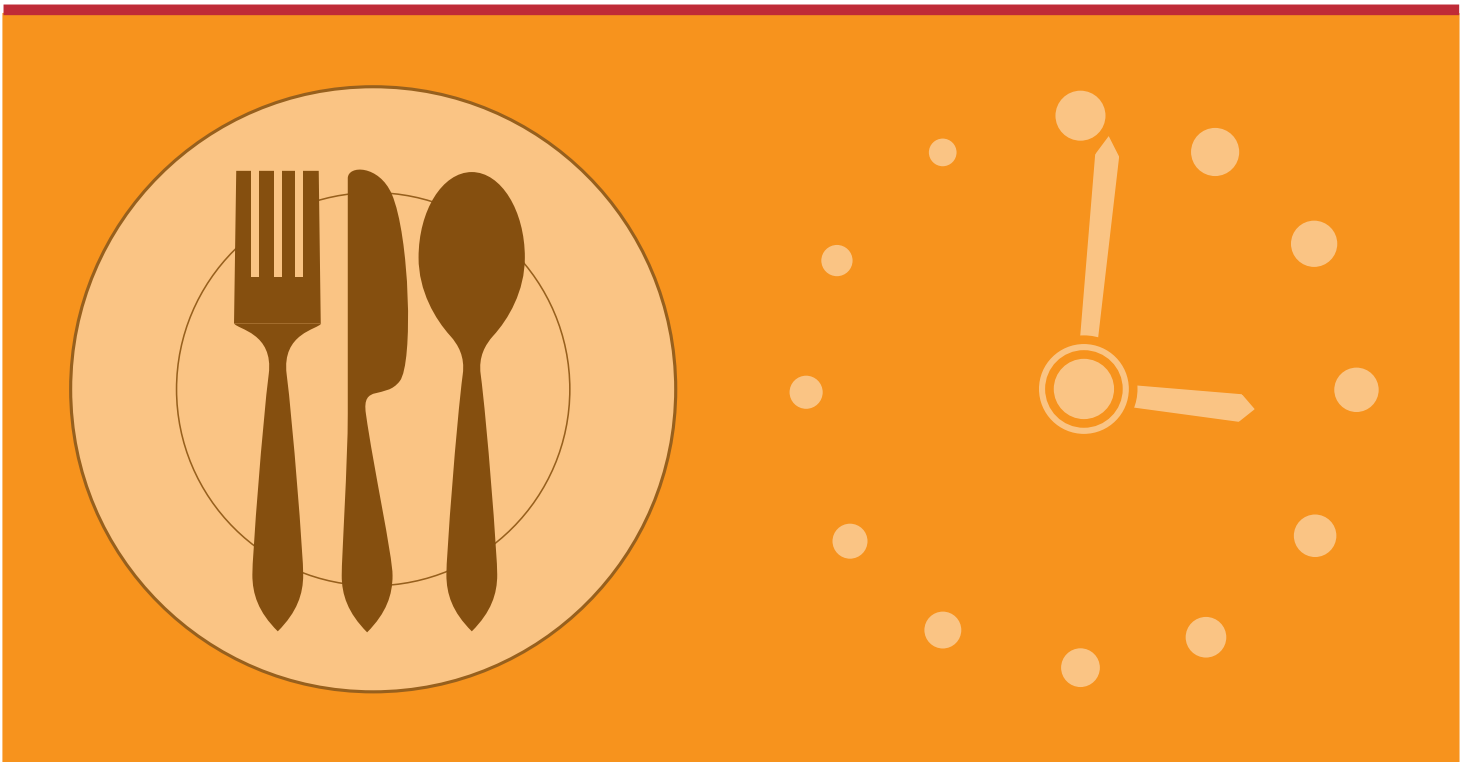
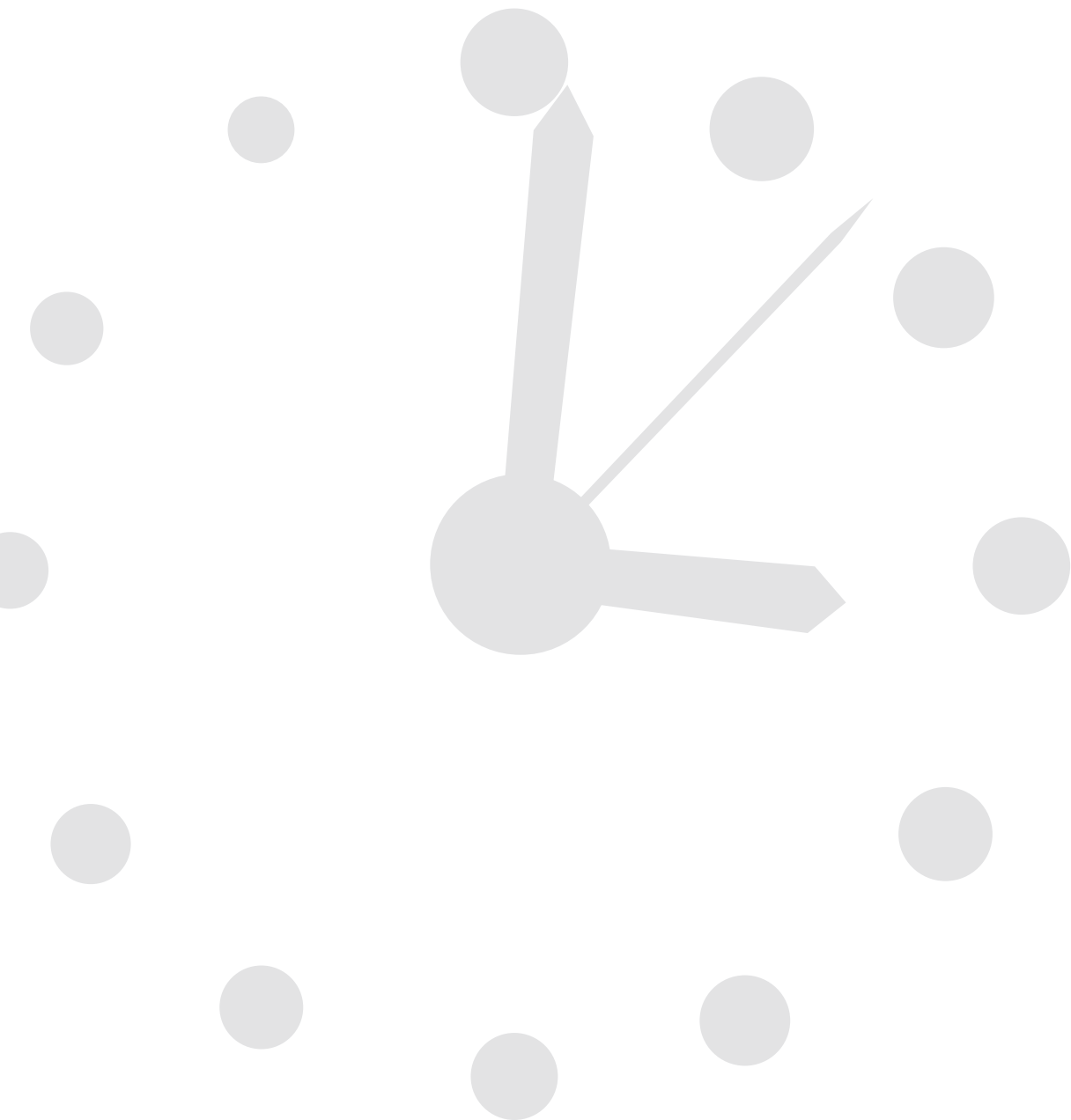


# Food at Work around the Clock - The Nordic Model

Report from a Nordic Workshop, November 4, 2016, Copenhagen, Denmark

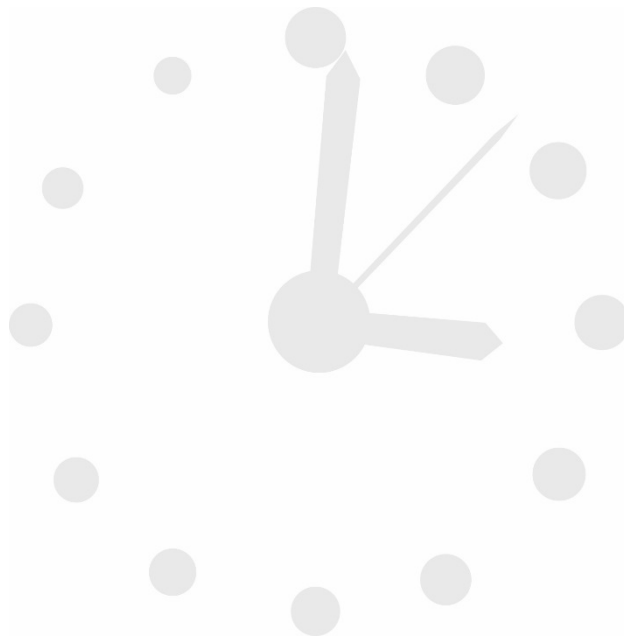




# Food at Work around the Clock – The Nordic Model

Report from a Nordic Workshop, November 4, 2016,  
Copenhagen, Denmark

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# Food at Work around the Clock – The Nordic Model

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## Preface

The Nordic workshop “Food at work around the clock – The Nordic model” was carried out with the aim of bringing together Nordic researchers, experts and stakeholders discussing “Food at work around the clock – The Nordic model”. The workshop is an important step in addressing the Nordic issues and health challenges/concerns found among the emerging group of employees working irregular hours “around the clock”. The workshop was held at the Technical University of Denmark, November 4, 2016 at 9 AM to 5 PM.

