Annual Report University Research Clinic for Cancer Screening 2021



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Annual Report 2021 University Research Clinic for Cancer Screening

Department of Public Health Programmes Randers Regional Hospital Central Denmark Region Department of Clinical Medicine Health Aarhus University

March 2022

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The report can be downloaded from www.cancerscreeningresearch.rm.dk or by contacting Research Secretary Marianne Rævsbæk Pedersen, tel. +45 7842 0172, email: marape@rm.dk





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Preface

The year 2021 marked the first full year of the University Research Clinic for Cancer Screening - and what a year it has been! Despite the continued challenges imposed by the COV-ID-19 pandemic, our research team has been able to win new prestigious grants, start up new projects, and publish exciting results.

The University Research Clinic is still based within the Department of Public Health Programmes at Randers Regional Hospital and the close collaboration between research and daily operations related to cancer screening in Central Denmark Region continues to be of great value for both research and daily practice.

This annual report is the first of many to come and it is meant to give a broad overview and status of the activities at the University Research Clinic for Cancer Screening as well as a peak into our strategic ambitions.

The appointment as a University Research Clinic in late 2020 was the preliminary highlight in the research environment that has originated from the visionary political decision in Central Denmark Region: to gather the regional administration and quality assurance related to the three national cancer screening programmes in one single unit, i.e. the Department of Public Health Programmes at Randers Regional Hospital. This unity makes it possible to transfer learning from one cancer screening programme to another and having in-depth knowledge of each cancer screening programme close together is a continuous source of inspiration for new research projects.



All healthcare professionals and life science researchers are highly dependent on the close collaboration with skilled colleagues, a common goal, and the possibility for immersion in the complex challenges we are facing. The continuous impact of COVID-19 with restrictions on the possibility to meet in person has hampered our researchers in their daily work but nonetheless they have always kept up good spirit and made the most of a sometimes challenging situation by an ever-growing use of virtual collaboration and online meetings.

We are most grateful for the readiness for swift changes which all members of staff have shown throughout 2021.

This annual report showcases some of our current research projects, staff of researchers, and research support crew. As management, we are especially proud of our new EU-funded project CBIG-SCREEN and Post Doc Mette Tranberg Nielsen's prestigious International Postdoctoral Grant from Independent Research Fund Denmark. Our ability to achieve external funding is key to expanding our research activities and is also a most welcome recognition of the quality of the research originating from our University Research Clinic.

Looking forward, our ambitions for the coming years remain focused on optimising cancer screening and lifting research and the methodology in practice to higher levels. In particular, we intend to do so, for example, by exploring new diagnostic methods such as better triage methods related to the initial screening test in order to provide more precise answers to the patients, by using artificial intelligence as a supplementary diagnostic tool, by using new sample types such as urine in cervical cancer screening, by working towards personalised screening protocols, and by broadening our knowledge on communicating risks and benefits of cancer screening in order to achieve the highest possible level of informed participation among all socioeconomic groups in our society. Further, a special emphasis is to facilitate research in post screening procedures including personalised approaches and economic evaluations. We believe that

cancer screening must undertake the same transformation towards a much more personalised and resident-centred healthcare system just as our colleagues and collaborators in the primary and secondary healthcare systems is undertaking. As an add-on to current cancer screening programmes we may add research in potentially upcoming screening programmes using our knowledge from the ongoing programmes and by gaining new knowledge on improving early diagnosis in other types of cancer. A common focus in all our future research is to strengthen research collaboration across the country as well as internationally - through current collaborations and through collaborations to come.

Last but not least, we would like to take this opportunity to warmly thank our staff and colleagues for their great efforts throughout the year. We want to thank our Danish and international collaborating departments and colleagues for continuously evolving, rewarding and pleasant collaborations. This is of high significance for our possibility to grow and gain new scientific insights. As a newly appointed University Research Clinic we are especially grateful for the support from the still evolving collaboration with the Department of Clinical Medicine at Aarhus University. A close connection between our regional hospital and the university is fundamental for excellence in research. We also thank the management at Randers Regional Hospital and Central Denmark Region for their extensive support throughout a very busy and difficult year.

