

Evaluation report for the UiA Priority Research Centre for Lifecourse Nutrition (2019-2022)

This report follows the guidelines specified in “*UiA PRIFORSK – evaluation report – requirements, guidelines and template*”. The guidelines are based on the criteria for the scheme ‘Priority Research Centres at UiA’ (UiA PRIFORSK), a strategic instrument at the University of Agder (UiA) aimed at increasing the impact of selected research areas. The report first briefly provides the history and scientific basis of the Centre for Lifecourse Nutrition. Next, it includes a self-evaluation of achievements in the period 2019-2022 (4 out of 5 years of funding) according to the Centre’s ambitions and indicator targets set out in its original proposal, which are in line with UiA strategy. The report further describes the organization of our work, underpinnings of scientific excellence, success with external funding and a description of our collaborative and interdisciplinary efforts. Finally, we describe our plans and strategy for further development for the next three years and beyond, including plans for long-term funding and a future National Research Centre of Excellence.

1.0 Introduction - a brief history of the Research Centre

The Priority Research Centre (PRC) for Lifecourse Nutrition (LN) was established in 2019 to advance the field of early life nutrition science. It was granted funding for five years (2019-2023) in recognition of the potential national and international impact of the research group FEED (Food and nourishment from early development into adulthood) from which the PRC-LN originated.

The PRC-LN is scientifically based on the advances in early life nutrition science which have profoundly changed the ways in which we understand the origins of lifelong health (1). Mounting evidence show that early life nutrition has major influences on how health unfolds over the lifespan, with potentially large consequences for public health and public health priorities (2). A nutritious and sufficiently balanced diet is also fundamental to physical and cognitive development (3), meaning that nutrition in early life affects intellectual development and future work capacity and prosperity. The PRC-LN was established acknowledging this fundamental importance of nutrition early in life and the potential impact a lifecourse approach to nutrition could have on population health and wellbeing. According to the World Health Organization, the lifecourse approach takes a temporal and societal perspective on the health and well-being of individuals and future generations, recognizing that the stages of a person’s life are intricately intertwined with the lives of others born in the same period, and with the lives of past and future generations (4). Adopting a life-course approach involves taking action early in the life-course, paying attention to critical transitions (pregnancy, childhood, adolescence), and acting together as a whole society - an approach this PRC takes on its research.

The PRC’s **mission** was “to conduct high quality research in co-creation with stakeholders to stimulate, promote and advocate a healthy food environment for the benefit of all citizens and to improve individual’s diet and health throughout the lifecourse”. The research focus was to identify associations between, preconception, pregnancy, and early life diet and subsequent health and development and to perform population-based interventions targeting early life diet, school meals and Early Childhood Education and Care (ECEC) meals. The PRC-LN set out to respond to four clearly defined scientific ambitions and to disseminate generated knowledge to the wider society.

When funded in 2019, the PRC-LN comprised an interdisciplinary team of 21 researchers and 5 PhD-students. Our PRC-LN has since expanded in scope, and attracted highly skilled and productive staff during the four years of its existence. Today the Centre houses 39 members, including 9 PhDs and 2 post docs. Between 2019 and Dec 2022, the PRC-LN received external funding totaling 53 million NOK for 10 projects, of which as PIs in three projects (31 million NOK) while partnered in seven others. All projects align with our ambitions (self-evaluation (2.0)) and respond to our mission. As part of our efforts to promote diversity in our PRC, and as a specific task given by the University board in 2019, we have taken steps to improve gender balance. In 2019 the PRC included six male researchers, wherein 2 of 6 were full members, totaling a 30% position combined. In 2023 there are nine men who are full members and represent positions totaling 54.5% in the PRC.

2.0 Self-evaluation in accordance with original proposal

The PRC-LN has four key ambitions:

1. Advancing understanding of the influential dietary factors in a lifecourse perspective
2. Generating evidence on effective interventions and actions for sustainable improvements to diet and health in a lifecourse perspective
3. Translating the generated knowledge into practice through effective and future-oriented education of students who will go on to implement it in the region and in society at large
4. Informing policymakers to drive sustained, positive impacts on children, families and the wider food environment, through translation and dissemination of the generated research knowledge.

To operationalize the ambitions, we established 18 goals and 20 key performance indicators (KPIs). During our first four years we have successfully achieved our ambitions in terms of personnel, collaboration, and projects, and we have exceeded many of our goals and indicators beyond initial expectations. We have met 17 out of 18 goals (one was removed on the advice of our Scientific Advisory Board). Out of 20 KPIs only four have not been fully met, in all cases for reasons outside our control: one KPI has not been met because the Faculty decided against establishing a course we had proposed, and three KPIs have only been partially met as a result of delays due to Covid-19.

2.1. Detailed description of achievements related to our listed scientific ambitions.

In the following, we provide a detailed self-evaluation based on the center's ambitions, aims, milestones, and KPIs described in the original proposal to the University board (Tables 1-6). The assessment is based on results from 2019-2022, i.e., four of the five years the PRC was funded for.

2.1.1 Ambition 1: Advancing understanding of the influential dietary factors in a lifecourse perspective.

Assessment #1: *We have complied with all aspects of Ambition 1 and have extended our goals by also evaluating the importance of diet in different phases of life not only on physical health, but mental health, personality traits and school achievements. Details and examples to illustrate follow:*

During the past four years we have advanced the understanding of influential dietary factors in a lifecourse perspective, underpinned with research revealing:

- i. the importance of intake of healthy diet in mid-adolescence (preconception) for pregnancy and future child's health ((5) and a submitted paper)
- ii. the importance of a healthy and sustainable diet in pregnancy and early childhood in relation to pregnancy complications (6), cognitive development (7), mental health (8), neurodevelopment (9) and even personality (8)
- iii. the importance of providing meals (breakfast, school meals, family meals) for school achievements (10, 11), and the relevance of a healthy diet (12), optimal growth, and feeling of social belonging (13)
- iv. the importance of exploring what a plant-based diet means to young people (under review)
- v. the consequences of high intake of alcohol in the young adult population with regards to diet dilution (14).

For these findings we have used our own collected data sets as well as registry data from The Norwegian Mother, Father and Child Cohort (MoBa), The Trøndelag Health Study (HUNT) and Trends in International Mathematics and Science Study, as described in our detailed specific goals (Table 1).

Within this ambition, we have also explored determinants of child diet, such as parental feeding practices and health motifs (15), parental and child characteristics (16), parental use of mobile phone during meals (17), Early Childhood Education and Care (ECEC) staff feeding practices (18), which are all important factors to understand to be able to influence child diet.

Going beyond exploring associations between individual diet and measures of health and development, we have attracted funding from The Research Council of Norway, FRIPRO, for a radical interdisciplinary research project, EATWELL (Attachment 1), that examines food systems in Bhutan and their entanglements with culture, society, environment, health, and nutrition, including additional fundings for collecting and analysing microbiome data, also taking a lifecourse approach.

Further, we have participated in ground-breaking research on human metabolism over the lifecourse, published in *Science* in 2021 (19), showing that, contrary to previous belief, human metabolism appears not to be constant but rather to undergo transitions at specific points in time, with distinct changes in total and basal energy from before birth to old age.

Last, to identify influential dietary factors, optimal dietary methods are of uttermost importance. We have developed and validated a food frequency questionnaire (20), a dietary screener and a Norwegian version of Myfood24, where portion size assessed by pictures have been validated (21).

Table 1. Ambition 1: Goals, milestones, and results.

Ambition 1 Advancing understanding of the influential dietary factors in a lifecourse perspective		
Goals	Milestones	Results by 2022
1.1 Establish research infrastructure for cohorts and dietary assessment in collaboration with Centre for eHealth and the Norwegian Institute of Public Health	By 2023	Established a Norwegian version of the well-established Leeds based Myfood24, developed and validated 2 FFQs (20-22). We have used Power Automate (platform by Microsoft for automation of recurring tasks) to build long lasting cohort infrastructure.
1.2 Establish a student cohort of dietary intake among UiA students	By 2020	Two studies have been completed to date: Studentkost 1 and 2 (14, 23).
1.3 Establish a nationally representative cohort on diet during preconception, both genders	By 2023	The PREPARED study includes 1400 participants who did not have children at baseline (2021) who will be followed up for 20 years or until they give birth to their first child. Diet quality is assessed longitudinally, and child outcomes will be assessed by linkage to the Medical Birth Registry of Norway (24).
1.4 Pilot and establish a Father-Child-cohort	By 2022	Integrated into the PREPARED cohort (24) with the inclusion of men.
1.5 Utilize existing dietary data from large national and international cohorts to investigate associations between diet and relevant outcomes in a lifecourse perspective	Continuously	Studies completed using data from the Norwegian Mother, Father, Child cohort (7, 25-27), and data from the HUNT-study (5).
1.6 Establish a regional longitudinal cohort of dietary intake in school children	By 2022	Our SAB advised us to reduce the number of cohorts to rather prioritize quality in one, so we decided not to pursue this goal.

FFQ, Food Frequency Questionnaire. HUNT, Trøndelag Health Study. Green: accomplished; Yellow: changed.

2.1.2 Ambition 2: Generating evidence on effective interventions and actions for sustainable improvements to diet and health in a lifecourse perspective.