We thank the participants for their input and enthusiasm and express special thanks for the speakers for their significant contribution to taking this research area further.

Also we wish to thank the Nordic Council of Ministers for their financial support to this workshop and research endeavour.

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## Introduction

This report brings together 12 invited presentations and outcomes of a workshop on food and meals for employees working irregular hours “around the clock”. The workshop, “Food at work around the clock – The Nordic Model”, was hosted by the National Food Institute at the Technical University of Denmark on November 4, 2016, in Lyngby, near Copenhagen, Denmark. This was a culmination of the collaboration started in 2015 between researchers from the hosts institute, Gävle University and Kristianstad University in Sweden, and the School of Applied Educational Sciences and Teacher Education in Finland. The workshop was funded by the Nordic Council of Ministers.

The programme (see Appendix 1) included two keynotes and 10 shorter presentations under four central themes followed by small group discussions and sharing conclusions at the end of the day. The invited participants, 23 in total, came from three Nordic countries; 5 from Sweden, 4 from Finland and 14 from Denmark (see participant list Appendix 2).

The workshop utilized a pre-workshop online collaboration environment and a LinkedIn group site and has invited all participants to join this group after the workshop for knowledge-building and the exploration of opportunities for collaborative activities and making joint applications for funding. Colleagues from other Nordic countries are welcome to join us in the online collaboration environment (<http://www.uef.fi/foodatwork>).

### Workshop organisers

#### **Anne Dahl Lassen, Senior Researcher, PhD, Technical University of Denmark**

Special area of expertise:

- Strategies for increasing healthy eating and sustainable food production at a community level including environmental, multi-component and empowerment strategies, healthy canteen food, food labeling and food innovation and reformulation
- Effectiveness of worksite health promotion interventions (e.g. among blue collar worksites and shift workers) including methods of data collection

#### **Anne Marie Beck, Docent, Institute of Nutrition and Midwifery, Metropolitan University College, Denmark**

Special area of expertise:

- Nutritional intervention studies with main focus on the use of “ordinary” foods
- Systematic reviews of nutritional intervention studies

#### **Anne Vibeke Thorsen, postdoc, Technical University of Denmark**

Special area of expertise:

- Strategies for increasing healthy eating and sustainable food production at a community level including environmental, multi-component and empowerment strategies
- Mixed methods of quantitative and qualitative characteristics



**Irja Haapala, Senior Researcher, PhD Nutrition, School of Social and Political Sciences, University of Melbourne, Victoria Australia, and School of Applied Educational Sciences and Teacher Education, Savonlinna, Finland**

Special area of expertise:

- Public health nutrition efforts to promote healthy ageing
- Public campaigning for healthy food provision in lunch-time restaurants
- Intergenerational relations and sustainable well-being
- Occupational Health Care Expert

**Maria Lennernäs Wiklund, Professor, PhD Nutrition, Department of Occupational and Public Health Science, Gävle University, Sweden**

Special area of expertise:

- Dietary intake, meal patterns and nutritional status parameters in shift workers
- Influences on eating behavior; chronobiology and chrono-nutrition

**Maria Nyberg, Senior Lecturer, Department of Food and Meal Science, Kristianstad University, Sweden**

Special area of expertise:

- Social and cultural aspects of food and meals at work
- Organizational impact on food and meal patterns, with special focus on organizations having people working irregular hours

**Sisse Fagt, Senior advisor, Technical University of Denmark**

Special area of expertise:

- Dietary habits and healthy eating initiatives
- Dietary assessment methods and mixed methods of quantitative and qualitative characteristics

## Opening remarks

**Anne Dahl Lassen, National Food Institute, DTU, Denmark**

On behalf of the workshop planning group, it is my great pleasure to welcome you here in Denmark to this workshop on Food at work around the clock - The Nordic Model, sponsored by the Nordic Council of Ministers.

I look very much forward to an enjoyable and fruitful workshop today. Thank you all for coming.

The background for the workshop:

- The modern society has become a “24-hour society” in which people can buy goods, food and go to restaurants “around the clock”. This means that more and more people are required to work and eat their meals at unconventional hours.
- At the same time we know that there are a lot of unhealthy aspects of working and eating “around the clock”. Research has linked shift work including working irregular hours “around the clock” to reduced wellbeing and increased health risks. Also, another aspect is that worksite health promotion activities do not necessarily reach shift workers to same extent as people working regular office-hours.
- In addition we have a gap in knowledge on the effectiveness and feasibility of health promotion interventions/strategies among the working population working irregular hours “around the clock”.

The aim of this workshop is to bring together Nordic excellence concerning food and workplace meals with particular reference to irregular working hours, shift work and extended working hour – here referred to as “working around the clock”.



Figure 1. Bringing together researchers, experts and stakeholders at the workshop.

The idea is to bring together researchers from different scientific fields, experts and stakeholders to build capacity and to establish a network of excellence (Figure 1). There are no simple solutions. In order to achieve effective actions in health promotion in the long term we all need to work together.

A key objective of the workshop is to provide state of the art and sharing knowledge on best-practices on food and meals for people “working around the clock. The goal is to pinpoint future research and funding opportunities.

More research and practical initiatives are required in order to obtain the long-term and ambitious goals of ***achieving improved food and meal conditions for shift workers***. Also our ambition is to ***build and promote a “the Nordic Model”*** internationally in this field.

There is good sense in working together in this field.

The Nordic region has much in common regarding work conditions as well as food and meal culture that differ on several points from the rest of Europe, including the New Nordic Diet. Also joint nutritional actions like the Keyhole and Heart Symbol labelling system in the retail and restaurant sector, the Nordic Nutrition Recommendations and Nordic monitoring project on diet and physical activity call for an extended cooperation in the area of health promotion at workplaces.

The Nordic approach to public health is to focus on the entire population and to reduce the risk for everyone, i.e. to promote health at the population level rather than focus only on individuals.

I wish us all a productive day ahead.

## Morning sessions I & II: Setting the Scene

The morning sessions included two keynote presentations and eight invited presentations under four different themes:

Theme 1. Food and meals in relation to shift work

Theme 2. Interventions at worksites with shift work

Theme 3. Policy, regulation and occupational health around shift work meals

Theme 4. Assessment and monitoring methods for short- and long-term effectiveness

Below, the presentations are in the order of appearance (for programme, see Appendix 1), either as a full paper or an abstract, both with a selection of presented slides.

## Presentations

### Key note: Working around the clock – challenges and opportunities in modern working life in relation to health

**Arne Lowden, Associate Professor, Stress Research Institute, Stockholm University, Sweden**

Circadian rhythm disorders are common in society and often occurring in connection to shiftwork, air travel, social jetlag and early school start etc. Working life exposures that cause regular disruptions of the light/dark cycle also cause disruptions of the feeding- and fasting cycle as well as disruptions of the rest/activity cycle. Several diseases are associated with circadian rhythm disruption. Cardiovascular diseases are often preceded by a slow accumulation of fat in blood vessels and elevated blood pressure and are related to shiftwork exposure (Figure 2 and Figure 3). Another group of diseases, closely related to shiftwork, are the metabolic diseases such as diabetes and the metabolic syndrome.

Definitions
<b>Stevens et al. 2010</b>
• Shift system
start time of shift
number of hours per day
rotating or permanent
speed and direction of a rotating system
regular or irregular
• Exposure
years on a particular non-day shift schedule
cumulative exposure to the shift system
shift intensity (time off between successive work days on the shift schedule).
• Night shift = 3 h of work between midnight and 05:00

Figure 2. How to define shift work as a concept.

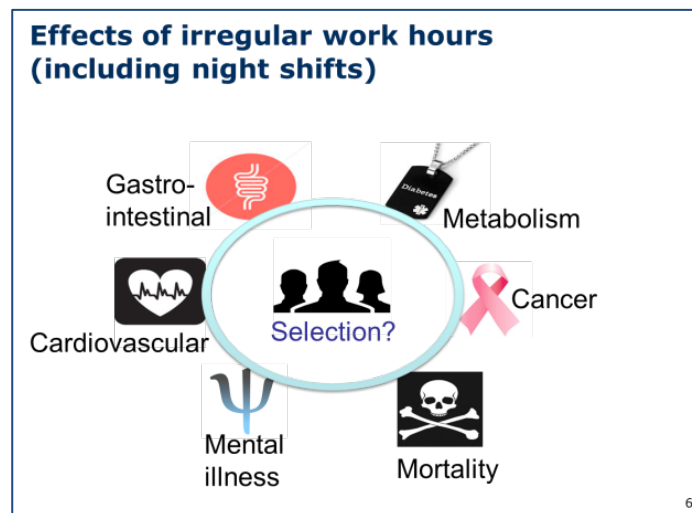


Figure 3. The impact of extended work hours on different health outcomes.

The mechanisms for developing health problems are explained by lack of circadian synchrony of the three main cycles (sleep, feeding, work hours) and the rhythms may differ in phase, amplitude and period length. New insights in circadian disruption emphasize the role of clock genes, expression of metabolomics and epigenetics.

## Theme 1: Food and meals in relation to shift work

**Chair: Maria Lennernäs Wiklund and Maria Nyberg**

### Who decides when I eat in the 24-hour society? The Shift Worker dilemma

**Maria Lennernäs Wiklund, Department of Occupational and Public Health Sciences, University of Gävle, Sweden**

Dietary guidelines are designed for daytime work. About 35% of the working population has other conditions. Eating behavior in shift workers is characterized by frequent snacking; irregular meal patterns and temporal changes in the 24hr distribution of energy. They might have a limited supply of healthy food at work, short or no meal breaks (Figure 4).