Berit Andersen

Professor, Co-Head of Department

Michael Werenberg Mikkelsen Co-Head of Department

About us

The University Research Clinic for Cancer Screening was appointed by the Department of Clinical Medicine at Aarhus University in October 2020.

The University Research Clinic is part of the Department of Public Health Programmes, Randers Regional Hospital, which manages all current cancer screening programmes in the Central Denmark Region. In 2010, the Department developed a research strategy with the aim of expanding the Department with an active research unit. Since then, the number of full-time researchers, research students, and scientific publications has increased steadily, leading to the appointment as University Research Clinic ten years later.

The scientific focus of the University Research Clinic for Cancer Screening is population-based screening and the research is centred on optimising cancer screening programmes – current as well as future – on a regional, national, and international level while utilising the Department's unique possibility to address cross-programme synergies. We employ different scientific disciplines and seek to promote synergies between Health Sciences, Social Studies, and Humanities.

Currently, we have four main research areas:

1. Cross-programme synergies

Health seeking behaviour in terms of participation in cancer screening, the risk of positive screening results, and the risk of having a cancer detected etc. may or may not be associated between the cancer screening programmes. Under this theme, such possible associations are explored, and interventions are developed and tested. The overall aim is to gain benefit from synergies across cancer screening programmes whenever it is meaningful. An example of a current project within this area is the PhD project 'Three cancer screenings in one' on page 30.

2. (Informed) participation

Participation is a key factor in securing effectiveness of a cancer screening programme. Reducing barriers by use of e.g. self-sampling procedures, securing easy access to appropriate information and decision aids, developing and evaluating refined reminder systems, and developing tailored interventions to vulnerable groups may contribute to increase par-



ticipation. Under this theme, associations are explored and interventions are developed and tested. The overall aim is to increase (informed) participation in all cancer screening programmes and among all groups of residents. An example of one of our projects within this area is the newly initiated EU project CBIG-SCREEN on page 26.

3. Effectiveness and consequences

Introducing and maintaining cancer screening is a delicate balance between benefits and harms. A better prognosis with possibly less treatment, changes in resources in the health care system, false test-results, overdiagnosis, over-treatment, and residents' desires all have to be taken into consideration. The balance may change over time as treatment and diagnostic procedures change or improve, and as the prevalence of relevant risk-factors change within the community. Under this theme, register-based evaluation of effectiveness and use of health care resources are combined with resident's perspectives on the subject. The overall aim is to secure relevant and continuous explorative focus on the benefit-harm ratio of cancer screening for residents as well as for the health care system. Examples of projects within this area are the two projects 'optimal cut-off values' and 'CASCADE' on pages 18 and 20.

4. Diagnostics and screening derived clinical procedures

Positive cancer screening results require subsequent clinical procedures of the highest possible standards. Such procedures may require special attention when a new screening programme is introduced, and the need for diagnostic procedures rapidly increases when new age-groups are targeted or when background risk factors change in the community. Under this theme, collaboration with clinical departments is of special importance. The overall aim is to contribute to, develop, and evaluate diagnostics and screening derived clinical procedures in order to continuously secure the highest possible outcome of cancer screening programmes. The project on urinary-HPV and DNA-methylation testing as a novel cervical cancer screening tool on page 28 is an example of a project within this area. In addition to internal projects within our main research areas, the University Research Clinic is involved in several major external collaboration projects on various topics. An example is the work in the 'COVID-19 and Cancer Global Modelling Consortium' aimed at providing more informed advice on cancer control to governments during the pandemic. Other projects include a collaboration with the Finnish, Icelandic, and Norwegian cancer registries on incidence, mortality, and participation in screening among non-western immigrants; the 'Endocopy III' project which is aimed at improving colorectal cancer screening by use of risk markers in blood samples and coordinated by Hvidovre Hospital; and 'PRSONAL' aimed at developing a personalised approach to breast cancer screening and headed by Herlev and Gentofte Hospital.