Assessment#2: *We have successfully achieved this ambition. The original goals are met and have been extended by seeking to identify ways to implement the interventions in regional and national settings. The generated evidence will enhance understanding of the role of lifecourse nutrition, from preconception to adolescence, has on lifelong health. Details and examples to illustrate follow:*

Our PRC-LN has developed a collection of intervention studies aiming to promote a healthy diet during the lifecourse, from adolescence, during preconception years and in the first thousand days of life (28-32). We have evaluated intervention effectiveness in randomized controlled trials and have demonstrated positive effects on dietary and mealtime behaviors (33-36). We have also evaluated effects of being offered free school meals for one academic year, showing improved diet quality and reduced social inequality in diet (37). This research has attracted a lot of attention nationally and internationally. A brief description of some of the interventions is presented below.

The Nutrition Now project: We have developed and reported on the effectiveness of four interventions targeting diet during pregnancy and early childhood (6-24 months) on parental feeding

practices, diet quality and meal environment in Early Care and Education Centres. All four interventions have shown evidence of dietary improvement in child diet (33-36, 38). These interventions are digital, largely video-based and grounded in social cognitive theory (39), addressing the interaction between person, environment, and behaviour. In 2020 we were funded by the RCN (16 million NOK, assessment in Appendix 1) to **implement** a combination of these four interventions as one joint e-learning resource (the Nutrition Now project) targeting parents, maternal and child health care staff (MCH) and ECEC staff in one municipality. The project also includes a scale up to county level. Through implementation strategies we aim to influence local policy relating to physical and social aspects of the food environment. The ultimate goal of the Nutrition Now project is to improve the quality of life in Norway through improved diet and diet-related behavior in the first 1000 days of life and reduce the burden of obesity and NCDs.

The PREPARED project: Another core undertaking, initiated with funding from the PRC-LN, is the randomized controlled PREPARED project, aiming to assess whether dietary guidance in preconception years (preconception phase range from early adolescence to late adulthood) may lead to improved preconception diet and future children’s health (24). A total of 1400 young adults are participating in this ongoing trial. Results from the project will start emerging in 2023.

The TOPCHILD project: Three of our previously developed interventions are included in the international TOPCHILD Collaboration to bring together planned, ongoing and completed trials from around the world to collectively assess which intervention components are particularly effective for specific populations in reducing risk of childhood obesity (40, 41).

Interventions targeting the educational system: We have conducted several interventions related to the Norwegian educational system. One important pillar in generating evidence of effective interventions is evaluating potential effects of school meals. Although not randomized, the “School meal project” included a pre-post evaluation with an intervention and a control group, where the intervention group received one year of free school lunch (32). Evaluations done immediately post intervention and five years later, showed that the intervention group had improved their diet (42), and that improvement was larger among those with parents of low socio-economic status (13, 37). In other words, those who profited most from a free school meal, were the ones who needed it the most, suggesting an approach to reduce social inequalities. We have also completed two intervention studies in kindergarten settings to increase food variety, food joy and courage, and staff’s meal practices, with positive results for both diet and staff experiences during meals and pedagogical work (38, 43). A new project is a collaborative project with the NGO Geitmyra culinary centre for children, funded by The Sørlandet Knowledge Foundation (SKF) , in the Norwegian after-school arrangement, “SFO”, enhancing the competence of the staff to improve children’s after-school diet. In addition, a new intervention, Skills for Life, is being developed, targeting students in their transition from living at home to being responsible for their diet, food purchase and preparation themselves.

Table 2. Ambition 2: Goals, milestones, and results.

Ambition 2 Generating evidence on effective interventions and actions for sustainable improvements to diet and health in a lifecourse perspective		
Goals	Milestones	Results by 2022
2.1 Develop, implement and evaluate interventions targeting adolescent and student diet	By 2024	We have developed, implemented and evaluated three different interventions targeting adolescent and preconception diet: PREPARED (24), Skills for Life (44), Lifelab Food and Health (described in Table 3) (45).
2.2 Develop, implement and evaluate interventions targeting preconception diet	By 2025	The PREPARED study includes a digital intervention (evaluated by RCT) to improve preconception diet and will follow up for pregnancy outcomes (24).
2.3 Develop, implement and evaluate actions to promote	By 2024	The Nutrition Now-project includes resources to promote breastfeeding before the child is born and to support breastfeeding from birth

breastfeeding among parents-to-be		onwards. Further, the project “Time for breastfeeding” will explore how the public intervention to promote breastfeeding is working.
2.4 Evaluate long-term effects of already implemented interventions	Continuously	All completed interventions include follow up to examine long-term-effects (46).
2.5 Evaluate the relative efficacy of dietary interventions carried out in different stages	By 2026	The design of Nutrition Now will allow for an evaluation of relative efficacy related to child age. In addition, TOPCHILD including 59 studies (3 of ours) aims at identifying the most effective early life intervention periods.
2.6 Evaluate the feasibility and sustainability of implemented lifecourse interventions	Continuously	The evaluation of feasibility and sustainability is part of the Nutrition Now-project.

Green: accomplished.

2.1.3 Ambition 3: Translating the generated knowledge into practice through effective and future-oriented education of students who will go on to implement it in the region and in society at large.

Assessment #3: *We have delivered in line with the goals of Ambition 3 and have a sustained focus on translating our research to teaching, reaching students in all the programs we cover (Nutrition, Food and Health, Public Health). Details and examples to illustrate follow:*

We are continuously working on translating research into practical and theoretical skills for our students in higher education, to the long-term benefit of society. We have involved 18 different students in our research projects in addition to students in master projects, to get their views on different topics, and for them to gain research experience (UiA: students in research scheme). Within Ambition 3 we have recently received funding by partnering with others in developing innovative pedagogical courses and topics for Nordic and International students (Sustaincomp, “Nordisk smag”, NAVI-HED). These include higher education curricula focusing on sustainability, UN-goals and Collaborative Online International Learning (COIL), and digital learning activities in Food and Health. Our research showing a mismatch between practice and guidelines in the school subject Food and Health (Home Economics) has received international attention (45). To bridge this gap, we have developed interventions (Lifelab Food and Health, Food and chemistry) that have been perceived relevant by Food and Health teachers. To reinforce UiA’s position in Food and Health, we have also worked towards making the Food and Health journal a scientific journal at Norwegian DBH level 1.

Table 3. Ambition 3: Goals, milestones, and results.

Ambition 3: Translating the generated knowledge into practice through effective and future-oriented education of students who will go on to implement it in the region and in society at large		
Goals	Milestones	Results by 2022
3.1 Apply innovative pedagogical approaches across a wide range of topics to foster professional practice within Home Economics, Nutrition and Public Health (UiA)	Continuously	Lifelab MH is an innovative approach that has been evaluated in the school setting and suggested used within home economic teaching practice. Further, entrepreneurial teaching methods are used in the Nutrition education programs, as in Food and Health, ECEC and Public Health programs.
3.2 Evaluate current and new teaching practices to promote learning	By 2025	Lifelab Food and Health evaluates the included teaching methods, as does the project Food and Chemistry.
3.3 Reinforce UiA’s National position in Food and Health (Home Economics) research	By 2023	UiA is a leading institution for education and research on Food and Health in Norway. Since 2020 we have provided a master’s degree in HE, we edit the national Food and Health journal (now level 1) (47), and have dedicated researchers and several projects in the field.

Green: accomplished.

2.1.4 Ambition 4. Informing policymakers to drive sustained, positive impacts on children, families, and the wider food environment, through translation and dissemination of the generated research knowledge.

Assessment #4: *We have successfully achieved this ambition. We highlight the Nutrition Now project which is doing research on how to drive sustained, positive impacts on children and families through systematic anchoring of the project in the municipality and among politicians. Details and examples to illustrate follow:*

Over the past 4 years (from 2019–2022) our research has been cited (appr. 8000 times, while the papers produced in 2019–22 have already been cited 412 times), presented, used in policy discussions (school meals, ECEC meals), and underpinned recommendations. We have contributed to a wealth of national councils, responded to national hearings, conveyed our results in scientific and public conferences (national and international), newspapers, TV, radio and podcasts, and social media (see Table 4). Through knowledge production, media contributions, and contributions to national and international guidelines we are supporting health of current and future generations.

While demonstrating intervention efficacy was our main aim in 2019, we are progressing the field through our implementation research, particularly in the Nutrition Now Project which explores how our science can support people to thrive.

Table 4. Ambition 4: Goals, milestones, and results.

Ambition 4. Informing policymakers to drive sustained, positive impacts on children, families and the wider food environment, through translation and dissemination of the generated research knowledge.		
Goals	Milestones	Results by 2022
4.1 Establish a network of stakeholders to support effective co-creation of research	2019	Networks are established for the Centre and within several of our projects. Extensive use of co-creation in Nutrition Now.
4.2 Actively respond to relevant national hearings and participate in national boards and networks as appropriate	Continuously	We have sent 6 responses to hearings and are part of 7 national and international networks and 11 boards.
4.3 Develop and adhere to a media plan for research dissemination, actively respond to media events and contribute at national and international arenas and conferences.	Continuously	From 2019 to 2022 we carried out a total of 216 research dissemination activities including numerous activities in radio, TV, newsletters, and podcasts. See our key performance indicators for results.

Green: accomplished.