Meal environment for shift workers might be uncomfortable and eating might occur directly at the work place. Evidence-based advice on healthy meal patterns in connection with shift work lasts. Studies indicate that night eating should be avoided or limited. Irregular and uncomfortable work hours cause a conflict between the body's need for food, sleep and work demands. The metabolic syndrome might be related to eating food at the wrong time. Chrono-nutrition deals with food administration in coordination with the body's daily rhythms. To study the effect of work hours on eating behavior a study design that covers

different work shifts, including days off, is required. Also, there is a need for reliable methods to evaluate meal patterns (Lennernäs et al, 1993, Lennernäs & Andersson, 1999).

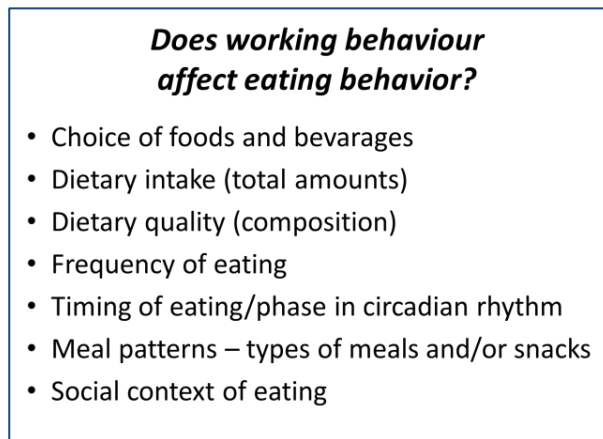


Figure 4. The possible effects of shift work on eating behaviour.

Figure 5 shows the frequency and distribution of eating events in rotating 3-shift workers (n=16) during afternoon shift left Figure (2pm to 10 pm) and night shift right Figure (10 pm to 06 am). Each line of symbols represents the intake of one shift worker during 24-hours. Each symbol reflects a certain type of meal or snack, i.e. red circles stands for hot prepared meal. As seen, some shift workers had a very short sleep during the night shift day. The dietary intake did not differ (intake of energy and nutrients) between shifts, but the temporal distribution of eating events “meal patterns” did.

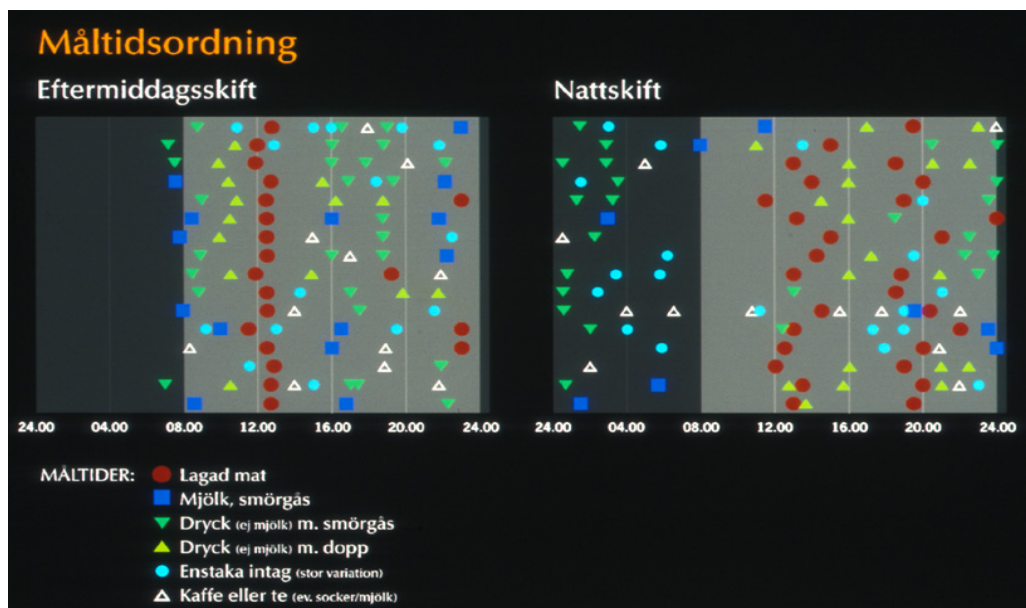


Figure 5. Meal patterns at different shifts.

There are no evidence based guidelines for the distribution of meals and energy intake across the 24-hr day in shift workers. However, experimental metabolic studies (Holmbäck

et al 2003) and observational studies (Lowden et al 2010, Nea et al 2015) and also hypothesis from emerging research in chronobiology (Buijs & Kreier 2006, Antunes et al 2010, Puttonen et al 2010) indicates that night eating might impair regulation of blood glucose and serum lipids. The following recommendations are suggested (Lowden et al 2010), as presented in Figure 6.

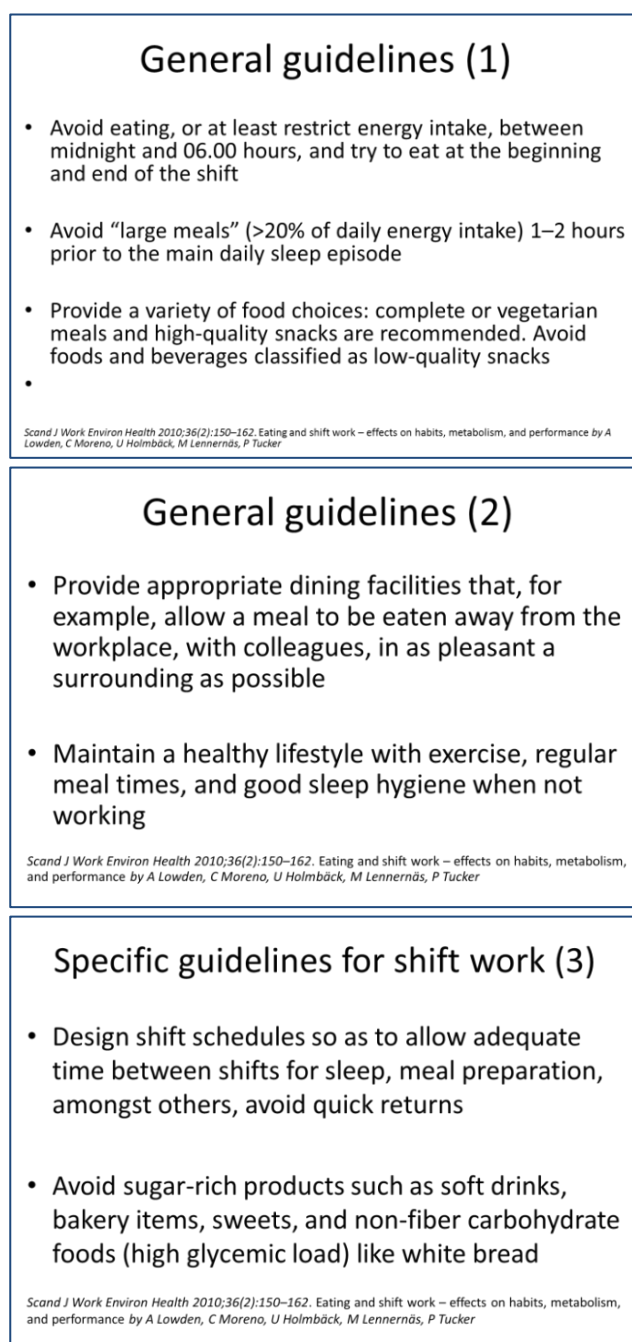


Figure 6. Specific guidelines for shift work, part 1-3.

## Impossible meals? The food and meal situation of Flight Attendants in Scandinavia – a qualitative interview study

**Maria Nyberg, PhD Sociology, Lecturer in Food and meal science, Kristianstad University, Sweden**

Flight attendants (FA) is one of many occupational groups where time and place for food and meals are constantly challenged (Figure 7). The work is characterized by great variations in schedules, breaks and time spent on meals. Working across time zones implies even greater challenges.

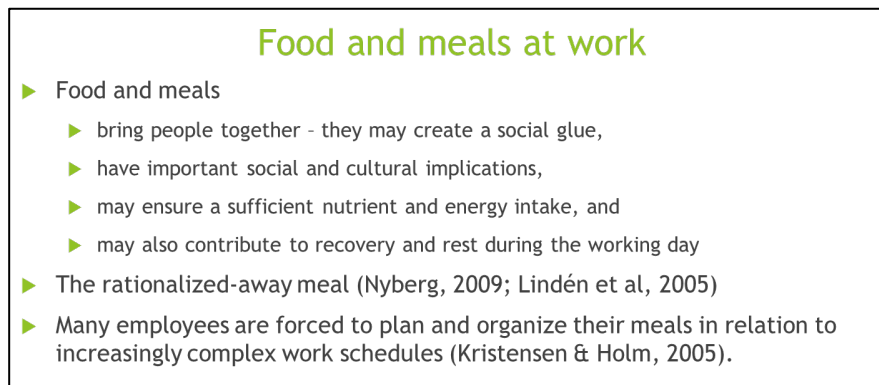


Figure 7. Food and meals at work.

The overall aim of this explorative study was to investigate how the organisation of work, time and place influenced the food and meal situation at work among FAs in Scandinavia. Qualitative, semi-structured interviews were conducted with 14 FAs.