The University Research Clinic aims to strengthen existing and new research collaborations and we value our long-standing research collaborations with clinical and paraclinical hospital departments within and outside the region as well as with national and international research groups. We also aim to take an active part in the public screening agenda by being involved in a number of national, interregional, and regional forums addressing operation, administration, quality assurance, and guidelines in cancer screening programmes. This includes, among others, the national steering groups for breast cancer screening and cervical cancer screening, the steering committee of the Danish quality database for cervical cancer screening, the Danish colorectal cancer screening database, and the Danish Health Authority's advisory committee on screening programmes.

Staff

Management



Professor Berit Andersen MD, PhD, specialist in community medicine

Co-Head of Department and Professor of Screening. Specialises in public health interventions with special emphasis on public health perspectives on screening programmes. Berit Andersen takes part in the organisation of cancer screening on national level as head of the national steering committees for breast cancer screening (NSBS) and cervical cancer screening (NSLS) and as member of the steering committees for the Danish quality database for cervical cancer screening (DKLS), colorectal cancer screening (DTS), and mammog-

raphy screening (DKMS). She is also member of the Danish Health Authority's advisory committee on screening programmes and the professional committee of the Danish Comprehensive Cancer Center (DCCC), and vice-chairman of the Danish Council on Ethics.



Michael Werenberg Mikkelsen

MSc Biomedical technology Co-Head of Department. Working with clinical and research management and digitalisation in health care with a background in medical imaging.

Honorary Professor



Professor Adrian Edwards MB BS (Medicine), PhD

Professor of General Practice at Cardiff University, Wales, UK. Director of the Wales COV-ID-19 Evidence Centre, Director of PRIME Centre Wales, and part-time General Practitioner in Cwmbran, South Wales.

Specialises in shared decision-making, risk communication, health literacy, and support to patients with chronic diseases.

Senior Researchers



Senior Researcher Pia Kirkegaard MA Anthropology, PhD

Specialises in screening and follow-up seen from the resident's perspective using exploratory qualitative research based on sociological theory and interviews, focus groups, and field work. Focuses on ensuring informed choice about screening participation among all residents in the target groups for cancer screening. Work-package leader in the EU Horizon 2020 project CBIG-SCREEN



Senior Researcher Mette Bach Larsen MSc Public Health, PhD

Specialises in health services research within the field of early diagnosis of cancer using quantitative methods such as surveys, register-based epidemiological research, and intervention studies with focus on different aspects of participation in cancer screening including effectiveness of screening, reasons for (non)participation, and interventions to improve informed screening participation. Responsible for teaching the Department's bachelor course in screening.



Associate Professor Sisse Njor

MSc Statistics and Computer Science, PhD Specialises in register-based research focusing on how to maximise the residents' benefits of screening while minimising the harms. Part-time biostatistician at the Danish Clinical Quality Program – National Clinical Registries. Member of the steering committee in the Danish Colorectal Cancer Group's Database. Collaborator in several major international col-

laboration projects and associated editor in BMC Cancer and BMC Public Health.

Postdoctoral Researchers



Rikke Buus Bøje MSc Nursing, PhD

Specialises in co-constructive methods focusing on reducing inequality in cervical cancer screening among vulnerable women.



Susanne Fogh Jørgensen MSc Health Science, PhD Specialises in register-based research focusing on the evaluation of follow-up after abnormal screening results.



Mette Tranberg MSc Health Science, PhD Specialises in intervention and laboratory

research focusing on improving cervical cancer screening through self-sampling and use of molecular biomarkers.

Research Support



Louise Dybdahl Pedersen Research Advisor/PA

Marianne Rævsbæk Pedersen



Bo Søborg Data Manager

Research Secretary



Zulfiya Rakhimi Project Assistant



Charlotte Riff Project Assistant





Vibe Munk Bertelsen MD, PhD Student

Vibe is focusing on improving the diagnosis of precancerous cervical lesions among women aged ≥50 years



Line Winther Gustafson MD, specialist in gynaecology, PhD Student Line is evaluating the most optimal way to diagnose older women with abnormal screening results.



Anne Dorte Lerche Helgestad MD, PhD Student Anne Dorte is exploring cross-programme syner-



Pernille Thordal Larsen MSc Health Science, PhD Student Pernille is evaluating the recommendations for

gies in the national cancer screening programmes.

Pernille is evaluating the recommendations for follow-up in the colorectal cancer screening programme.