2.1.5 Assessments of Compliance with the PRC-LN’s key performance indicators (KPIs)

The key performance indicators listed in the original application are provided below, with indication of whether or not they have been reached by December 2022. Table 5 describes general KPIs, while table 6 describes KPIs in line with the University’s strategy and ambition.

Assessments of compliance with KPIs: *Overall, we have excelled in relation to the KPIs decided upon in 2019. We have published more papers than proposed, we have submitted 37 applications for external funding, and succeeded in 10 providing a total 53 million NOK in external funds. We have increased the number of professors and associate professors, and employed PhDs, postdocs and included master students. We are engaging with the region, running projects with NGOs, have been active in the media, have had five exchange students in our group, and developed a consortium of global nutrition. We have also managed to recruit a higher proportion of male students (PhD and master) with active recruitment strategies and increased the numbers of female professors. The rows marked yellow (Tables 5–6) are KPIs that we have not reached. The covid-19 pandemic was a key factor for some of these, for example, travel restrictions limited visiting professors and postponed the establishment of a Nordic DOHaD-chapter. Further, it took more time than expected to get external funding for more PhD-students, and therefore fewer have completed their PhDs 2019–23. Two of our PhDs have had maternity leaves; hence their schedules were revised. The proposal for a master’s program in Public Health Nutrition was not prioritized by the Faculty, and was therefore removed as an ambition.*

Table 5. Key performance indicators: original proposal vs. December 2022 results.

Description of key performance indicators (KPI)	Dimension figure (2019-23)	Results per December 31, 2022
Deliver 60 peer-reviewed papers over 5 years on the research topics described above	60 papers	Total of 74 from 2019-2022
Publish in high quality scientific peer-reviewed journals (Top Journal (SciVal))	>50% of papers	More than 50% of papers in Q1 of SCI ranking .
Apply for external funding from RCN	3 applications	9 applications submitted (2 funded as PI, 1 as co-investigator).
Apply for external funding from H2020/FP9	1-2 applications	2 applications
Apply for other external funding	5 -10 applications	26 applications (see Table 10)
Advance internal academic competence: -Five full professors in 5 years -Three associate professors in five years -Three assistant professors starting PhD-studies within 2024	5 professors 3 associate prof. 3 PhDs	4 full professors (Vik, Hillesund, Wills, Barker) 3 associate professors (Helland, Røed, Beinert) 3 starting (Valand, Omholt, Dalane)
Attract international collaborators as visiting professors	5 visiting professors	3 visiting professors from Canada, Sweden and Finland. Fewer due to covid-restrictions.
Deliver PhD dissertations	15	8 completed and 11 due to complete (Table 8).
Recruit Post docs	4	6 post docs recruited
Supervise master's projects/master's theses	50	53
Apply for SFF Research Centre of Excellence, The Research Council of Norway	Apply within 2025	Application in progress for next call (expected 2025)

Table 6. Key performance indicators in accordance with UiA's visions and aims from 2019 (subheading)

Description of key performance indicator	Dimension figure	Results
Co-creation of knowledge/Social impact/Community Involvement		
Engage in collaboration with relevant NGOs and community, regional and state level health care	Formal agreements with 4 parties	Established formal agreements with Geitmyra Culinary Centre for Children, The Science Centre for young people, and Agder county and Arendal municipality.
<i>Media plan:</i> Disseminate research to the scientific community (e.g. scientific journals, conferences/meetings, twitter and other social media) Communicate with stakeholders/partners (e.g. User and scientific advisory boards and health authorities) Communicate with the general public (Press releases, establish a web page and twitter)	See above KPI regarding publications. User advisory boards in all projects 2 press releases/year	Since 2019 we have annually tweeted between 75 and 99 posts. A total of 216 disseminations of research activities have been conducted and published 74 scientific peer review papers. User perspectives are included in all projects since 2019. We have established web pages, info videos etc.
Increase international participation (Global mindset)		
Establish a Nordic chapter of the DOHaD Society and host a Nordic Conference of DOHaD	Establish by 2022	We are planning to do this in 2023 or 2024. Postponed due to covid.
Research exchange with relevant research groups (Internships Europe/US)	5 students	Exchange students from Belgium (n=4) and France (n=1) have been part of our group the last 4 years.
Consortium development within the field of global nutrition research	1 consortium	The EATWELL-project includes a global nutrition research consortium.
Learning and Education for the Future (LUF) (see also Ambition #3)		
Establish a Public Health Nutrition Master's-program	By 2023	The faculty decided not to pursue this.
Gender balance		
Recruit a higher proportion of male PhD students	30% of new PhDs	30% (3 of 10, March 2023)
Recruit a higher proportion of male master's students and bachelor's students	20 % of students by 2024	Master F&H: 0%, Public Health (PH): 38%, bachelor PH: 22% and Nutrition; 24%
Increase number of female professors (UiA-strategy is to increase female prof. to 35%)	5 female professors	Three new female professors and we are hoping for 2 more in 23-24.

Green: accomplished; Light green: close to accomplished; Yellow: not reached. F&H: Food and Health, PH: Public health

3.0 Organization

3.1 The formal organization and infrastructure of PRC-LN

The formal organization and the connection between the different groups in our PRC are depicted in Figure 1, and their respective aim and members are briefly described below.

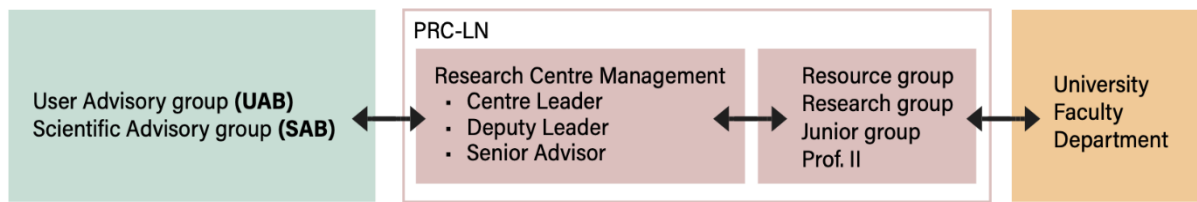


Fig. 1. Formal organization of the PRC-LN

Management group: Aim: overall operating management and research development of the PRC-LN. Who: center leader *Øverby*, deputy leader *Medin* and administrative manager *Grasaas*.

Resource group: Aim: discuss overall directions and priorities. Who: all PhD-level PRC-LN members.

Research group: Aim: an arena for scientific discussions, research evidence updates, presenting papers and projects and debating hot topics. Who: all PRC-LN members.

Junior group: Aim: promote academic culture and facilitate research dissemination. Who: All PhD students, *Grasaas* and a senior researcher attend each meeting.

Prof II: Continuous input is provided by *Rutter* and *Barker*, whose expertise is indispensable in quality assurance of applications for funding and when facing scientific crossroads.

Scientific Advisory Board (SAB): Aim: advice on strategic direction. Who: national and international interdisciplinary experts within the PRC-LN's thematic portfolio (*Godfrey, Watkins, Størdal, McAuliffe, Pendergast, Þórsdóttir, Torheim, Biesma-Blanco, Hansen* and *Andersen*).

User Advisory Board (UAB): Aim: advice on user needs and how to reach users. Who: representatives for the PRC's user groups, i.e., parents and children, health services, schools and ECEC, politicians, food science promotion (*Herlofsen, Nilsen, Isaksen, Inntjore, Østensen* and *Wangerud*).

The University and the Faculty of Health and Sport Sciences have provided the PRC funding. The PRC is situated in the Department of Nutrition and Public Health.

The organization is developed to ease communication and management; however, more is needed to create a successful research team. From 2013 (as FEED) we have worked systematically to build a **culture** with shared values and academic ambitions, a culture where different skills are recognized and valued, where individuals can develop and thrive and where the social environment is nurtured with frequent events. Such aspects are being more acknowledged for twenty-century research teams (48). The infrastructure and events depicted in Fig. 2 build culture and underpin the success of our Centre.

Meetings	Frequency	Activities
Management group	Weekly	Walk and talk, tweeting, Info on Teams
Resource group Research group Junior group Head of Department Economy Controller	Monthly	Written monthly update to all members
Faculty Dean	Semiannually	Guest lectures, social events, "shut up an write", seminars
Individual talks with all members	Annually	Writing retreats
University leaders, Scientific Advisory Board, User Advisory Board	Biannually	Methodological courses

Building culture

Research excellence

Fig. 2. Illustration of the PRC-LN infrastructure

3.2 The organization of research activities

The research activities are organized at different levels. **First**, we have nine different research areas (Preconception phase, Pregnancy, Childhood, ECEC, School, School subject Food and Health, Anthropology of food systems, Nutrition and metabolism and Dietary assessment), with one researcher taking main responsibility for each topic. The leader of each research area is responsible for one research group meeting every year and for regularly providing the group with important information on their topic. This structure has facilitated the development of new projects bridging

the different topics. **Second**, the research activities are organized in the specific projects, with some including 3-4 researchers while the largest, Nutrition Now, includes 16 researchers. **Third**, at the individual level, Øverby and Grasaas have had yearly meetings with each individual researcher, mapping plans for projects and careers, identify possibilities and what the PRC-LN and the researcher can do in co-creation to enhance that. We have provided 6-8 persons each year with extra research time from the PRC-LN to reach ambitions and KPIs. **Fourth**, based on identified needs we have collectively worked to improve our qualitative and quantitative research methods skills by arranging courses for all PRC-LN members and arrange writing retreat weeks.