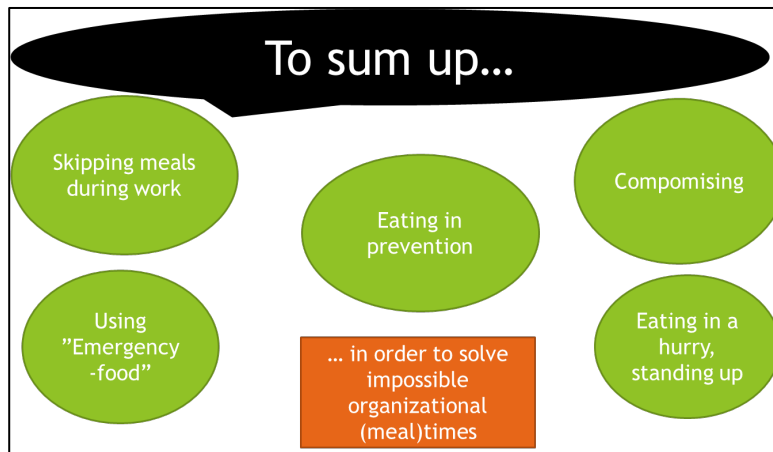


Figure 8. Summary of food and meal strategies for FAs.

Meals at work were characterized by great irregularity, stress and time-pressure, as well as feelings of unpredictability. The FAs adopted multiple of food and meal strategies, including eating in prevention, using "emergency food", avoiding certain food and drinks or eat little or nothing at all. Time for meals was squeezed in wherever suitable from the organizational perspective and the individual had to solve these organizational times in relation to their food and meals (Figure 8).



## Theme 2: Interventions at worksites with shift work

**Chair: Anne Vibeke Thorsen**

### Outcomes of a lifestyle intervention in an airline company with 60-70% shift workers

**Katri Hemiö, National Institute for Health and Welfare, Finland**

The aim of this study was to evaluate the effectiveness of a health check-up and lifestyle counselling on chronic disease risk factors as part of occupational health care at an airline company.

A total of 2312 employees completed the physical examination, blood test and questionnaire. Finnish Diabetes Risk Score (FINDRISC) and/or blood glucose measurement were used to identify increased risk for type 2 diabetes (T2D). 53% of employees identified as at risk (n = 657) took part in 1–3 lifestyle counselling sessions. After 2.5 years, 1347 of the 2199 re-invitees participated in the follow-up study.

Employees with low T2D risk gained weight and their lipid-profile deteriorated. Larger proportion of men who attended the counselling sessions lost at least 5% weight compared to non-attendees (18.4% vs. 8.4%, p = 0.031) (Figure 9).

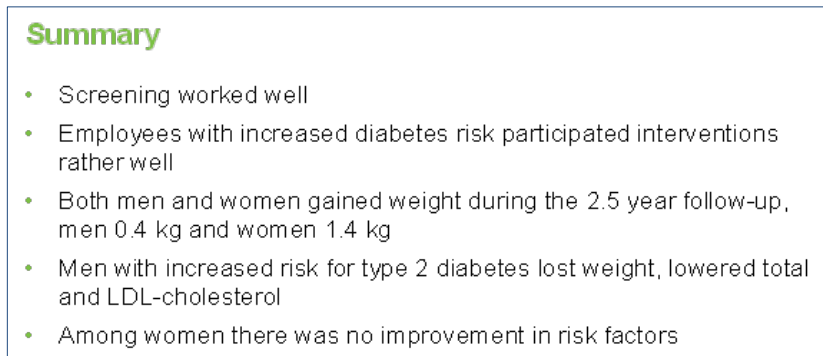


Figure 9. Summary of the results of a lifestyle intervention in an airline company.

**Conclusion:** Lifestyle counselling supports the reduction of chronic disease risk factors while the FINDRISC score can help identify employees with T2D risk through routine occupational health care.

## Do worksite interventions reach shift workers?

**Kirsten Nabe-Nielsen, Department of Public Health, University of Copenhagen**

This work has been published in collaboration with Professor Anne Helene Garde, senior researcher Thomas Clausen, and senior researcher Marie Birk Jørgensen from The National Research Centre for the Working Environment

We aimed to investigate if the reach of worksite interventions varied between shift workers and day workers. We used cross-sectional questionnaire data from 5361 female care workers in the Danish eldercare sector and from 7555 participants in a study of the general working population in Denmark.

In the Danish eldercare sector, shift workers were less likely to be reached by worksite interventions aiming at improving the psychosocial working environment.

In contrast, results from the general working population did not support that the availability of worksite health promotion was lower among shift workers than among day workers. Still, health promotion among shift workers often occurred outside their working hours (Figure 10 and 11).

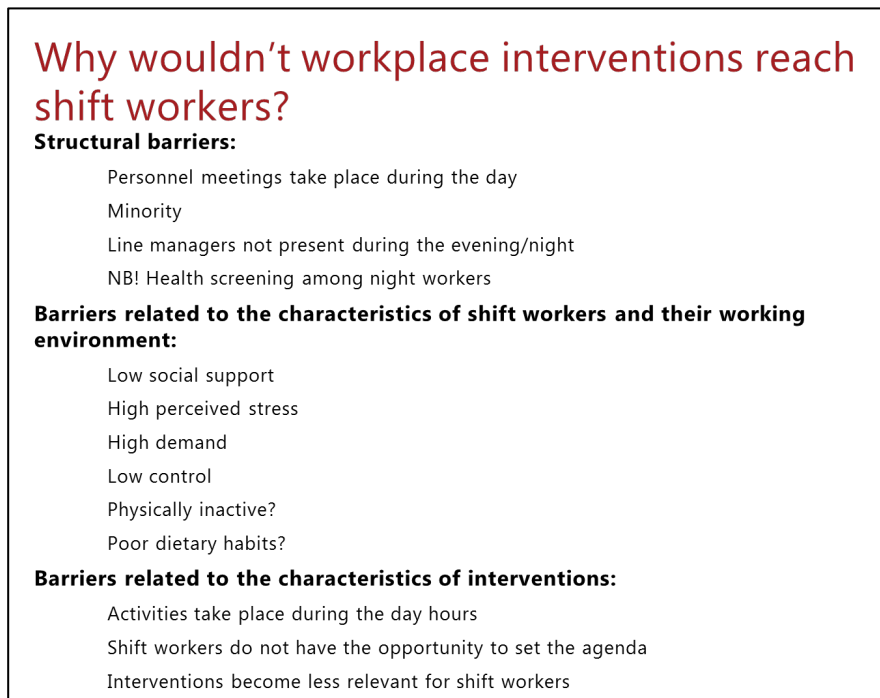


Figure 10. Are workplace interventions reaching shift workers?

### Conclusion

- We cannot confirm that shift workers *generally* report a lower availability of and participation in workplace health promotion.
- Shift workers in the eldercare are less likely to be reached by workplace interventions aiming at improving the working environment.

Figure 11. Conclusions from cross-sectional questionnaires among female care workers and in the general working population in Denmark.

Future studies should address how to enhance the reach of working environment interventions among shift workers and how to increase the possibility of participating in worksite health promotion during the working hours.

## Theme 3: Policy, regulation and occupational health around shift work meals

**Chair: Irja Haapala**

### Keynote: Policy and practice around worksite meals in light of international trends

**Irja Haapala, School of Applied Educational Science and Teacher Education, University of Eastern Finland; School of Social & Political Sciences, University of Melbourne, Australia**

The Nordic approach to public health has traditionally focused on promoting the health of the population as a whole instead of placing undue pressure on the individual. For the individuals working extended hours and irregular hours around the clock, however, the traditional framework of policy and practice does not offer equal opportunities (Nabe-Nielsen et al, 2016; Toker, Heaney & Ein-Gar, 2015). The new 24-hour society has created a subgroup of employees whose long-term health is jeopardised by lack of access to and availability of healthy food during irregular and extended working hours (Beck et al, 2016).

In order to answer the question of how we can move our thinking and policy from focusing on traditional working hours to take into account the irregular and “unsocial” working hours, I’d like to look at regulation in light of Fiona Haines’ (2013) model from political science on how to implement a policy and augment this model by considering also the effects of marketing and Foucaultian power-knowledge influences that surround us (Figure 12).

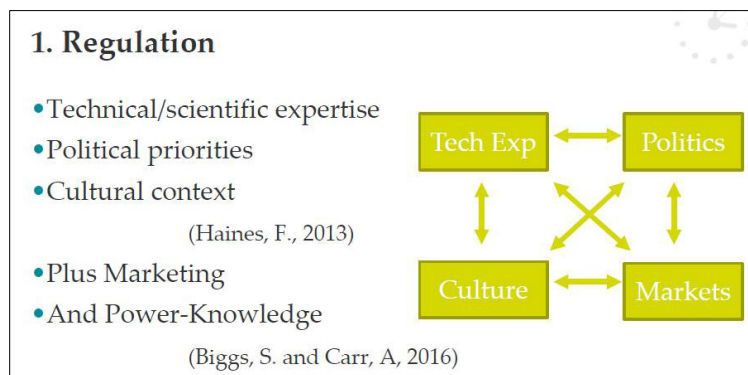


Figure 12. Regulation and the influences on implementing a policy.

In this model, “technical/scientific expertise”, i.e., the evidence-base, is shown in interaction with political priorities and the cultural context. The evidence-base shows a link between good nutritional status, working capacity and quality of life. This is where our first keynote speaker and previous presenters have given us food for thought on the circadian rhythm and chrono-nutrition and their relationship with health and wellbeing among shift workers.

Politics of the day will always dictate whose voice is heard and whose priorities are taken into account, while the culture in which we operate varies from country to country and continent to continent. When we add to this the effects of markets and marketing carried out by each stakeholder who wants to make money on the media hype and the reductionist view of food and nutrition, we can see how difficult it is to successfully implement a policy, even in countries with a long history of strong social welfare policy (the Nordic countries) (Figure 13).