Bayan Sardini MSc Applied Mathematics, Research Assistant Bayan is evaluating follow-up in the breast cancer screening programme.



Rikke Stokholm MSc Public Health, Research Assistant Rikke is focusing her research on how to measure knowledge about cancer screening.



Camilla Rahr Tatari MSc Public Health, PhD Student Camilla is exploring attitudes and identifying barriers towards cancer screening among vulnerable residents.

Staff & visitors

New Co-Head of Department

Due to the growth of the University Research Clinic, the Department management has been expanded with a new Co-Head of Department. Michael Werenberg Mikkelsen joined us in September. He comes from a position as Head Biomedical Laboratory Scientist in Department of Nuclear Medicine & PET-Centre at Aarhus University Hospital and has several years of experience in research management.



Extension of our Honorary Professor

Professor Adrian Edwards has been extended as Honorary Professor. Adrian Edwards is Professor of General Practice and Co-Director of the Division of Population Medicine at Cardiff University, Wales, UK. He is also Director of PRIME Centre Wales, a Centre for Primary and Emergency, and part-time general practitioner. We look forward to continuing the fruitful collaboration for five more years.



PhD defence

On August 31, Susanne Fogh Jørgensen successfully defended her PhD thesis entitled 'Adherence to recommendations for follow-up in breast and cervical cancer screening in Denmark'. Susanne evaluated the adherence to recommendations for follow-up after abnormal findings in the Danish breast and cervical cancer screening programmes as well as the derived resource use. Susanne is continuing her research with us as a post doc.



New research students and employees

During 2021, the University Research Clinic has welcomed Anne Dorte Lerche Helgestad and Vibe Munk Bertelsen as our new PhD students and Jannie Villekjær Solnæs as Master Student. We have also been joined by two new Postdoctoral Researchers, Rikke Buus Bøje and Susanne Fogh Jørgensen, as well as Research Assistant Bayan Sardini, and Project Assistants Charlotte Riff and Zulfiya Rakhimi.



Visiting scientist

Dr. Severien Van Keer from the Vaccine & Infectious Disease Institute at Antwerp University, Belgium, visited the University Research Clinic in October and November. Severien

Van Keer is collaborating with Post Doc Mette Tranberg on a project using urine-based cervical cancer screening and DNA methylation.

Grants & new international collaborations

Two prestigious new grants

In 2021, the University Research Clinic for Cancer Screening won two new major grants:

The CBIG-SCREEN consortium was awarded €3.66 million from the prestigious EU Horizon 2020 work 'Health, programme Demographic Change, and Wellbeing'. The University Research Clinic received DKK 3.5 million and will be leading two work-packages. Post doc Mette Tranberg was awarded an international postdoctoral grant from the Independent Research Fund Denmark. The purpose of these grants is to strengthen Danish research through international collaboration and mobility of young talented researchers.

You can read more about the two projects on the following pages.







New international collaborations

The University Research Clinic for Cancer Screening has increased its international collaboration considerably during the past year.

- We have joined an international EU-consortium with 13 additional partners from 9 different countries in the project CBIG-SCREEN and initiated research collaborations with almost all partners in 2021.
- Associate Professor Sisse Njor and Data Manager Bo Søborg have established a fruitful collaboration with the Finnish, Icelandic, and Norwegian cancer registries on incidence, mortality, and participation in screening among non-western immigrants across the four Nordic countries.
- Together with Post Doc Susanne Fogh Jørgensen, Sisse Njor has also established a collaboration with the Cancer Prevention Group at Kings College London, UK, on how to improve estimates of sensitivity in cancer screening programmes. The collaboration is a spin-off from Susanne's PhD project.
- PhD Student Line Winther Gustafson and Post Doc Mette Tranberg have established a collaboration with the National Cancer Institute in USA and the TIGA center at University of Heidelberg in Germany on the use of molecular biomarkers for risk stratifying women in the cervical cancer screening programme.