3.3 Past and present PRC-LN participants

In addition to the participants of PRC-LN presented in Table 7, persons have been associated with the PRC-LN for shorter periods, including PhD students; Illøkken, Blomkvist, Øvrebø, and Løvdahl, scholar at risk employee: Dauqan; post doctors: van Lippevelde, Vejrup, and Lamu; professors: Palojoki, Prinz, and associate professors: Skreden, Åbacka, Mathiesen, and Nome, in addition to Andreasen.

Table 7. Past and present Centre participants, showing degree of participation as a percentage of man-years.

Starting participants and title N=21 (PAST)	Current participants and title N=37 (PRESENT)	Role	Degree of participation in 2023,%	Field of expertise
Nina C. Øverby, Prof.	Nina C. Øverby, Prof.	Leader	40 + 35	Nutrition
	Anine C. Medin, Assoc. Prof.	Deputy leader	40 +10	Nutrition
	Erik Grasaas, Senior advisor, PhD	Senior advisor	100	Physiotherapist
Elisabet R. Hillesund, Assoc. Prof.	Elisabet R. Hillesund, Prof.	Resource gr.	30	Nutrition
Frøydis N. Vik, Assoc. Prof.	Frøydis N. Vik, Prof.	Resource gr.	40 + 5	Public Health/biochemistry
Anne S. Ask, Prof. (Dosent)	Anne S. Ask, Prof. (Dosent)	Resource gr.	40	Teacher/food and health
Harry Rutter, Prof.	Harry Rutter, Prof.	Resource gr.	10	Medicine /Public Health
Andrew Wills, Assoc. Prof.	Andrew Wills, Prof.	Resource gr.	40	Epidemiology/biostat.
Mary Barker, Assoc. Prof.	Mary Barker, Prof.	Resource gr.	10	Psychology
Dagrun Engeset Assoc. Prof.	Dagrun Engeset, Assoc. Prof.	Resource gr.	30	Food science/epidemiology
Sissel H. Helland, PhD-student	Sissel H. Helland, Assoc. Prof.	Resource gr.	30 + 5	Preschool pedagogy/Chef
Margrethe Røed, PhD-student	Margrethe Røed, Assoc. Prof.	Resource gr.	30	Teacher/food and health
Cecilie Beinert, PhD-student	Cecilie Beinert, Assoc. Prof.	Resource gr.	30 + 5	Public Health
	Wim van Daele, Assoc. Prof.	Resource gr.	40 + 5	Food anthropology
	Sergej Ostojic, Prof.	Resource gr.	5 + 5	Medicine
	Tormod Bjørkkjær, Assoc. Prof.	Resource gr.	35 + 5	Public Health/nutrition
	Vigdis Guttormsen, Assoc. Prof.	Member	30	Teacher/food and health
	Migle Hermansen, Assoc. Prof.	Member	30	Medicine,
	Kjersti K. Danielsen, Assoc. Prof.	Member	30	Teacher/Physical activity
	Silje S. Halvorsen, Assoc. Prof.	Member	30	Physiotherapist
Ida U. Valand, Msc	Ida U. Valand, PhD-student	Member	100	Nutrition
	Christine Helle, Post doc	Member	100	Psychiatry/Medicine
	Kim Jeong, Post doc	Member	100	Health economy
	Henrik Lian, PhD-student	Member	100	Clinical nutritionist
	Synne Groufh-Jacobsen, PhD-student	Member	100	Nutrition
	Natalie G. Osorio, PhD-student	Member	100	Clinical nutritionist
	Torunn Ersfjord, PhD-student	Member	100	Social anthropology
	Marianne Gjellestad, PhD-student	Member	100	Midwife
	Anam S. Rai, PhD-student	Member	100	Health sciences
	Kristine L. Vigsnes, PhD-student	Member	100	Social science
	Lorentz Salvesen, PhD-student	Member	100	Public Health
	Neha Agnihotri, PhD-student	Member	100	Nutrition
	Erlend Larsen Valen, PhD-student	Member	100	Public Health
Mona L. Omholt, Msc	Mona L. Omholt, Msc	Member	10	Public Health
Mette F. Dalane, MSc	Mette F. Dalane, Msc	Member	10	Teacher/ Food and health
Kaia Heslien, Msc	Kaia Heslien, Msc	Member	10	Public Health
	Camilla Bjornes, Mcs	Member	10	Public Health

Gender balance: The field of public health and nutrition includes more female researchers than male, and we have worked for a gender balance in our PRC the last 4 years. In 2019 the PRC included six male researchers, wherein 2 of 6 were full members, totaling a 30% position combined. In 2023 there are nine men who are full members and represent positions totaling 54% in the PRC.

3.4 The Centre's disposition of internal strategic funds The PRC-LN annually receives 2.000.000 NOK from the University board, supplemented by 500.000 NOK in strategic funding from the Faculty of Health and Sport Science, wherein the funding from the University board have nearly covered the positions in the PRC-LN: Øverby (35-50%), Medin (10%) and Grasaas (100%) and of prof II: Wills (20-40%), Rutter (10%) and Barker (10%) in addition to a part time position for a research assistant: Valen (25-100%). There have been some fluctuations and adjustments in positions percentages for the respective persons to ensure having means to provide solid strategic investments. Prioritization of the strategic means have been an ongoing endeavor throughout the PRC-LN period, with the overall aim of securing the best prerequisites for achieving our milestones and KPIs within the agreed granted criteria, while also keeping a sustainable and balanced economy. Providing additional research time for some of the researchers has been considered a valuable investment of the strategic funds. Having research assistants employed have also been an invaluable strategic investment.

3.5 The use of internal recruitment positions provided to the PRC-LN

The PRC-LN was provided with two PhD positions from the UiA board and two from the Faculty of Health and Sport Sciences. Two positions (Salvesen and Valen) were included in the innovative project targeting preconception diet, PREPARED, while one position (Illøkken) was allocated to the project of school meals and the importance of healthy meals for learning outcomes. The last one was allocated to the project Skills for Life (Valand), which is still ongoing. The latter provides a unique Skills for Life course for students to help them manage the transition from living at home with family to preparing meals and ensuring a healthy diet for themselves. We have also applied for two internal postdoctoral positions (Van Lippevelde and Vejrup/Helle). The first was related to the project PRECONDIET, using unique existing data HUNT and national birth registry data, to assess association between adolescent diet and future children's health and own pregnancy health. The second post doc was an internal post doc at the faculty on a public health call. This was the start of the Nutrition Now project which is now funded by RCN. The post doc conducted the first assessment of needs for a digital intervention in ECEC and at the primary health care centre. In addition, we applied for and received funding for a PhD from the UiA Board, calling for projects addressing the Sustainable Development Goals. This position held by Grouff-Jacobsen, compares nutritional status of young vegetarians vs non- vegetarians, a hot topic with many stakeholders awaiting the results.

Within the PRC-LN period, one strategic PhD position from our Faculty was awarded, given condition of granted RCN funding. Hence funding for the Nutrition Now and EATWELL projects resulted in the recruitment of *Lian* in 2022 (Nutrition Now) and one upcoming PhD in the fall of 2023 (EATWELL). There is also an upcoming PhD allocated from the Dean to Food and Health research.

3.6 Master's and PhD students: Progress reports and estimated completion dates. We have from 2019- 2022 supervised master students in Public Health (n=23), Food and Health (n=8) and one in ECEC, in total **32**. Currently, **21** master students in Public Health are being supervised by researchers in PRC-LN (exam in May 2023). By June 2023 a total of **53 master students have done their masters in PRC-LN**. In total 19 PhD-students have been or are currently supervised during the time of PRC-LN (Table 8), including 8 who have defended their PhD, one who has submitted, one who will submit in May, and nine others. We are also in the process of hiring three new PhDs (EATWELL and Food and Health).

