2.0) 2.0 (2.0, 2.0)	2.2 (1.7) 2.0 (2.0, 2.0)	2.3 (2.2) 2.0 (0.9, 2.0)	2.2 (1.5) 2.0 (2.0, 2.0)
Rice (times/week)				
Low intake group	0.8 (0.9) 0.5 (0.0, 2.0)	0.8 (0.9) 0.5 (0.0, 2.0)	0.9 (0.9) 0.5 (0.0, 2.0)	0.9 (0.9) 0.5 (0.0, 2.0)
High intake group	1.1 (1.0) 0.5 (0.0, 2.0)	1.2 (1.0) 2.0 (0.1, 2.0)	0.8 (0.9) 0.5 (0.0, 2.0)	0.8 (0.8) 0.5 (0.0, 2.0)
Bread (times/week)				
Low intake group	9.7 (4.7) 10.5 (10.5, 10.5)	9.6 (4.4) 10.5 (10.5, 10.5)	9.8 (4.6) 10.5 (10.5, 10.5)	9.8 (4.7) 10.5 (10.5, 10.5)
High intake group	9.5(3.7) 10.5 (10.5, 10.5)	10.0 (5.0) 10.5 (10.5, 10.5)	9.4 (4.3) 10.5 (6.4, 10.5)	9.1(3.6) 10.5 (10.5, 10.5)

*Significant differences at p<0.05, **Significant differences at p<0.001

[1] Sum score of frequency of intake of carrot, rutabaga, sweet potato, cauliflower, broccoli, green salad, spinach, cucumber, tomato, corn, sweet pepper, pea and other

[2]Sum score of eaten (1) or not eaten (0) carrot, rutabaga, sweet potato, cauliflower, broccoli, green salad, spinach, cucumber, tomato, corn, sweet pepper, pea and other

[3] Sum score of frequency of intake of orange, banana, apple, pear, plum, grapes, kiwi, melon, mango, berries and other

[4]Sum score of eaten (1) or not eaten (0) orange, banana, apple, pear, plum, grapes, kiwi, melon, mango, berries and other

[5] five unhealthy snack items and two sugar-sweetened beverages

[6] sweet and sour milk and yoghurt

[7] Artificially sweetened soda and lemonade

[8] Homemade and industrially made

[9] Homemade only

Appendix 8

Research clearance from the Norwegian Centre for Research Data (NSD)

Margrethe Røed
Institutt for folkehelse, idrett og ernæring Universitetet i Agder
Serviceboks 422
4604 KRISTIANSAND S

Vår dato: 08.06.2016 Vår ref: 48643 / 3 / MHM Deres dato: Deres ref:

TILBAKEMELDING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 12.05.2016. Meldingen gjelder prosjektet:

48643	*Fostering healthy dietary habits through a mobile-health intervention targeting toddlers' food and eating environment(Foreldre kan!SMART matmiløfor liten og stor)*
Behandlingsansvarlig	*Universitetet i Agder, ved institusjonens øverste leder*
Daglig ansvarlig	*Margrethe Røed*

Personvernombudet har vurdert prosjektet, og finner at behandlingen av personopplysninger vil være regulert av § 7-27 i personopplysningsforskriften. Personvernombudet tilrår at prosjektet gjennomføres.

Personvernombudets tilråding forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, ombudets kommentarer samt personopplysningsloven og helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, http://www.nsd.uib.no/personvern/meldeplikt/skjema.html. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, http://pvo.nsd.no/prosjekt.

Personvernombudet vil ved prosjektets avslutning, 31.12.2022, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

Kjersti Haugstvedt

Marianne Høgetveit Myhren

Kontaktperson: Marianne Høgetveit Myhren tlf: 55 58 25 29

Dokumentet er elektronisk produsert og godkjent ved NSDs rutiner for elektronisk godkjenning.

Vedlegg: Prosjektvurdering

Personvernombudet for forskning

Prosjektvurdering - Kommentar

Prosjektnr: 48643

FORMÅL
Meldingen gjelder et forskningsprosjekt, der formålet er å utvikle, prøve ut og evaluere effekten av en digital intervensjon som ønsker å fremme sunne matvaner blant barn, (12-18 mnd) med fokus på mat- og spisemiljø.

UTVALG
Utvalget består av helsesøstre og foreldre som har barn fra 12-18 måneder.

INFORMASJON OG SAMTYKKE
Utvalget får skriftlig informasjon om prosjektet og samtykker til deltakelse. Vi har mottatt informasjonsskriv tilpasset helsestasjon, helsesøstre og foreldre. Informasjonsskrivene er noe mangelfullt utformet, og vi ber om at følgende endres:
- inkludere informasjon om at dere ønsker å se om foreldre har tatt i bruk appen i informasjonsskrivet til foreldre
- inkludere at det er frivillig å delta og at datamaterialet skal anonymiseres ved prosjektslutt 2022 i skrivet til helsesøstre.