External projects & scientific communications

Major external collaboration projects

In 2021, the University Research Clinic was involved in several external collaboration projects. Selected highlights are:

- The 'COVID-19 and Cancer Global Modelling Consortium' in which we have been working on the prioritisation of colonoscopy services in colorectal cancer screening programmes to minimise the impact of the COVID-19 pandemic on the predicted cancer burden.
- The COVID-19 research project 'Testing Denmark'. The project is a national, large-scale, epidemiological surveillance study of SARS-CoV-2 in the Danish population.
- A collaboration with the Finnish, Icelandic, and Norwegian cancer registries on incidence, mortality and participation in screening among non-western immigrants.
- The long-standing collaboration project 'Endoskopi III', which is aimed at developing blood-based biomarkers for colorectal cancer screening.

EU webinar on health equality in cancer screening

Professor Berit Andersen was an invited speaker at the European webinar 'Health equality in cancer screening and treatment' hosted jointly by Coral and The Reference Site Community Network. The talk addressed the use of nationwide registerdata to describe inequalities in cancer screening in Denmark and ways to overcome these inequalities in the cancer screening programmes.

Services to the scientific community

Researchers from the University Research Clinic for Cancer Screening continuously serve as reviewer for numerous international peer reviewed journals and 2021 was no exception.

Associated professor Sisse Njor is an associated editor in BMC Cancer and BMC Public Health and researchers contribute to national as well as international assessment committees and evaluations of PhD students. Also, Professor Berit Andersen was appointed as new member of the prioritising committee in the Health Research Foundation of Central Denmark Region.

Conference contributions and organisation

In 2021, researchers from the University Research Clinic for Cancer Screening participated actively in several national and international conferences and meetings including, among others, the 34th International Papillomavirus Conference (IPVC 2021), Eurogin, and Danish Cancer Research Days. A full list of contributions can be found at the end of this report.

At Danish Cancer Research Days, which is the largest national conference on cancer, Professor Berit Andersen co-arranged a session on 'screening and early diagnostics'.

Outreach & public communications

Social media & press coverage

In the University Research Clinic, we strive to communicate our research to the public and contribute constructively to the public debate.

We are active on social media and in the press. We issue press releases regularly and the University Research Clinic was mentioned in several newspaper articles and participated in three news reports in 2021.

We communicate our research – in particular new projects and results – to research and health care professionals through our personal LinkedIn profiles and through Randers Regional Hospital's LinkedIn profile. We also update the public of relevant research news through the hospital's Facebook profile.

Outreach to ethnic minorities

Senior Researcher Pia Kirkegaard and GP Trine Brogaard from Medical Practice Brogaard & Skibsted taught a course for Bydelsmødrene in Gellerup.

The topic was the three national cancer screening programmes and the course was a result of the 'SWIM project'. SWIM seeks to develop tailored interventions to promote cancer screening in ethnic minority groups.

The project has found that tailored interventions should focus on knowledge in the form of face-to-face teaching and information material in the women's own language with a simple, positive and concrete communication strategy.



Popular scientific dissemination

In 2021, Professor Berit Andersen was an invited panellist in the virtual debate 'Hvad nu, Sundhedsvæsen?' hosted by the journal Sundhedspolitisk Tidsskrift. The question 'what can future cancer screening learn from the COVID-19 pandemic?' was in focus.

Senior Researcher Mette Bach Larsen was an invited speaker at the inaugural Morning Talk in 'Alliancen mod Social Ulighed i Sundhed'. The topic was health literacy and the residents' possibility for navigating the Danish health system. The Morning Talk was moderated by Jesper Fisker, CEO of Danish Cancer Society.

Mette Bach Larsen was also invited to present the Department's research on increased participation in cancer screening to the Danish Health Authority's Screening Committee.

Associate Professor Sisse Njor gave an invited presentation at the Danish Cancer Society's workshop on colorectal cancer. Sisse presented her work on 'age and gender specific cut-off values in colorectal cancer screening' which is presented in this report.

Research training & teaching

Research training

During 2021, University Research Clinic for Cancer Screening hosted a total of three postdoctoral researchers, six PhD students, and a master student. In June, master student Jannie Villekjær Solnæs defended her thesis entitled 'Does full HPV genotyping perform similarly well in clinician-collected cervical samples and self-collected vaginal samples when using the CLART HPV4S assay?'.