Table 8. List of PhD-students from 2019 to 2022

Name	Shortened titles:	Progress	Date of completion
Sissel H. Helland	<i>Food bravery in the Kindergarten. A study of two-year-olds' food neophobia and diet and how this can be changed</i>	Completed	19.06.2019 Link to thesis here.
Christine Helle	Early Food for Future Health. RCT evaluating the effects of an eHealth intervention aiming to promote healthy food habits in early childhood	Completed	20.09.2019 Link to thesis here.
Ingrid M. Hovdenak	<i>Evaluating school fruit schemes in Norway - A pilot study and the national implementation</i>	Completed	05.05.2020 Link to thesis here.
Cecilie Beinert	LifeLab Food and Health: Assessment and Development of Teaching and Learning Practices in the Norwegian School Subject Food and Health	Completed	28.04.2021 Link to thesis here.
Margrethe Røed	Fostering healthy dietary habits through targeting toddlers' food and eating environment: The Food4toddlers study	Completed	07.06.2021 Link to thesis here.
Eli Anne M. Blomkvist	Barns matmot 2.0. Diet, development, and food neophobia in early years. How to promote healthy diets in a kindergarten setting	Completed	25.08.2021 Link to thesis here.
Kristine E. Illøkken	Breakfast and school lunch as pathways for enhancing educational outcomes and promoting public health	Completed	16.09.2022 Link to thesis here.
Bente Øvrebø	Evaluations of school-based and fiscal efforts on diet-related behaviors and weight, emphasizing fruit, vegetables, candy, and soda	Completed	30.03.2022 Link to thesis here.
Neha Agnihotri	A healthy and sustainable diet during pregnancy and beyond, - associations with child's subsequent growth and development	Submitted 2023	
Ida Ulrikke Valand	Skills for Life – diet literacy for health in the next generation.	Started 01.10.2018	Two maternal leaves included.
Anam Shakil Rai	New diagnostic criteria for Gestational diabetes: Should actual screening criteria be modified to further improve maternal and offspring health?	Started 01.08.2019	Currently in maternal leave.
Lorentz Salvesen	Diet of prospective parents and health in the next generation (PREPARED)	Started 01.09.2019	Submitting in May 2023
Erlend N. Valen	Diet of prospective parents and health in the next generation (PREPARED)	Started 03.08.2020	In paternal leave
Synne G. Jacobsen	Sustainable Plant-Based Diets in Adolescence – The VeggiSkills Study	Started 01.03.2021	
Natalie Osorio	Implementation and evaluation of evidence-based early-life nutrition interventions in a community	Started 10.01.2022	
Henrik Lian	Implementation of e-learning resources to promote healthy food environments in kindergartens at a community level	Started 01.04.2022	
Marianne Gjellestad	Women's health and working life	Started 01.08.2021	
Torunn I Ersfjord	Scaling up evidence based early-life nutrition interventions – focusing on groups at the margins of society in Southern Norway	Started 04.04.2022	
Kristine L. Vigsnes	Municipalities handling of complex systems and processes.	Started 01.05.2022	

3.7 Extent of collaboration with external partners (academic and non-academic). The PRC-LN has throughout the last four years established several collaborations within different projects - from national public sector and municipalities to commercial business partners and international academic collaborators. Our RCN-funded projects have required the establishment of collaboration agreements. To assess the extent of collaboration we have developed a grading system. The PRC-LN management have together with the respective project leader evaluated the extent of collaboration based on our overall experience and importance of the collaboration (qualitative approach) and time used, in terms of frequency and regularity of meetings and correspondence (quantitative approach) and thus graded the collaboration as low, medium or high. The PRC-LN have collaboration with 23 universities, including National, Nordic and International universities, wherein the extent of collaboration is graded high in most cases (17/23), 3 graded as medium and 3 as low. We have 3 collaborative municipalities, wherein Arendal is graded as high and Kristiansand and Larvik as medium. Further, we collaborate with 3 research institutes, 2 NGOs and 3 hospitals/centers, all graded with medium extent of collaboration.

4.0 Scientific excellence and impact

4.1 Collaborative contributions advancing the research frontier beyond individual capabilities.

Measuring scientific excellence is a complex task, proved by the ongoing debate on whether wider quality criteria should be used at the expense of the traditional metrics such as citations and journal impact factors (49). In the following, we have explained the scientific value and health/societal impact of each topic in narrative form (1-8). For info on citations see 2.1.4 and journals see 4.3.

We consider the **jointly** achieved and most significant contributions we have made in advancing the research frontier to be (paper number in parenthesis refer to the list of top 10 publications):

1) The **Nutrition Now-project** is a collaborative effort involving 16 PRC-LN members, 11 external partners, and 12 scientific fields. The project, which is externally funded by the RCN, builds on meticulous work of the PRC-LN since 2012 and aims to provide **new, effective interventions for improving diet early in life** as well as **knowledge on how to implement** such interventions in communities. Nutrition Now uses a lifecourse approach to its full potential with interventions in early life, across different settings, and addressing factors at an individual, municipal and policy level. The project has enormous potential in achieving long-term effects and will demonstrate how to implement interventions to improve public health (Paper 1).

2) The **PREPARED project** is another collaborative effort involving 8 PRC-LN members, and one of the first studies internationally to evaluate the potential effectiveness of a preconception dietary intervention targeting adults aged 20–35 without biological children, with the aim of improving preconception diet and health outcomes of their future children. This study includes more than 1400 participants. The large sample size and long follow-up time make this study an important cohort. This study will, if successful, provide an easily scalable intervention targeted at the general young adult population to promote a **healthy start for their future children**. Additionally, the study will provide **unique long-term data** on young adults' diet in preconception years (see paper 2). We aim to include the PREPARED intervention in the national scale-up of Nutrition Now.

3) **Focus on School and ECEC meals: The School Meal Project** involves 2 PRC-LN members and 7 students and is an example of our research in school settings. The project addresses a politically “hot topic” in Norway: whether to replace packed lunches from home with a free served lunches in all schools as a public health measure. The School Meal project has contributed to the national debate by providing evidence that a free school meal leads to a healthier diet, reduces social inequality in health, and improves wellbeing. We have also shown that meals (nutrition) play a key role in Norwegian adolescents' school achievements, with regular breakfast consumption leading to better performance in math, science (TIMSS-data), and reading literacy (PIRLS-data) (see Papers 4 and 5 below). Moreover, our research group is one of the first to address the **meal setting in kindergarten**, where more than 90% of Norwegian children attend. We explore how to change the culture, competence of kindergarten staff regarding meals, providing healthy foods and use food and meals for pedagogical measures. Our work has drawn international attention (see papers 9, 5, 4).

4) **Identifying important dietary aspects for lifecourse health.** We are one of the first to show that a healthy diet mid-adolescence is important for later pregnancy and child health, using unique Norwegian HUNT-data (5). With this contribution, we have provided an initial understanding of important dietary factors in a generational perspective. Using MoBa-data we have shown that a healthy and potentially sustainable Nordic diet in early years (prenatal, 0-7 years) influences childhood cognitive development, mental health and personality traits assessed at age 8. Also, we were the first to show a relationship between pregnancy and child diet and personality traits, resulting in a highly read paper that attracted significant national and international attention (see paper 3). These findings contribute individually and together to the understanding of dietary factors that are important in improving development and lifecourse health. Another first was our report on the impact of parents using mobile phones during meals with toddlers, which is increasingly

prevalent while consequences for such are not yet known. Moreover, we are exploring the diet and nutritional status in young vegans, vegetarians and omnivores, which has inspired sister projects in Sweden and Australia.

5) **Enhancing the 'Food and Health' school subject in Norway.** Although 'Food and Health' is a life skills course that all Norwegian pupils take during their first 10 years of schooling, it has not been well studied. Our research has identified a mismatch between what is supposed to be taught according to national guidelines and what is actually taught (45), highlighting the need for improvements. Therefore, we have developed several interventions with innovative pedagogical approaches to be evaluated in RCTs to improve teachers' work in the school subject 'Food and Health'. This work has attracted international funding from Nordisk Smag and NAVI-HED. Another important achievement is the establishment of the journal for 'Food and Health'- teachers as a level 1 journal in the Norwegian journal system, increasing the impact of the field.

6) **EATWELL** is a research project that takes a radically interdisciplinary approach to studying food systems in Bhutan, examining their entanglements with culture, society, environment, health, and nutrition. Through an integrated approach that combines ethnographic and nutritional methods, we aim to better understand the intricate and complex interplay between culture, environment, and nutrition. Our research builds on the concepts of Planetary Health and One Health and is enriched by culture-sensitivity.

7) **Participation in high impact consortia.** Several of our researchers are actively involved in scientifically excellent consortia. Assoc. Prof. Medin is part of the IAEA DLW Database Consortium that has published papers in journals such as *Science* (19). This work has changed our understanding of how people's energy consumption changes over the course of life. Similarly, Ostojic and Vik are collaborators in the NCD Risk Factor Collaboration (NCD-risC) consortium by providing valuable data on obesity prevention interventions. Their recent publication in *Nature* (March 23) on the diminishing benefits of urban living for children and adolescents' growth and development is an important contribution (50). Additionally, three of our researchers are involved in the TOPCHILD consortia, which is an exciting opportunity for collaborative research and discovery (40).

8) **Receiving two major research grants as PIs** (NOK 28 mill) would not have possible without the funding, structure, scientific environment and competence in the PRC-LN.

4.2 Top 10 publications with brief impact assessment.

1. Øverby NC, Hillesund ER, Helland SH, Helle C, Wills AK, Lamu AN, Osorio NG, Lian H, Ersfjord TI, Daele WV, Bjørkkjær T, Valen EN, Gebremariam MK, Grasaas E, Kiland C, Schwarz UvT, Abel MH, Love P, Campbell K, Rutter H, Barker ME, Vik FN, Medin WC **Evaluating the effectiveness and implementation of evidence-based early-life nutrition interventions in a community setting a hybrid type 1 non-randomized trial - the Nutrition Now project protocol** *Front Endocrinol (Lausanne)*. 2023 Jan 10;13:1071489. [doi:10.3389/fendo.2022.1071489](https://doi.org/10.3389/fendo.2022.1071489) **Assessment:** This protocol paper describes our 16 million NOK research project Nutrition Now where 16 of our internal staff are included, showing the enormous collaborative effort and will, and this combines four of our important projects/interventions in one. Further, it is the fundament for our next phase, focusing on implementing the intervention in real world settings, which is where the research frontier is now, reducing the gap between research results and society use.