Vi ber om at revidert informasjonsskriv sendes til personvernombudet@nsd.no før utvalget kontaktes.

DATAINNSAMLING
Datamaterialet samles inn ved elektronisk spørreskjema og gruppeintervju. Foreldre forespørres om fysisk og psykisk helse i spørreskjemaet. Personvernombudet tar derfor høyde for at det kan registreres sensitive personopplysninger om helseforhold.

INFORMASJONSSIKKERHET
Personvernombudet legger til grunn at dere etterfølger Universitetet i Agder sine interne rutiner for datasikkerhet. SurveyXact /Rambøll er databehandler for prosjektet. Universitetet i Agder skal inngå skriftlig avtale med SurveyXact / Rambøll om hvordan personopplysninger skal behandles, jf. personopplysningsloven § 15. For råd om hva databehandleravtalen bør inneholde, se Datatilsynets veileder: http://www.datatilsynet.no/Sikkerhet-internkontroll/Databehandleravtale/.

PROSJEKTSLUTT
Forventet prosjektslutt er 31.12.2022. Ifølge meldeskjema skal innsamlede opplysninger da anonymiseres. Anonymisering innebærer å bearbeide datamaterialet slik at ingen enkeltpersoner kan gjenkjennes. Det gjøres ved å:
- slette direkte personopplysninger (som navn/koblingsnøkkel)
- slette/omskrive indirekte personopplysninger (identifiserende sammenstilling av bakgrunnsopplysninger som f.eks. bosted/arbeidssted, alder og kjønn)

- slette digitale lydopptak

Vi gjør oppmerksom på at også databehandler (SurveyXact / Rambøll) må slette personopplysninger tilknyttet prosjektet i sine systemer. Dette inkluderer eventuelle logger og koblinger mellom IP-/epostadresser og besvarelser.

Appendix 9

NSD change notification and approval

Email correspondence with NSD, 28th and 29th of June 2017.

Flott, takk skal du ha. Skrivet er registrert.

God sommer!

Med vennlig hilsen

Hildur Thorarensen
Seniorrådgiver | Senior Adviser
Seksjon for personverntjenester | Data Protection Services
T: (+47) 55 58 26 54

NSD Norsk senter for forskningsdata AS | NSD Norwegian Centre for Research Data
Harald Hårfagres gate 29, NO-5007 Bergen
T: (+47) 55 58 21 17
postmottak@nsd.no www.nsd.no

Margrethe Røed skrev den 29.06.2017 10:53:
Hei

Tusen takk for rask behandling.

Sender ved informasjonsbrevet der setningen du refererte til, er tatt ut.

Med vennlig hilsen Margrethe Røed

Fra: Hildur Thorarensen [mailto:hildur.thorarensen@nsd.no]
Sendt: onsdag 28. juni 2017 15.38
Til: Margrethe Røed <margrethe.roed@uia.no>
Emne: Prosjektnr: 48643. Fostering healthy dietary habits through a mobile-health intervention targeting toddlers' food and eating environment(Foreldre kan!SMART matmiløfor liten og stor)

BEKREFTELSE PÅ ENDRING

Hei, viser til endringsskjema registrert hos personvernombudet 27.06.2017.

Vi har nå registrert følgende endringer:
1) Deltakerne får ikke tilgang til en app som først beskrevet, men et nettsted (Mat til Minsten).
2) Det er gjort noen endringer i spørreskjemaet i forhold til det som opprinnelig ble sendt inn.
3) Følgende punkt i den første meldingen er tatt ut: «Det skal produseres en film som skal stimulere til refleksjon rundt hva som påvirker matvalg. Den skal vises på helsestasjoner med etterfølgende Gruppediskusjon»
4) Det gjøres endring fra klynge-randomisert studie (rekruttering av helsestasjoner som enhet) til en randomisert kontrollert studie hvor en randomiserer deltagere på individnivå.
5) Antall deltakere er noe endret.
6) Prosjekttittel endres fra "Fostering healthy dietary habits through a mobile-health intervention targeting toddlers' food and eating environment(Foreldre kan!SMART matmiløfor liten og stor)" til "Mat til Minsten / Food4toddlers "

Vedlagt informasjonsskriv er godt utformet, men setningen "Prosjektet er godkjent av Norges Samfunnsvitenskapelige Datatjeneste" (side 1 av skrivet) må fjernes da, NSD formelt sett ikke gir godkjenninger. Det er tilstrekkelig å skrive at prosjektet er meldt til oss, som dere har gjort på side 2 av skrivet.

Personvernombudet forutsetter at prosjektopplegget for øvrig gjennomføres i tråd med det som tidligere er innmeldt, og personvernombudets tilbakemeldinger. Vi vil ta ny kontakt ved prosjektslutt.

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Med vennlig hilsen

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