In addition to the students hosted by the University Research Clinic for Cancer Screening, we are involved in the supervision of external PhD students at University of Southern Denmark and University of Copenhagen as well as member of the Scientific Monitoring Committee of a PhD project at CHU Dijon Bourgogne.



International workshop

In the EU-funded project CBIG-SCREEN, a major task is to train local facilitators of collaborative user boards in Estonia, Romania, Portugal, Bulgaria, France, Italy, and Denmark. A collaborative user board is a board of stakeholders engaged in cervical cancer screening at different levels.

Through facilitated workshops, the stakeholders are asked to share their perspectives on challenges with and possible solutions to increased cervical cancer screening uptake for vulnerable women.

In order for these workshops to succeed, the local facilitators need to be equipped with the right tools for engaging the stakeholders in an open and constructive dialogue.

A joint 2-day training workshop for all local facilitators was held in September in Aarhus.

Teaching at the university

Continuing the tradition from the past ten years, researchers at University Research Clinic for Cancer Screening have taught the course 'Screening' for medical students at Department of Public Health, Aarhus University. As something new, the course had been moved from masters to bachelor level in 2021. We have also educated doctors receiving speciality training in general medicine in screening. In the fall semester, we contributed to the joint course 'Epidemiology and Biostatistics' in the master programmes nursing, health sciences, and optometry and vision science.

Selected Results



Cancer screening during COVID-19

"I know the busses are running and everything, but I just don't want to take the bus at the moment." "The realproblem is the examination itself. If it were just an x-ray, it would be okay because the distance is big but when you get a mammography, someone has to stand close to you to place your breast where it is supposed to be."

"I know that I have several friends who had a breast cancer detected in screening because the cancer was hidden so deeply that they couldn't feel it. But I believe that during this period, it can wait."



By Pia Kirkegaard, Senior Researcher

Why did women postpone or cancel their appointment for breast cancer screening at the beginning of the COVD-19 pandemic despite the fact that the screening clinics remained open?

Two years have passed since the World Health Organization declared the COVID-19 a pandemic. Healthcare systems were forced to reallocate resources from the detection and treatment of other diseases to combat the threat of COVID-19. Several countries paused their screening programmes either regionally or nationally. In Denmark, however, the population-based breast cancer screening programme remained open. Despite this, the number of women who did not appear, postponed or cancelled their screening appointment increased.

The aim of this study was to explore attitudes, motivations, and intentions about attending breast cancer screening among women who cancelled or postponed their screening appointment in late April 2020. At that point, the pandemic had been a reality for only one and a half months and 8,000 people in Denmark had tested positive while 430 had died with COVID-19. The longevity and consequences of the pandemic were still unknown and a variety of uncertainties about health and everyday life had been introduced.

Telephone interviews

The study was designed as a telephone interview study with women who called the Department of Public

Health Programmes to cancel or postpone their prebooked appointment for breast cancer screening. The main questions were: 1) Could you tell me about your thoughts and considerations about breast cancer screening when you decided to postpone or cancel your appointment for a screening mammography?, 2) What are your general thoughts about breast cancer and breast cancer screening?, 3) What are your general thoughts about COVID-19?, and 4) When and why do you (not) intend to get screened later?

The telephone interviews were audio-recorded and transcribed verbatim for a thematic analysis. The approach was constructivist with an emphasis on phenomenology to explore how the women made sense of their experiences in the specific context. We decided to apply constructs from the Theory of Planned Behaviour including attitudes to breast cancer screening, norms and motivations to comply with breast cancer screening, perceived control, and anticipated regret. We interviewed 33 women aged 50-69 years.

Why did the women cancel or postpone?

Intentions to get screened for breast cancer in the shadow of the COVID-19 pandemic were influenced by several things. This included the attitude that "I thought it was better that the doctors spend their energy on patients who are really sick with corona, instead of filming me." "My mom has diabetes so I wasn't particularly keen on posing a risk of contagion on her. I'd like to visit them with a clean conscience and I know that I'd never be able to forgive myself if they got infected and the fault was mine."

screening was generally important but of secondary importance right now, a sense of clashing norms and conflicting messages from the health authorities about the correct way to exercise 'community spirit', low perceived control over transportation to the screening clinic and the screening situation itself, and an anticipated regret about exposing themselves or others to COVID-19 contagion before, during, or after being screened for breast cancer.