2. Øverby NC, Medin AC, Valen EL, Salvesen L, Wills AK, Engeset D, Vik FN, Hillesund ER. **Effectiveness of a digital dietary intervention program targeting young adults before parenthood: protocol for the PREPARED randomised controlled trial.** *BMJ Open*. 2021 Dec 1;11(12). [doi:10.1136/bmjopen-2021-055116](https://doi.org/10.1136/bmjopen-2021-055116) **Assessment:** This protocol paper describes our ambitious project PREPARED addressing adults before parenthood, with two internal PhD-students funded by the PRC. This project is unique in its population, long term follow-up (20 years) and the data from birth registries. It builds on our

prospective studies from HUNT and will be one of the first to show whether dietary guidance in the preconception phase improves diet and affects future children's health.

3. Vejrup K, Hillesund ER, Agnihotri N, Helle C, Øverby NC. Diet in Early Life Is Related to Child Mental Health and Personality at 8 Years: Findings from the Norwegian Mother, Father and Child Cohort Study (MoBa). *Nutrients*. 2023 Jan 3;15(1):243. [doi:10.3390/nu15010243](https://doi.org/10.3390/nu15010243) **Assessment:** This paper is the first to describe the association between diet (healthy and sustainable) early in life (womb-7 years) and mental health and personality traits at 8 years. It has attracted much attention, nationally and internationally, also within the professional field of psychology, and in 10-12 news outlets, being the most read article in the largest newspaper in Norway the day it was published, the scientific paper has an Altmetric score of 82 after 2 months, being in the top 5% of all research outputs scored by Altmetric.

4. Vik FN, Nilsen T, Øverby NC Aspects of nutritional deficits and cognitive outcomes – Triangulation across time and subject domains among students and teachers in TIMSS *International Journal of Educational Development* Volume 89, March 2022, 102553. [doi:10.1016/j.ijedudev.2022.102553](https://doi.org/10.1016/j.ijedudev.2022.102553) **Assessment:** This paper showed that breakfast intake was positively associated with higher school achievements in mathematics and science among 9th graders in Norway. There has been a large decline in both breakfast intake and school achievements from 2015 to 2019 in this age group, and breakfast skipping explained one third of the decrease in science achievements and more than half in mathematics. Knowledge about how meals, such as breakfast, are associated with school achievements for students have been lacking in Norway, and this paper uses large datasets from TIMSS to enlighten these associations. The results have attracted national attention (NRK, largest broadcaster) and debate among both teachers and the scientific community. Nutrition and the fact that students may be hungry at school has not previously been regarded as a factor to consider when school performance and achievements are discussed. This paper shows that this needs attention.

5. Vik FN, Van Lippevelde W, Øverby NC. Free school meals as an approach to reduce health inequalities among 10-12- year-old Norwegian children. *BMC Public Health*. 2019 Jul 16;19(1):951. [doi:10.1186/s12889-019-7286-z](https://doi.org/10.1186/s12889-019-7286-z) **Assessment:** This paper is the main outcome paper of “the School Meal project in Agder”. It reports that serving a free school meal for one-year increased children's intake of healthy foods, especially among children with lower socio-economic status. This showed for the first time in an intervention study with a control group in Norway that a free school meal may reduce health inequalities among school children. Since the evidence in the field of school meals in Norway is scarce, this paper and this project have contributed to the evidence base in this regard. This paper has contributed to the public debate on school meals, and has created attention in national newspapers, television and social media. The paper has been cited 42 times and have been referred to in numerous reports including the Norwegian Directorate of Health and the Norwegian Public Health institute.

6. Van Daele W Entangled Assemblages: The Mutual Becoming of Food and More-than-Human Being *Found Sci*. 2022 Nov 2: 1–18. [doi:10.1007/s10699-022-09858-w](https://doi.org/10.1007/s10699-022-09858-w) **Assessment:** Food and life are intimately entangled. To grasp the underlying complexity of this seemingly simple statement, this article introduces the approach to food/eating as an assemblage enacted by various heterogeneous components, and further develops it by engaging with actor network theory and material semiotics. Thereafter the focus turns to ‘entanglement’, as inspired by quantum physics, to elicit the basic dynamics of the entanglement of food and more-than-human beings, conceived of as involving mutual and differential becomings within and among assemblages.

7. Pontzer, H., Yamada, Y., Sagayama, H., [and 79 others, including Medin, A.C.], & IAEA DLW database consortium (2021). Daily energy expenditure through the human life course. *Science*, 373(6556), 808–812. [doi:10.1126/science.abe5017](https://doi.org/10.1126/science.abe5017) **Assessment:** This study has changed our understanding of how people's total energy consumption (which reflects our energy needs) changes over the course of life. It is the first time that so much data on this topic has been collected in one

data set, which has made it possible to study the total energy consumption, measured by the gold standard method doubly labelled water, throughout the entire life course from infancy to 95 years of age. Several researchers from around the world, including Medin, have contributed with original data. Metrics per 07-March-2023: Total Citations: 83, Total Downloads from Science: 22 447.

8. Beinert C, Palojoki P, Åbacka G, Hardy-Johnson P, Engeset D, Hillesund ER, Ask AMS, Øverby NC, Vik FN. **The mismatch between teaching practices and curriculum goals in Norwegian Home Economics classes: a missed opportunity** Education Inquiry 12 (2), 183-201

[doi:10.1080/20004508.2020.1816677](https://doi.org/10.1080/20004508.2020.1816677) Assessment: This paper both discusses and challenges current teaching practices in the Norwegian school subject Food and health. The paper is widely cited within Home Economics research, both national and international, and as of March 2023, the paper has more than 4000 views and 26 citations in google-scholar. Its findings have also been discussed on the local radio channel of the largest Norwegian Broadcasting Corporation (NRK) in Norway.

9. Helland SH, Øverby NC, Myrvoll Blomkvist EA, Hillesund ER, Strømmer S, Barker M, Bjørkkjær T **Wow! They really like celeriac! Kindergarten teachers' experiences of an intervention to increase 1-year-olds' acceptance of vegetables.** Appetite. 2021 Nov 1;166:105581.

[doi:10.1016/j.appet.2021.105581](https://doi.org/10.1016/j.appet.2021.105581) Assessment: This qualitative paper describes ECEC teachers' experiences with implementing the web-based intervention Children's Food Courage 2.0, an intervention that proved effective in increasing child intake of vegetables. This paper helps develop an understanding of *how* the intervention produced beneficial changes in 1-year-olds' vegetable intake, and *how* this may have affected staff practices and beliefs. The information obtained from the interviews may help with implementing similar interventions aimed at 1-year-olds and the knowledge is implemented in our education of ECEC teachers. The results were presented in several newspapers and created discussion in the ECEC field.

10. FN Vik, E Grasaas, MEM Polspoel, M Røed, ER Hillesund, NC Øverby **Parental phone use during mealtimes with toddlers and the associations with feeding practices and shared family meals: a cross-sectional study** BMC Public Health 21, 1-8 [doi:10.1186/s12889-021-10757-1](https://doi.org/10.1186/s12889-021-10757-1) Assessment: This

paper focuses on mobile phone use among parents during mealtimes with their toddlers, and we found that it was quite common; 4 out of 10 parents reported various levels of phone use (meal distraction). Also, parental phone use was associated with less healthy feeding practices and less family meals. Mobile phones have entered all our daily routines, including mealtimes with our children. These findings highlight the importance of making parents aware of potential impacts of meal distractions. Mindless eating is a concept, and “mindless mobile phone use” deserve to be put on the agenda as we experience that it does affect daily life, including mealtimes. These results have been presented in several papers and a web based popular science spot (forskning.no).

4.3 Scientific publications (2019-2022) by publication level according to the Norwegian Register for Scientific Journals, Series and Publishers (Kanalregisteret).

The PRC-LN has far exceeded the KPI of >60 research publications. From 2019 to 2022 a total of 74 papers had been published in international peer-reviewed journals (see Figure 3). Including papers

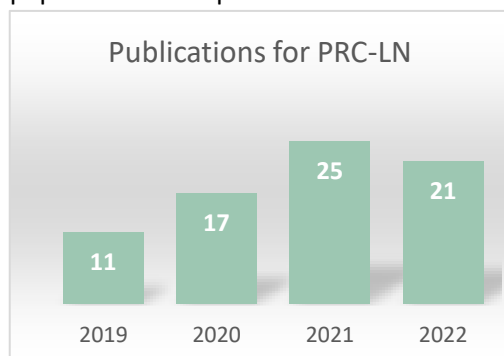


Fig. 3. Publications per year from 2019 – 2022.

likely to be accepted in the coming months, we expect the total number of publications to be more than 90, exceeding the KPI by over 50%. In our annual reports we have provided assessments of scientific impact categories by using the SciVal software tool. UiA unfortunately does not longer possess access to this software, which makes our KPI regarding SciVal categories not applicable. 16 % of our papers are level 2 (best) in the Nordic ranking system, while 42/74 are ranked within Q1 in journal impact ranking.

4.4 Communication and dissemination (excluding scientific publications)

A total of 216 research dissemination activities have been registered by PRC-LN members in [CRISTIN](#) (Current Research Information SysTem In Norway) from 2019 to 2022 (Table 9). This includes 75 academic presentations, one book on public health nutrition and one on meals and pedagogy in ECEC, and several book chapters. We have also participated with media contributions (n=78) in TV, radio broadcasters and newspapers contributing to debates and knowledge translation of the importance of meals, healthy diet for health, wellbeing and development.