Figure 13. Context for a new model of meal service.

We will also have to acknowledge that the markets have an influence on politics and technical expertise through funding sources. Most importantly, the cultural context begs us to modify the message to fit the needs and expectations of each culture and subculture. This relates to choosing the type of food service model or a food model and the way in which they should be marketed (e.g., the Nordic diet/Mediterranean diet; meal/plate models;

balanced meals; Japanese food and nutrition law of education and campaign on changing perceptions).

To highlight the difficulties I will briefly discuss the findings from a qualitative pilot study on Finnish Home Economics teachers' knowledge and perceptions of the newly launched Nordic Diet and relate this to a European study on marketing balanced meals in lunch-time restaurants. These can serve as manifestations of regulation and policy implementation.

In the pilot study, while the Nordic Diet was seen as an integral part of everyday practice in Home Economics, the teachers called for more support from local and European policy makers, media and institutions in order to increase the visibility and practice of the diet (Mark & Raiskinmäki, 2015) (Figure 14).

**3. Manifestations: The Nordic Diet today and in the future. Perceptions among Home Economics teachers**

**Pilot study Results and Conclusions**

- Nordic Diet is part of everyday practice in Home Economics teaching
- Visibility and practice may be poor/low due to:
  - a) lack of teaching materials on the topic
  - b) not used as a basis for school food service
  - c) lack of public support/ school level initiatives to integrate it into the curriculum/lessons
  - c) confusing, misleading or contradicting information and practice in the media.

Figure 14. Manifestations of regulation and policy implementation.

Similarly, a European study on worktime lunch service (Preventing Obesity through Offer and Demand) carried out in Belgium, France, Italy, Spain, Sweden and the Czech Republic in 2008-2011, found that the interviewed chefs reported that they “would offer healthier meals if there was demand”; and the employees, in turn, stated that they “would demand (buy) if there was offer”. From a marketing perspective it is also important to note that the concept of a balanced meal varied by country (Yngve, Haapala & Lynch, 2011) (Figure 15).

**4. Culture and markets: Restaurant offer and customer demand**

**Perceptions of “A balanced meal”**

- “Varied food in moderate amount in a nice environment”  
(73% of 6185 survey responses)
- “Pleasant food that will also protect one’s health”  
(38% of 6185 survey responses)
- Not very many chose: “Tasty and good food”

• [www.food-programme.eu](http://www.food-programme.eu)

**FOOD**  
A question of balance

Figure 15. Manifestations of policy implementation, culture and markets.

So, how about building the Nordic Model of food service for people working around the clock? Current evidence, models and recommendations are largely based on the average working population while no unified model has been put forward that would consider subgroups employed in shift work and those working during irregular hours (Toker, Heaney & Ein-Gar, 2015).

In spite of the accumulating evidence and of political support for creating health promoting working environments, a gap exists at the organisational and operational level especially in small and medium size enterprises in the translation of research and policy into practice (EU-OSHA, 2016; Guazzi et al 2014). Barriers to participation relate to resource availability (age and health status) and valuation (Toker, Heaney & Ein-Gar, 2015), workplace culture (negative/unmotivated employees), lack of management support, poor communication of “why”, low salary and fear of losing more, and lack of consultation with employees (EU-OSHA, 2016). Success, on the other hand, has been supported by legislation, line and senior management, a life-course approach plus an in-built evaluation plan. (Figure 16).

In the Nordic countries, much of the needed regulation and policy are there, but in practice, differences and gaps exist (Søgaard Jørgensen et al, 2010). Research within the Nordic countries has focused on multiple areas varying by country: working conditions, meal time organisation, physiological consequences, stress, work-family life, and pricing/subsidy policies plus nutritional intake. However, the findings are not easily transferable and embedding of practice is often lacking (Søgaard Jørgensen et al, 2010).

Still, it needs to be pointed out that within the field of workplace health promotion the role of food, meals or nutrition is not that of a central one. Nutritional status is seen as part of physiological health, and meal times are often seen as a good opportunity for health promotion interventions, seminars, presentations and other activities to discuss workplace health promotion overall (Guazzi et al, 2014). The promotion of well-being at work, similarly, comprises five focus areas: social, community, financial, physical and career wellbeing, but the definitions differ between countries (EU-OSHA, 2013).

### 5. Working models

Workplace Good Practice Reports:

- Safer and healthier work at any age: Analysis report of workplace good practices and support needs of enterprises. (EU-OSHA, 2016)
- At the European level, a general model of workplace health management and knowledge on common success factors and tools for worksite health promotion exist, but new mechanisms for effective dissemination and implementation of good practice are needed. (Guazzi et al., 2014)
- No single model of health care or way to address the costs and coverage; components to suit the unique policy environment and culture (Guazzi et al., 2014)

Figure 16. Research on working models of workplace health promotion.

Taken together, we still have a way to go, but I believe that the existing evidence-base from nutritional, physiological and behavioural research (technical expertise) combined with a winning food model and marketing mix can be elaborated into an effective Nordic model. This will require cross-sectoral collaboration to create a shift in the political and cultural thinking and to steer the current markets to consider the health and wellbeing of people working irregular hours. Finally, an emphasis on a life-course approach would help secure the health and well-being of our ageing workforce, especially women.

### **Intervention studies on working hours and health and WINC**

**Anne Helene Garde, The National Research Centre for the Working Environment, Denmark**

This presentation will provide results from two intervention studies we have carried out with the purpose to reduce potential health risks among shift and night workers.

In the PRIO study we aimed to investigate the consequences of self-rostering for working hours, recovery, and health, and to elucidate the mechanisms through which recovery and health are affected. 28 workplaces were allocated to an intervention or a reference group. Questionnaires (n = 840) on recovery and health and objective workplace reports of working hours (n = 718) were obtained at baseline and twelve months later (Figure 17).

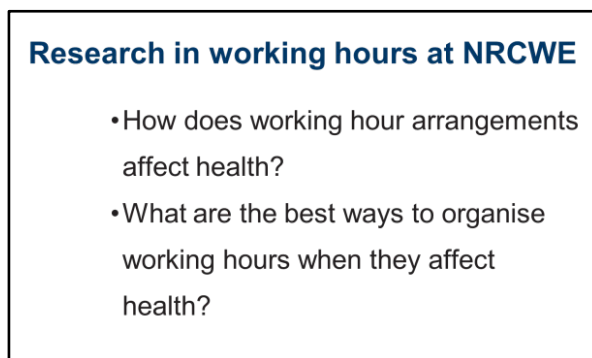


Figure 17 Research in working hours at The National Research Centre for the Working Environment.

The study 'MIDT om NATTEN' aimed to study the consequences of 2, 4 and 7 consecutive night shifts among 73 male police officers. They collected information on sleep and naps, timing of snacks and meals, preferences and saliva for measurement of diurnal variation in melatonin, testosterone and cortisol.

I will also present information regarding WINC (Working hours in the Nordic countries) which is a network for researchers from the Nordic countries with interest in research in working hours.

## Theme 4: Assessment and monitoring methods for short- and long-term effectiveness

**Chair: Sisse Fagt**

### Workmen's eating habits and food services during work time in "blue collar" companies. The use of social marketing

**Riitta Tuikkanen, Mikkeli University of Applied Sciences, Mikkeli, Finland**

The project "Male manual workers improving their work time dining" was carried out in Eastern-Finland in 2014-2016. Four companies were involved the project. The aims of the project were to describe the workmen's eating habits and food services during work time in these companies and to develop work time eating by using service design and social marketing. The social marketing was used as a planned consumer-oriented development process. The eating habits of workmen and their work time eating environment were analysed.



Figure 18. Lunch pack and educational material used in the project "Male manual workers improving their work time dining".

Based on the results the men were segmented, three different types of men could be defined when viewing healthy eating and use of food services. The men gave a lot of proposals for promoting good work time eating. This information was utilized when developing good work time eating (Figure 18).



## The role of partnerships with trade unions in workplace health promotion. Results from focus group interviews with shift workers

**Sisse Fagt and Mette Rosenlund- Sørensen, National Food Institute, DTU, Denmark**

A partnership on “Healthier food at work” has been started by Danish Veterinary and Food Administration, Pensam (an insurance company) and two trade unions. The aim is to train trade union stewards and work environmental representatives to act as ambassadors for healthier food and meals at blue collar workplaces.

Prior to the training four focus groups (Figure 19) with new ambassadors were conducted to gather knowledge, uncover current facilities and meal cultures at the work places as well as perceived barriers and possibilities for change. And to examine how the coming ambassadors see their future role in changes and what needs do they have in order to act as ambassadors.

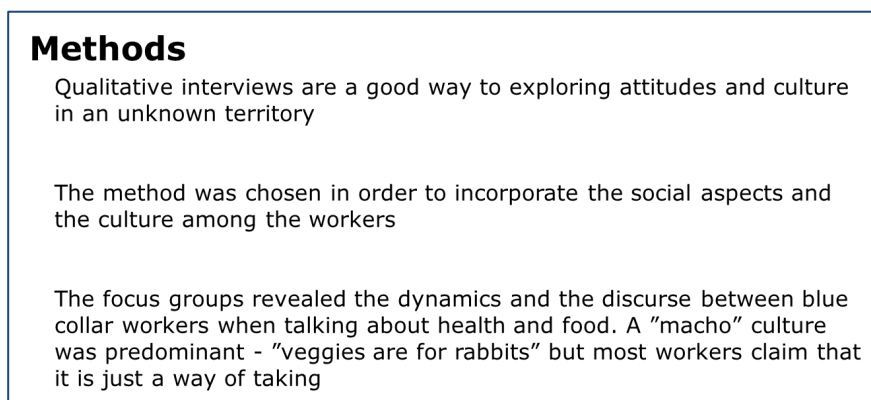


Figure 19. Methods used for examining social aspects and attitudes.