Screening of secondary importance

The attitude of many women was that screening was of secondary importance in this time of uncertainty. Some women perceived the public recommendations from the government and health authorities as contradictory. At this point, face masks were not recommended in Denmark. Instead, the recommendations included physical distance and hygiene, and the anticipated inability to comply with these recommendations at the screening clinic was the main motivations for the women to postpone or cancel the screening appointment. They were expected to keep a distance from loved ones and suffer emotional deprivation but at the screening clinic no face masks or other personal protective equipment were worn by staff even though a physical distance of one to two meters was impossible.

Preferred to stay at home

The women were motivated to stay home because of uncertainty about other people's lack of intention or ability to maintain physical distance and hygiene, for instance in public transportation or at the screening clinic. For some women, the risk of becoming a 'healthy carrier' of COVID-19 who could infect others at random informed their decision to postpone screening. They had vulnerable family members and felt they would fail in their obligations if they put them at risk of contagion. Others said they just wanted to stay away from society to avoid contagion because they were vulnerable themselves.

Clear recommendations are key

The study showed that women who postponed or cancelled breast cancer screening due to the COV-ID-19 pandemic were motivated to participate, except in a time of extreme uncertainty where public recommendations appeared contradictory.

Balancing the risk of getting COVID-19 against the risk of having an undetected breast cancer drew on deliberations about responsibility – community spirit – to avoid contagion with COVID-19, and uncertainty about the 'new norm(al)' of COVID-19. Clear information and recommendations from the government and authorities are pivotal in women's decision-making about screening participation. Information needs to include what is being done to manage risks and recommendations about what people can do to manage risks themselves.

Publication from the study

Balancing risks: Qualitative study of attitudes, motivations and intentions about attending for mammography during the COVID-19 pandemic. Kirkegaard P, Edwards A, and Andersen B. In: Scandinavian Journal of Public Health 49: 700-706

Cut-off values in FIT-based colorectal cancer screening



By Sisse Helle Njor, Associate Professor



Varying the cut-off values in FIT-based colorectal screening by age and gender can increase the benefit and reduce the number of needed colonoscopies

The Danish colorectal cancer screening programme uses a faecal immunochemical test (FIT). The test detects tiny amounts of human haemoglobin in a stool sample. A FIT-based colorectal cancer screening programme must decide how much haemoglobin the sample should contain before the individual is recalled for diagnostic follow-up. That is, the programme must decide what the optimal cut-off value is.

The evidence on an optimal cut-off value has been sparse and based on studies with a low number of cancer cases. Based on a large data set, our research group has conducted two studies on the optimal cutoff values in colorectal cancer screening:

The optimal overall cut-off value

In an observational study, we used data from the Danish Colorectal Cancer Screening Database to estimate the sensitivity and specificity for various cut-off values based on a large number of cancers. Traditionally, optimal cut-off values are found by weighting sensitivity and specificity equally. However, it can be discussed whether an equal weighting is acceptable as this results in many unnecessary colonoscopies to detect one cancer. This study provided optimal cut-off values for different weightings of sensitivity and specificity or number of needed colonoscopies to detect one cancer.

Weighting sensitivity and specificity equally gives an optimal cut-off value of 45 ng Hb/ml. This, in turn, means 24 colonoscopies has to be made in order to detect one cancer. If, however, 24 colonoscopies needed to detect one cancer is too huge a burden on the health care system as well as on the participants, higher cut-off values can be set. If only 19, 16, 14, or 10 colonoscopies can be accepted to find one cancer, the optimal cut-off values are 80, 125, 175, and 350 ng Hb/ml.

Age and gender specific cut-off values

Most FIT-based colorectal cancer screening programmes use the same cut-off value for all participants. The

aim of our second study was to find age and gender specific cut-off values that can improve populationbased colorectal cancer screening.

The study was an observational study using data from the first two years of the Danish FIT-based colorectal cancer screening programme. Data from 531,828 participants showed that lower cut-off values for older residents and higher cut-off values for younger residents (mostly men) increased the overall sensitivity and specificity and decreased the number of needed colonoscopies by 7%. These age and gender specific cut-off values also increased the number of screen-detected cancers by 1.1%, the number of screen-detected adenomas by 5%, and decreased the number of interval cancers by approximately 1.5%.