Table 9. Dissemination activities for 2019-2022

Dissemination activities 2019-2022	N
Chronicles	15
Popular science	6
Written academic contributions	7
Reader's post, editor's post and summaries	12
Conference- and academic presentations	75
Books	2
Dissertations	3
Reports/chapters	14
Media contributions	78
Digital learning products	4

4.5 Utilization of innovation potential identified in own research.

Innovation can be defined as something novel that is useful and can be used. We have six main areas of innovation in our PRC-LN:

- 1) *Innovation in our research topics:* By contributing pioneering and groundbreaking work to our research field— ranging from targeting preconception diet to explorations of the entanglements between social, cultural, religious factors in food systems.
- 2) *Innovation through the development of digital dietary interventions.* The core ambition of our PRC-LN is to identify **new ways** to improve diet through the lifecourse. We were among the first to develop digital interventions to promote healthy eating throughout the lifecourse. So far five such have been developed, which can be used and implemented in universal services nationally. We have signed a DOFI (Disclosure of Invention) for these innovations.
- 3) *Innovation in the public sector through the Nutrition Now project:* We are transforming the way ECEC teachers can work with food and meals with new tools for their pedagogical practice to the benefit of child health. We are also innovating the way public health nurses can address diet in early life at their control schemes.
- 4) *Innovating approaches* are taken regarding women and integration with cooking as a meeting point of integration. Innovation funding from Norwegian Labour and Welfare Organization.
- 5) *Patent application for Creatine and guanidinoacetic acid for improving region-specific bioenergetics in human brain:* This invention is to improve the level of brain phosphocreatine and/or concomitant features caused by brain dysfunction and/or due to enhanced requirements for cerebral high-energy compounds during growth or stress.
- 6) *Innovation project SOUP:* A collaboration between industry (Orkla), academia (UiA, Nofima), and farmers to improve ultra-processed foods by developing healthier products with simpler ingredients. The project aims to create healthier, but robust products that can withstand changes in raw material supply due to pandemics or climate change.

4.6 The interdisciplinary nature of the PRC-LN's research.

An interdisciplinary approach is crucial to advance the field of lifecourse nutrition and take action to improve public health. We have established extensive interdisciplinary collaboration as documented in our publications. Our PRC-LN builds on formal competence in a broad range of scientific fields, such as public health nutrition, molecular nutrition, public health, biochemistry, home economics pedagogy, ECEC pedagogy, psychology, child psychiatry, food anthropology, social anthropology, sport science, biostatistics, medicine, physiotherapy, and health economics. Within the different projects we also involve necessary external competence to respond to the respective project aims, such as competence within social science, implementation science, humanities, mathematics, and chemistry. We have wide-ranging collaboration with IT- and video developers and web-designers.

5.0 External funding

5.1 The PRC_LN's external funding proposals

The last four years the PRC-LN has submitted 37 proposals for external funding and 5 proposals related to UiA funds, a total of 42 proposals (Table 10).

Table 10. Proposals for external funding and for UiA funding, 2019-2022

External funding agency	Centre's role	Year	Proposal title or theme	Funds
Dam Foundation	Øverby (C)	2019	Gestational diabetes and identification	3 mill NOK
S-E Regional Health Authority	Øverby (P)	2019	New diagnostic criteria for Gestational diabetes	3.3 mill NOK
RCN (KSP)	Ask (C)	2019	INNO Innovative learning methods in food and health	No
RCN (Bedrehelse)	Øverby (C)	2019	From public health evidence to public health practice	No
Norwegian Cancer Society	Medin (P)	2019	Dietary assessment in cancer survivors (DACSAHP)	No
RCN (Miljøforskning)	Bjørkkjær (P)	2019	Young citizens transition' towards sustainable diets.	No
Nordforsk	Øverby (C)	2019	INTERSCHOOLFOOD	No
METADIS CALL: ERA HDHL	Vik (P)	2019	Gender-dependent influence of childhood food habits	No
NordPlus Horizontal	Vik (P)	2019	LEARNFOOD	475.000 NOK
Nordforsk	Øverby (C)	2019	INTERSCHOOLFOOD	No
RCN (FRIPRO)	Daele (C)	2020	EATWELL (FRIPRO)	No
FORMAS Sweden	Medin (P)	2020	VeggiSkills Sweden	No
NWPHA	Bjørkkjær (C)	2020	Preschoolers Food Courage 3.0	No
RCN (KSP)	Øverby (C)	2020	Nutrition Now	15.8 mill NOK
Dam Foundation	Medin (C)	2020	Sustainable eating habits	No
Swedish Research Council	Medin (P)	2020	VeggiSkills Sweden	No
DKNVS Foundation	Medin (C)	2020	Means regarding VeggiSkills	No
Erasmus+ - KA-203	Vik (P)	2020	SUSHE	No
Dam Foundation	Øverby (C)	2020	Healthy start to life – from evidence to practice.	No
RCN (KSP)	Ask (C)	2021	Beans and fractions	No
DKNVS Foundation	Medin (C)	2021	Means regarding VeggiSkills	No
FORMAS Sweden	Medin (P)	2021	VeggiSkills Sweden	No
Erasmus+	Åbacka (P)	2021	Digital challenges in home economics education	No
RCN (FRIPRO)	Van Daele (C)	2021	EATWELL	12 mill NOK
HORIZON-HLTH-2022	Øverby (P)	2021	The partnership project	No
HORIZON-HLTH-2022	Ostojic (P)	2021	Development of Evidence-based funding Strategies	No
Erasmus+	Vik (P)	2021	Sustainable Competences in Higher Education	2.7 mill NOK
SK Foundation	Vik (P)	2021	Food in after-school program	2 mill NOK
A.S Møller (Denmark)	Ask (P)	2021	Nordic taste	4.5 mill NOK
FORMAS Sweden	Medin (P)	2020	VeggiSkills Sweden	No
Swedish Research Council	Medin (P)	2021	VeggiSkills Sweden	No
FORTE Sweden	Medin (P)	2021	VeggiSkills Sweden	4.98 mill SEK
RCN (FRIPRO)	Daele (C)	2022	CULTGUT	No
Dam Foundation	Engeset (C)	2022	Semen quality and nutrition in men	No
Blix grant	Medin (P)	2022	Validate myfood24	No
Tempelton	Daele (C)	2022	Food systems	No
RCN (IPN)	Medin (P)	2022	SOUP project	4.3 mill NOK
Proposals for UiA funding	Centre's role:	Year:	Proposal title or theme:	Funds:
UiA (postdoc means)	Øverby (C)	2019	Early nutrition for life-course health	3 mill NOK
UiA (post doc means)	Bjørkkjær (C)	2019	Food Jungle – National implementation	No
UiA (PhD means)	Medin (C)	2020	VeggiSkills Norway	3 mill NOK
LU Means (UiA)	Guttormsen (C)	2021	Food and Chemistry in the future school	250.000 NOK
LU Means (UiA)	Bjørkkjær (C)	2021	Beans and fractions	No

C: Coordinator, P: Partner RCN: The Research Council of Norway, NWPHA: Norwegian Women's Public Health Association, SK: Sørlandet Knowledge Foundation, S-EN R: South-Eastern Norway Regional Health Authority, KSP: Collaborative and knowledge building project, FRIPRO: Ground-breaking research, IPN: Innovation project for the Industrial sector

5.2 External assessments of submitted proposals

Assessments of the PRC-LN's submitted proposals where we have received assessments are attached as Appendix I. These include funding from the Research Council of Norway and Erasmus+ program.

5.3 Successful (funded) proposals.

Of the in total 42 proposals submitted, a total of 13 proposals were funded, of which 10 proposals received a total 53 million NOK from **external grants** and 3 proposals received 6.25 million NOK from **UiA-grants**, totaling 59 million NOK. The total amount is equivalent to about 5 million Euros (April 2023 currency), however in 2020 currency the total would have been equivalent to 6.8 million Euros. The Research Council of Norway provided the largest proportion of funding with a total of 31.100.000 NOK for the respective period (Table 10). Herein, the Nutrition Now project received 15.8 million NOK related to the call: *Collaborative and knowledge building project* (KSP) and the EATWELL project received 12 million NOK related to the call: *Ground-breaking research* (FRIPRO).

5.4 The PRC-LN’s reliance on internal strategic funding vs capacity to secure external funding.

The PRC-LN is at present reliant on internal strategic funding to fund Centre leaders (45%), senior advisor (100%) and additional research time for the most active researchers in the PRC-LN (total 45%). The PRC-LN was awarded 4 internal PhD-students through the institutional PRC funding. The fact that since 2019 we have attracted funding for additional 12 PhDs and post docs with external (n=7) or internal (n=5) funding shows we have a proven track record to fund research activities from external sources. Within the next three years we will apply for funding for a Centre for Research Excellence from the Research Council of Norway to broaden our research activity, increase its societal impact and secure sufficient time for strategic leadership and administration. To succeed with this plan, we are reliant on internal UiA-funding the next three years.