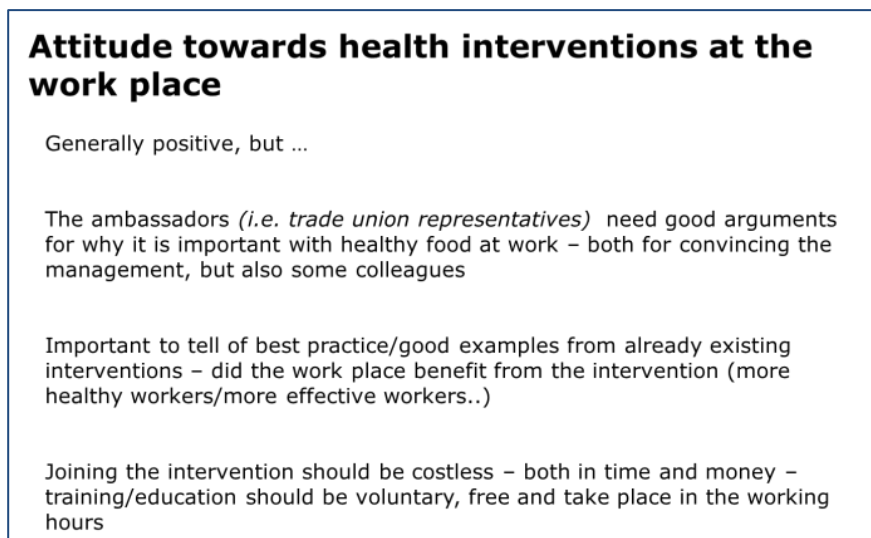


Figure 20. Results from the focus group interviews.

The results from the interviews reveal many issues to take into account in the future training in order to succeed with changing the workplaces in a more healthy direction (Figure 20).

## Smartmeal – an intelligent tool for restaurant customers’ to monitor their dietary intake

Teija Rautiainen , Mikkeli University of Applied Sciences, Finland

Smartmeal provides restaurant customers individualised real-time information on the nutritional value of their meal, for example, the amount of energy, fibre, fats, carbohydrates and protein of the portion taken. It also solves the problem of knowing how much food you collect on your plate when using a self-service buffet line. Figure 21 shows the Smartmeal set-up in a real life setting. A video presentation can be accessed at <http://smartmeal.fi/>.



Figure 21. Smartmeal in brief.

Smartmeal is a combination of embedded technology, scales and displays integrated to a buffet trolley, a touch screen application and separate interfaces for customers and for kitchens to an online service. Customers describe that use of Smartmeal is a delicate way to receive nutritional guidance and a modern tool to estimate dietary habits and required changes. It is also found useful when following special diets.

Restaurants see the use Smartmeal as a tool for promoting healthy and conscious eating for their customers. It is also a new way for restaurants and companies to prove being supportive of well-being at work.

## **Afternoon sessions I & II: Knowledge-building and ways forward**

In the afternoon sessions, the focus was on knowledge-building, identifying ongoing research, and discussing the benefits of different methods of assessment and intervention plus regulation and policy in relation to the different aspects of shift workers eating habits (dietary quality, meal pattern, effect of diet and sleep on metabolism and health).

Two presentations were given followed by small group discussions and a plenum group discussion.

### **Presentations**

#### **The impact of worksite interventions promoting healthy food and physical activity on well-being and risk markers of chronic disease among employees working irregular hours around the clock. Methods and preliminary findings from a systematic review and meta-analysis**

**Anne Dahl Lassen, National Food Institute, DTU, Denmark**

The presentation is based upon a systematic review and meta-analysis completed by Anne Marie Beck, Sisse Fagt, Maria Lennernäs Wiklund, Maria Nyberg, Irja Haapala-Biggs, Anne Vibeke Thorsen, Anna Christine Meinertz Møbjerg and Anne Dahl Lassen. The systematic review is submitted for publication in *Public Health Nutrition*, autumn 2016.

Workplace health promotion programs among employees with ordinary daytime working hours have been shown to be successful in improving dietary habits of workers, increasing productivity and reducing body weight. Yet, uncertainty exists especially regarding the feasibility and effectiveness of health promotion programs among the working population working irregular hours “around the clock”.

The objective of the present work was to systematically review previous research on controlled studies on the impact of interventions focusing on improving the health-promoting working environment with regard to healthy food and/or physical activity among people working irregular hours “around the clock”. Impact was assessed by measures of well-being (primary outcome) and risk markers of chronic disease. Only controlled intervention trials were included.

The result showed that only seven studies (published in 14 papers) fulfilled the inclusion criteria for the present review. The studies varied highly in target group (see figure 22), purpose and the intervention strategies used. No studies were found on the retail and service sector; only few having female workers as a target group.

The interventions reviewed in this paper were focused on 1) broader lifestyle interventions aimed at improving dietary habits and increasing physical activity in two studies lasting for 3

and 12-month respectively, 2) physical activity in two studies; 4 and 10 weeks; and 3) changing the meals offered in three studies, two of these lasting for a very short period of time. In contrast to the lifestyle interventions, none of the studies regarding change of meals were using empowerment techniques or involving the worksite or employees for long lasting effects (Figure 23). Preliminary findings of the review were discussed and can be found in a publication submitted for publication in Public Health Nutrition.



Figure 22. Different target groups in the included studies.



Figure 23. Different intervention strategies in the included studies.

### The effectiveness of healthy meals at work on employees' reaction time, mood, and dietary intake – Methods and preliminary findings from a randomised cross-over study in daytime and shift workers at a university hospital

**Eva Leedo, Research Unit for Nutrition, Herlev University Hospital, Herlev, Denmark**

The presentation is based upon research carried out by Eva Leedo, Anne Marie Beck, Arne Astrup and Anne Dahl Lassen at the Herlev Hospital providing healthy meals, snack and water during work. This study was the one that kick-started the current collaboration and networking under "Food at Work Round the Clock".

The food and drink that we consume affect both our cognitive performance and mood. Proper reaction time and mood is not only important for the welfare of individual healthcare staff but is also vital for the quality of care their patients receive.

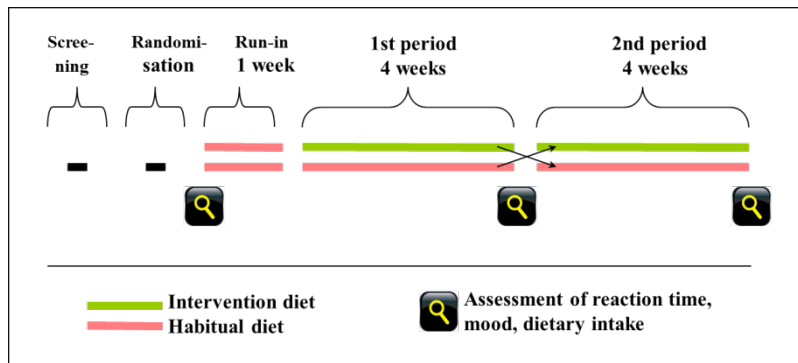


Figure 24. Study design of the RCT-study.

Figure 24 shows the design: A randomised, controlled, 2 x 4 weeks cross-over trial was conducted in order to examine the effect of increased availability of healthy lunch meals, snacks, and water at work in healthcare staff.

A total of 60 physicians, nurses and nursing assistants, including 16 working on shifts, with direct patient contact and who used the staff canteen less than once a week, were recruited for the study. The participants received a self-selected keyhole-labelled lunch, snack and bottled water during each shift throughout the intervention period (Figure 25).

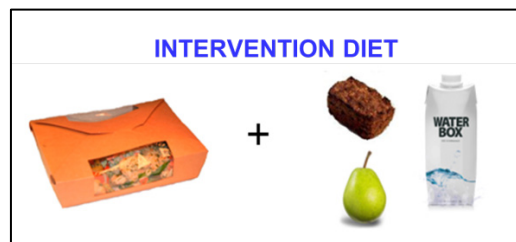


Figure 25. The intervention diet of the RCT-study.

Participants were instructed to maintain their habitual dietary intake at work during the control period. Reaction time (Go/No-Go test), mood related scores (POMS), and dietary intake were assessed at run-in, and at the end of the intervention and the control periods.

Preliminary results suggest that providing healthy meals, snacks and water during working hours successfully improved employees' dietary intake during working days. Moreover, the intervention diet seemed to be associated with beneficial effects on fatigue, vigour and total mood in shift working healthcare staff.

## Knowledge-building and ways forward: parallel thematic group discussions

In this workshop, the second afternoon session was set aside for small group discussions to further elaborate on the day's topics and to find ways forward. The small groups were formed by self-selection under parallel themes. This resulted in a relatively equal number of participants per group. The groups were tasked to consider the type of study that would be of interest to them as a group and as part of the larger network. Specific questions suggested for all groups included the following:

1. How to set up a mapping and intervention study?
2. What setting/settings and target groups would best suit the purpose?
3. At what level of influence should the intervention be?
4. What indicators and tools to be used?
5. What would be the funding options?
6. How to proceed with the Nordic model of best-practice?

Each group approached the task in a unique way and did not necessarily answer all of the suggested questions. Outcomes from each thematic group are presented below in brief followed by a summary overview.

### Theme 1: Food and meals in relation to shift work

Under the theme of food and meals in relation to shift work and working irregular hours "around the clock", several interests were voiced for future research but common ground was found in terms of focusing not only on the food eaten and the nutritional content, but also the timing of meals and the place where meals are eaten (i.e., what, when and where). These are likely to vary according to the type of shift work people are engaged in.

Important topics identified were: 1) how to organize shift work schedules to allow for meal breaks, 2) what foods to recommend for different shifts With respect to time of day and the biological rhythm system and settings and 3) what type of a meal pattern, i.e. temporal distribution over the 24 hour day to recommend and 4) when should the meal breaks take place in different shifts and what do the shift workers themselves identify as optimal solutions?

There is still a need for information on what can be recommended and how to best communicate it. A market approach is required.

The group emphasized the importance of considering the cultural aspects and the need to understand people's food behavior at work. In an intervention it is crucial to integrate these cultural and informal aspects related to the aspects of organizational culture. In addition, the way in which the actual working hours effect meal times is poorly understood across occupations. In terms of settings and target groups, a lack of research in retail and service sector and among women plus night shift workers was identified.

Funding opportunities might be slim, due to lack of needs assessment (identified risks and need for intervention) in this sector (retail and service).

It needs to be pointed out that because of the existing gap in evidence-base/research in this field/sector there are no evidence-based recommendations for shift workers on how to distribute meals and energy intake across the 24-hour day. Current dietary guidelines are designed for daytime work.

Mapping/baseline data gathered at workplaces “working around the clock” are urgently needed. This will include current practices and policies for the eating environment and readiness and capacity among the worksites to implement a healthy food and beverage environment policy. Best practices need to be tested scientifically under real-life conditions (see theme 2).

## **Theme 2: Interventions at worksites with shift work**

The discussion in relation to interventions at worksites with shift work evolved around the need to tailor the intervention to the facility and type of shift work, and to assess the effects of well-designed health promotion interventions aimed at improving the wellbeing and health of workers working “around the clock”. Many current interventions are not evaluated and therefore do not contribute to our evidence-base of best practice.

Setting clear goals/objectives for the intervention was called for in order to enable assessment of the outcomes. For example, focusing on the 1) lack of time to eat in many jobs during irregular or extended working hours and 2) availability and content of the food and meal provided in different shift working conditions might provide such clear goals for assessment.

Overall, there is a great need to develop and implement well-designed health promotion intervention studies among many different occupational groups working irregular hours “around the clock”. Possible target groups included: night shift workers or other clearly defined target groups within employees working irregular hours.

## **Theme 3: Policy, regulation and occupational health around shift work meals**

Two different types/levels of regulation were identified as possible focus for research: 1) governmental regulation and its effects on working conditions and 2) local workplace policy and bargaining through workers’ unions.

There is a lack of information on what type, if any, food is available. Do workers have proper meal breaks and are they allowed to leave the work place for lunch etc.? More knowledge is needed especially from low-paid and mini-small-size enterprises, such as the retail and service sector, but also from construction sites, corner shops, and from the social and health care sector.

Different sectors all have a role to play in supporting healthier worksite environments, including health authorities, community-level authorities, and the trade unions (many of these actors were represented at the workshop).

Especially a focus on the blue collar workers and employees with lower education levels is needed, because these groups of employees has been shown to be less likely to participate in workplace health promotion programs and, in general, to have poorer dietary intake than white collar workers.

It could be interesting to compare national (and local) practices on what is regulated and how regulation affects the shift workers' opportunities to have proper food and meals during their irregular hours of work.

Funding options may become available through ageing research and workforce training plus education due to the clear link between shift work, nutrition and metabolic health. This is linked to the way in which the ageing work force will be capable of working longer and living healthier. Also, the employers may become more interested in the issue due to the need to promote productivity and any preventable decline in employee health status that might affect productivity and working capacity.

#### **Theme 4: Assessment and monitoring methods for short- and long-term effectiveness**

In terms of assessment and monitoring, the group pointed out that the approach should be different for females and male employees. Work places tend to be gendered, men in factories and as leaders; women in care professions as nurses and managers. Meals and snacks are different based upon gender and occupation.

The group would recommend the use of more objective methods of monitoring individual food and nutrient intake including: digital photography methods for measuring of food and nutritional content, indicators of dietary quality or classification of foods or meals or classification of eating events according to foods eaten, short, 8-item scales to define/classify different snacks etc. For an overall assessment of diet quality validated the questionnaire for the Nordic monitoring System on diet, physical activity and overweight could be a low cost method to use.

Also, the development and validation of measures of the food and meal environment are needed to determine practices and policies for the eating environment, for example a questionnaire/checklist tool directed at worksites with shift and irregular or extended working hours.

In order to get funding, the benefits for the society, e.g., a healthier population and economic growth, need to be clearly communicated to the policy-makers and politicians as well as to other key actors.



## Final discussion

The final discussion that followed was lively and several good ideas emerged. The main discussion evolved around interdisciplinary approach to the effects and importance of meals on the wellbeing of shift workers doing irregular hours, particularly among women employed in the retail and service sector.

Future collaboration possibilities were listed as follows:

- Research could be set up as a Nordic exchange and a research training programme
- PhD students could carry out a new research programme from different view points
- Student training and exchange of students via Erasmus programme
- A summer school for Master's students
- Niva-courses (Advanced education in occupational healthcare, focused on working environment. For more information: <http://niva.org/>)
- Look for funding for research through 1) masters student training, student exchange programmes, national and European funding institutions, ageing research and lifestyle and health promotion research.

Final discussion was concluded with a plan to continue our collaboration and information exchange on future opportunities for funding via Food at Work round the Clock networking website at <http://www.uef.fi/foodatwork>.

## Conclusions, research needs and future perspectives

### Conclusions

This one-day workshop has brought together 23 Nordic researchers, experts and stakeholders to share knowledge on best-practice on food and meals for shift workers and for people “working around the clock”. The goal was to pinpoint future opportunities for research collaboration and joint funding applications for research and action to achieve improved food and meal conditions for people working irregular hours “round the clock”. This workshop has given rise to a new network of excellence that aims to build and promote a winning “Nordic Model” of meal service and food provision for workers doing irregular hours, both locally and internationally.

The topic is of great interest, due to an increase in the number of people working irregular hours, including shift work. In the past, shift workers were often defined as those working in the industry and in the transport sector. However, as a result of extended opening hours in, for example, shops and supermarkets, more people in the retail sector can today be defined as “shift workers”. Accordingly, there is a greater need for understanding of how the working hours in general, and shift work including night shift, in particular, affect meal times and meal patterns, and the way in which these are related to health and wellbeing.

The workshop has highlighted the need for putting the work meal, especially at shift work, on the agenda. Food and meals at work are part of occupational health but the importance of worksite meals for the health and performance have not yet been recognized by the scientific community to the same extent as other occupational health aspects. Within the field of occupational health food and nutrition can be considered as a neglected research area.

Each presentation at the workshop brought to the fore the various dimensions and perspectives that are important in understanding, as well as improving, food and meals at work focusing on employees working irregular hours. In addition, each workshop participant, an expert in work life issues, contributed to the outcome with their perspective on nutrition, food and meals in a workplace context, focusing on impacts of health, social dimensions as well as ideas on how to work with interventions within the field and how to take the collaboration further.

What today’s presentations have specifically provided us is an update on the research into the potential causes of ill health in shift work focusing on how the disrupted circadian rhythms and lack of sleep may affect human metabolism (see presentations by Arne Lowden and by Anne Helene Garde). From the evidence on metabolic disturbances caused by shift work, the link between shift work and risk of cognitive decline in the ageing workforce became quite evident. A large number of people employed in shift work may be at a higher risk due to poor access to or availability of meals during their irregular working hours.

While we lack formal recommendations for timing of meals and what to eat during shift work, preliminary recommendations exist (Maria Lennernäs-Wiklund). In practice, many employees are forced to devise personal strategies to solve impossible organizational (meal) times and to self-plan and organize their food and meals in relation to increasingly complex work schedules (Maria Nyberg) with little guidance or support from the employer. There is a need to increase shift workers' possibilities of participating in worksite health promotion events during their working hours as a clear disparity exists when compared to non-shift workers working regular hours (Kirsten Nabe-Nielsen).

Experimental studies to improve dietary intake, nutritional status, health, vigour or quality of life and to reduce chronic disease risk factors among shift workers during the irregular hours are rare. It is the evaluation phase that is most often neglected. This has become evident through critical review of the literature as reported by each of the presenters in today's workshop. Particularly, there is a shortage of evidence on the effectiveness of the impact of worksite interventions promoting healthy food and physical activity among employees working irregular hours around the clock as indicated by the recent literature review carried out by the workshop organisers (see presentation by Anne Dahl Lassen).

When well-designed interventions studies have been carried out, the results have been promising as presented here today. Positive results were seen in the case of providing meals, snacks and water (Eva Leedo), offering personalized lifestyle counselling (Katri Hemiö) and lunch packs (Riitta Tuikkanen), employing innovative technological tools for self-assessment and guidance of dietary intake at luncheon restaurants (Teija Rautiainen), and using a social theory-driven approach to service design (Riitta Tuikkanen).

Employing a theory driven design is crucial to ensuring successful involvement of stakeholders in all stages of the intervention; its planning, implementation and evaluation plus embedding the research into practice (Riitta Tuikkanen). In addition to engaging with the employees and the employer plus food service staff, important stakeholders to include in the process are the trade union and health and safety representatives. They can help make sure that the "why" questions are answered (Sisse Fagt). It is important to be readily able to explain why it is important to serve healthy food at work; both to convince the management and to engage the employees and the food service staff.