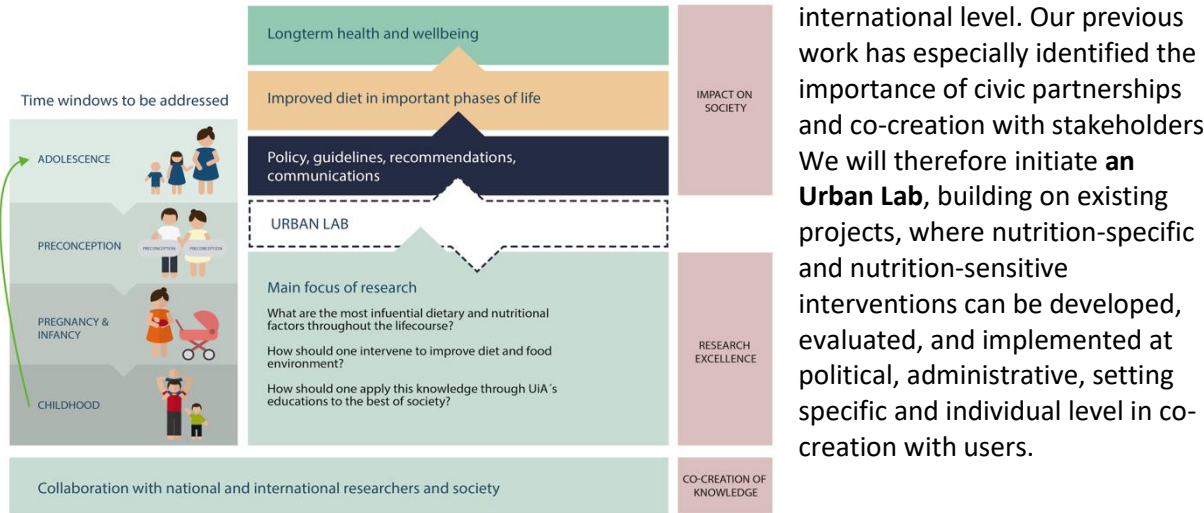
6.0 Strategy and plans for further development

The first four years of UiA-funding have strengthened our scientific foundation, knowledge and international collaboration, yielding new insights into future directions for research and societal involvement to fulfil our research ambitions. In the following we will describe our **scientific, strategic and capacity building plans** for developing our research and Centre beyond 2022 which includes the following refined vision and mission for the ten years ahead.

Vision: Children and young people grow up in environments which enable them and future generations to live long and healthy lives.
Mission: Work with partners and stakeholders to generate knowledge and use it to create healthy and sustainable food environments in which children, young people families and future generations thrive.

6.1 The scientific plan for the PRC-LN beyond 2022

Scientifically, we will pursue our ambitions for excellence in research within lifecourse nutrition as depicted in our original Figure 4, and extend our work into new settings to increase impact (dotted line and new ambition 3). We will specifically extend our focus on **implementation science** to maximise translation of our research into effective action at the individual, societal, national and



international level. Our previous work has especially identified the importance of civic partnerships and co-creation with stakeholders. We will therefore initiate an **Urban Lab**, building on existing projects, where nutrition-specific and nutrition-sensitive interventions can be developed, evaluated, and implemented at political, administrative, setting specific and individual level in co-creation with users.

Fig. 4. Original figure with new methodological setting (Urban Lab) to increase impact.

The ambitions and future plans are included below (ambition 1-4). With these ambitions we also respond to internal **UiA strategy** of co-creating knowledge, working interdisciplinary, focusing on sustainability, health and living conditions (51) and adding to the research field of psychology (important for establishment of the Psychology study program).

1. Advancing the understanding of what the influential dietary factors for child development and health across the lifecourse and what constitutes a healthy food environment.

We will continue to advance knowledge on sustainable and healthy diets applying a lifecourse perspective. Specifically, we will focus on the field of preconception research through our PREPARED cohort study. We will emphasize diet-**mental health associations** and dietary factors important for child development, quality of life and children's educational achievement. We will also continue our work on food systems and their entanglements with culture, everyday life, and health.

2. Generating evidence of effective interventions and actions for sustainable improvements to diet and health across the lifecourse.

We will investigate the effectiveness of our ongoing interventions and extend this by evaluating and implementing interventions at a **structural level** in co-creation with our partners and stakeholders in our planned Urban Lab (see ambition 3 below). We will also conduct educational interventions in our study programs for teachers, nutritionists and public health workers.

3. Co-create an Urban Lab with partners/stakeholders to generate knowledge of how to implement effective interventions in the community, addressing both policy, administrative and the different settings in a community.

Experience from Nutrition Now has demonstrated that when a project is anchored at several levels and across different sectors, **ripple effects can occur** leading to a raft of other positive changes supplemental to the original intervention. We will use these experiences to co-create, plan, develop and evaluate interventions on different levels; these include individuals, settings, and policy, addressing the **whole food environment** and its entanglements to create healthy and sustainable food environments. The Urban Lab will be instrumental as a location and vehicle for testing ideas and engaging with different stakeholders (e.g., school children, teachers, politicians, parents, shops, farmers) to identify and prioritise needs and gaps to create a healthy food environment for the present and future generations. We will be able to test whether initiatives work and identify what effects they have on specific outcomes and whether there are unexpected outcomes. The Urban lab will comprise one or more urban locations in the Agder region of Norway where we have established extensive relationships with multiple partners and stakeholders, which will enable genuine co-creation and testing of interventions in real world settings.

4. Impact society by scaling up successful interventions, translating generated knowledge through higher education and disseminating our findings to the wider public.

We plan to scale up interventions tested in our Urban Lab to have societal impact. In addition, our direct involvement in higher education programs comprise Public Health, Public Health Nutrition, school and ECEC teacher education, and Public Health Nursing, contributing to workforce knowledge of the fundamental importance of healthy eating, healthy food environments and sustainable food systems. We will facilitate learning by translating generated PRC-LN knowledge to students with innovative pedagogy and knowledge of specific tools developed and strategies identified in our Urban Lab, for them to apply and implement in their future work, thus translating their knowledge into benefit across the region and into wider society. In addition, we will disseminate our findings not only to the scientific community, but to different audience (decision makers, practitioners, stakeholders, users and the general public) at both regional, national and international levels. We will work with our UAB and SAB to find the best ways to raise awareness, understanding and impact of our field.

Figure 5 summarizes our four ambitions for the next years and shows that the ambitions are connected, meaning that knowledge gained from one will inform the other.

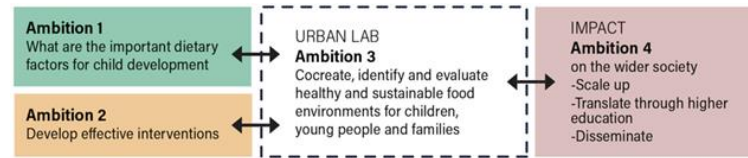


Fig. 5. Summarizes the PRC-LN ambitions.

6.2 Strategic plan and timeframe

We believe that a lifecourse approach to nutritional health/development that integrates epidemiological studies of interventions, with implementation science and a systems thinking approach, will provide us with the scientific rigor, innovation, results and competence to succeed in attracting external funding to further advance our research. In the following we describe our planned tasks for the first year, the internally funded three years (hopefully) and the next 10-years.

First year: For the first year we have defined four main tasks: 1) Continue our work on the proposal for the RCN Research Centre of Excellence scheme, 2) Establish an Urban Lab in Southern Norway, building on and extending current collaboration, 3) Gain necessary insights to facilitate prioritization regarding nutrition sensitive interventions which influence the underlying determinants of nutrition, and their implementation across an urban area, 4) Recruit new members of the PRC-LN to strengthen the methodological team, social science and health economics perspectives, and necessary competence in applying a systems' approach (52). **Three years:** On a 3-year time frame we will 1) apply for funding from local and national funders to secure the Urban Lab research, 2) generate a model for developing a healthy and sustainable city/community, 3) develop capacity for partnership working and develop research methods incorporating political, economic and social science perspectives of lifecourse nutrition relevance, and 4) some members will apply for European Research Council funding. **Ten years:** On a ten-year timeframe we aim to be an internationally recognized research centre, having attracted funding from RCN Research Centre of Excellence scheme, and led the field with respect to creating healthy and sustainable food environments for present and future generations. **Every day:** work to uphold our friendly environment and research culture.

6.3 Competence plan for PRC-LN

To comply with our scientific and strategic plans we need to build more internal competence and attract new collaborators.

First year: To develop the competence in our team further to respond to our ambitions, we will 1) apply for funding for a postdoc in **biostatistics** and increase the present 40% position of our biostatistician, 2) continue our work on enhancing in-house capacity and skills in data science and management which has already started, 3) increase the qualitative research skills of our group by organizing advanced courses in thematic analysis, building on previous courses arranged by our Professor II, Barker, and 4) work to include persons with skills and knowledge of the fields of psychology and quality of life, in line with increased attention to the importance of diet for mental health and the UiA ambitions for establishing a psychology program. **Three years plan and beyond:** recruit a colleague of social science and one of complex systems thinking (in addition to our Professor II, Rutter) to assist in creating the Urban Lab as proposed above. We will seek funding for post docs and PhDs to establish the framework and infrastructure of the Urban Lab. We will also work strategically to enhance competence of the Centre leader and the scientific topic leaders' CVs to match RCN's Research Centre of Excellence criteria.

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