In our future attempts at achieving sustainable solutions through changes in policy in relation to worksite meals for shift workers working irregular and often unsocial hours, an examination of the current political, cultural and market conditions in relation to the regulation of worksite meals is called for (Irja Haapala). Overall, by harnessing the Nordic expertise and best-practice concerning working life and food policy plus public health, we can aim to develop an integrated and transferable model of meal service and food provision for workers doing irregular hours. For this, we will need to examine the interconnection between these factors to have a significant impact on current practice. This is where the Nordic tradition of adopting an ecological approach to public health will be our unique strong point.

Furthermore, the Nordic region has much in common regarding work conditions as well as food and meal culture, including the New Nordic Diet and joint nutritional actions that differ on several points from the rest of Europe.

The workshop has laid the foundation for collaboration on describing and designing an integrated Nordic Model for meal service and food provision for workers doing irregular hours, securing access to and availability of healthy “Food at Work Around the Clock. This includes some of the following aspects:

- The Nordic Nutritional Recommendations as a common base for action
- Focusing on both nutritional intake and on temporal distribution of eating over the 24-hr day time to eat (meal duration)
- Focusing on a healthy meal environment including social and physical aspects (noise, comfortable chairs, a calm atmosphere, choice of eating alone or with others)
- Placing the primary focus on promoting health at the population rather than individual level, and to focus on primary rather than secondary prevention
- Making the healthy choice the easy choice, i.e., improving the food and meal environment for all workers, not only the shift workers
- Using a participatory and empowerment approach to intervention design and policy planning and implementation.

## Research needs

A long list of research needs was identified. To summarise, the list includes the following:

- Evidence-based recommendations regarding timing of eating and food composition in connection with night- and shift work leading to circadian disruptions
- Longitudinal studies of shift workers’ dietary intake and health and by use of day workers as controls
- Prospective studies of shift workers eating behavior in connection with different work shifts across a shift cycle to evaluate day-to-day variations in meal times (regular vs irregular) timing (energy intake during day versus night) and eating frequency
- Well-focused intervention studies to compare different approaches in different types of shift work under irregular working hours
- Studies where the exposure to shift work is well-defined and controlled
- Co-operation with the industry and relevant partners to increase availability of healthy meals at different shifts
- Evaluation of program sustainability in the long-term
- Establishing partnerships with trade unions and other key actors
- Adopting an intergenerational and life-course approach to secure the health of the (ageing) workforce in the long-run
- Research on:
  - the physical and psychosocial meal environment at workplaces
  - the effect of work meals on recovery, work detachment and performance
  - current practice in order to outline the need for specific interventions
  - current policy and regulations at the area/field of study
  - the perceptions of and importance assigned to meals among shift workers

- how night eating affects metabolism
- the effects of type, timing and place of meals on shift workers' wellbeing and work performance
- shift workers experience of the importance of meals at work for their well-being
- shift workers coping strategies for arranging their meals at work
- specific tool development for assessing meals/dietary intake during irregular working hours
- the effectiveness and feasibility of intervention studies under real-life conditions using empowerment and participatory strategies
- how to enhance the reach of working environment interventions among shift workers and to increase the possibility of the worker participation in worksite health promotion during the working hours
- best practice to improve public perception of the importance of meals, food and nutrition during irregular working hours

## Future perspectives

This workshop has highlighted the need for multidisciplinary collaboration between different fields of study and different sectors working with the questions regarding nutrition and health at work during irregular and unsocial hours, as well as more broadly concerning food patterns and meal structures at work. At the workshop different concrete collaborate possibilities were discussed.

Several gaps in knowledge were identified including the need for evidence-based recommendations regarding timing of eating and food composition in connection with night and shift work and on the effectiveness and feasibility of health promotion interventions/strategies among the population working irregular hours "around the clock".

Food at work around the clock according to a Nordic Model should not only be about the food, but to a larger extent focus on the meal and the meal context. Here, it is important to identify the different aspects of the meal, not only the food eaten but also the time, the timing, the place and the social context including the regulation and policy framework surrounding workplace meals. The healthier choices should always be the easier choices.

The goal is to further develop and strengthen the influence of "the Nordic Model" in designing meal service and food provision for workers doing irregular hours, securing access to and availability of healthy "Food at Work Around the Clock" both nationally and internationally. This will require efforts to affect current policy to achieve improved meals and mealtimes for shift workers, the population working irregular, unconventional and unsocial hours.

Future perspectives to achieve the long-term and ambitious goals of achieving improved food and meal conditions for shift workers include:

- Enable collaboration for the now established network of excellence (web platform)
- Initiate collaborative activities among the Nordic partners through the network and

other relevant networks

- Build and further strengthen the influence of “the Nordic Model” of meal service and food provision for workers doing irregular hours locally and internationally
- Prepare joint applications for funding for future collaborative research and action.

We would like to draw the reader’s attention to the conclusion that although most people spend half of their waking time at work and probably eat a great part of their daily intake at work, the importance of ensuring a high quality meals and mealtimes has been largely ignored. The importance of nutrition for sustainable health, work performance and reduced number of sick days due to metabolic disorders must be argued, acknowledged and put on the scientific and public agenda and also on the governmental agenda.

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## Appendices

### Appendix 1. Program



<http://www.uef.fi/foodatwork>

## Food at work around the clock The Nordic Model Workshop

Meeting Centre, Building 101, room S10 at Technical University, Lyngby, Denmark  
Anker Engelundsvej 1, 2800 Lyngby. For transport from Copenhagen airport, see route details.

**4 November 2016, 9:00 - 17:00**

Workshop coordinator: Anne Vibeke Thorsen (email: [avth@food.dtu.dk](mailto:avth@food.dtu.dk)) Queries: Sisse Fagt (email: [sisfa@food.dtu.dk](mailto:sisfa@food.dtu.dk)). Meals are offered by the organisers and served on the premises. For specific dietary requests, please contact the organiser.

#### Program

8:30-9:00 Registration and networking over a cup of coffee/tea and breakfast

#### Morning session I: Setting the scene with presentations, key concepts, state-of-the-art

9:00 – 9:15 Welcome and introductions

9:15 – 9:45 Key note: Working around the clock – challenges and opportunities in modern working life in relation to health. Arne Lowden, Stress Research Institute, Stockholm University (SE)

9:45 – 10:15 **Theme 1: Food and meals in relation to shift work**

Meal patterns in shift workers and cabin crew. Maria Nyberg, Kristianstad University (SE)

Shift work in relation meal patterns, chronobiology and health Maria Lennernäs Wiklund, Högskolan i Gävle (SE)

10:15 – 10:45 **Theme 2: Interventions at worksites with shift work**

The lifestyle intervention in an airline with 60-70% shift workers. Katri Hemiö, National Institute for Health and Welfare (FI)

Do worksite interventions reach shift workers? Kirsten Nabe-Nielsen, Department of public Health, University of Copenhagen (DK)

10:45 – 11:00 Coffee/tea break

#### Morning session II: Setting the scene with presentations, key concepts, state-of-the-art

11:00 – 11:30 **Theme 3: Policy, regulation and occupational health around shift work meals**

Key note: Current practice and evidence-base on policy, regulation and workforce training around worksite meals and food provision in light of international trends.

Irja Haapala-Biggs, University of Eastern Finland (FI)



<http://www.uef.fi/foodatwork>



- 11:30 – 11:45 Intervention studies on working hours and health with the main purpose to reduce potential risks related to work at night. The Nordic Network on research in working hours in the Nordic countries (WINC, [www.nrcwe.dk/winc](http://www.nrcwe.dk/winc)). Anne Helene Garde, the National Research Center for the Working Environment (DK)
- 11:45 – 12:30 **Theme 4: Assessment and monitoring methods for short- and long-term effectiveness**
- Workmen's eating habits and food services during work time in "blue collar" companies. The use of social marketing. Riitta Tuikkanen, Mikkeli University of Applied Sciences (FI)
- The role of partnerships with trade unions in workplace health promotion. Results from focus group interviews with shift workers. Sisse Fagt, Mette Rosenlund-Sørensen, National Food Institute, DTU (DK)
- Smartmeal – an intelligent tool for restaurant customers' to monitor their dietary intake. Teija Rautiainen, Mikkeli University of Applied Sciences (FI)
- 12:30 – 13:30 Lunch break

#### Afternoon session I: Knowledge-building in small groups under parallel themes

- 13:30 – 13:45 **Presentation of a systematic review article and meta-analysis**  
The impact of worksite interventions promoting healthy food and physical activity on well-being and risk markers of chronic disease among employees working irregular hours around the clock. Anne Dahl Lassen, National Food Institute, DTU (DK)
- 13:45 – 14:45 **Parallel Themes - Workshop activities – including coffee/tea**  
The purpose of the parallel themes is to work on the network's long-term objective to achieve improved food and meal conditions for shift workers. This session will also make use of the pre-workshop online contributions. Questions to consider:
1. How to set up a mapping and intervention study
  2. What setting/settings and target groups would best suit the purpose
  3. At what level of influence should the intervention be
  4. What indicators and tools to be used
  5. Funding options
  6. Building a Nordic model of best-practice
- 14:45 – 15:00 Coffee/tea break

#### Afternoon session II: Working together, ways forward

- 15:00 – 16:00 Presentations bringing together the parallel working groups
- 16:00 – 16:45 Discussion on the ways forward
- 16:45 – 17:00 Concluding remarks and farewell

## Appendix 2. Participants

Country	Name	Affiliation	E-mail
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