However, the cut-off values also increased the inequality in sensitivity and specificity among the different age and gender groups and other strategies like ensuring equal sensitivity could be considered. Choosing cutoff values that ensured equal sensitivity between the groups did however increase inequality in e.g. the interval cancer rate.

Publications from the study

The results of the project can be found in the following two publications:

The optimal cut-off value in fit-based colorectal cancer screening: An observational study. Njor SH, Andersen B, Friis-Hansen L, de Haas N, Linnemann D, Nørgaard H, Roikjaer O, Søndergaard B, Rasmussen M. In: Cancer Medicine 10(5):1872-1879.

Varying fecal immunochemical test screening cutoffs by age and gender: a way to increase detection rates and reduce the number of colonoscopies. Njor SH, Rasmussen M, Friis-Hansen L, Andersen B. In: Gastrointestinal Endoscopy 95(3): 540-549



Cancer screening in Denmark: What lies ahead in real life?



By Susanne Fogh Jørgensen, Post Doc



Evaluation of the adherence to national recommendations for follow-up after abnormal breast and cervical cancer screening illuminated large discrepancies between recommendations and real-life adherence to follow-up in the cervical cancer screening programme.

In order to perform a sufficient evaluation of a cancer screening programme, the derived use of resources in the entire follow-up pathways must be included. In spite of this, previous studies have only focused on the first few steps of the pathways even though follow-up recommendations often tend to be comprehensive with explicit recommended courses of action.

Abnormal screening results are either expressed as cancer suspicious findings or pre-cancerous findings that need treatment or surveillance. Either way, further diagnostic testing is required since screening is not a diagnostic test. Delays or missing procedures during the diagnostic process may affect the prognosis of a potential cancer diagnosis or lead to the development of invasive cancers from precursors. Furthermore, follow-up should be performed smoothly and effectively to avoid unnecessary distress and anxiety among the patients. In contrast, excessive follow-up beyond the recommended diagnostic follow-up may not have any beneficial effects for neither the patients nor society and will probably lead to costlier programmes.

The PhD project 'CASCADE – Cancer screening in Denmark: What lies ahead in real life?' aimed at determining the adherence to the recommendations for follow-up after abnormal breast and cervical cancer screening. The project also included an assessment of the total resource use during follow-up. We used register data to define a large cohort of women with abnormal screening results in the period from 2012 to 2016. The women were then followed until 2020, mapping their entire follow-up pathways and determining whether these pathways followed the recommendations. Finally, the total use of diagnostic tests and procedures during follow-up was estimated.

Poor adherence in cervical screening

The analyses showed different results in the two screening programmes. While the majority (75%) of

women had timely and recommended follow-up after breast cancer screening, less than half of the women (42%) from the cervical cancer screening programmes had followed the predefined recommended diagnostic follow-up path. The proportion that followed the recommendations was lowest among elderly women screened with primary HPV testing. For these women, the proportion was only 26%.

The deviations from the recommended pathways covered both insufficient follow-up and delays as well as excessive testing and preterm surveillance tests. Screenings performed by private health care providers and women with previous abnormalities had a higher risk of deviating follow-up paths.

Higher resource use

Our estimation of resource use in the two programmes showed that the numbers of diagnostic procedures were in line with what was expected in the breast cancer screening programme. The cervical screening programme generally employed a higher resource use than would be expected. In fact, the resource use was higher than average even if follow-up care was insufficient according to the national recommendations.

Future perspectives

The results underline the importance of monitoring the follow-up after abnormal screening results. Even in highly organized screening programmes, national published guidelines may not be followed to a high extent. This can affect the quality of the health care offered and result in more expensive and ineffective screening programmes. The research group will continue this research with an evaluation of the colorectal cancer screening programme in 2022. Further studies are planned using the large data material and the algorithms used to map follow-up pathways. The studies will investigate the potential harms caused by non-adherence to follow-up and the disease risks in addition to the regular cost-effectiveness analyses. The aim is to determine the effects of non-adherence on the health care resource utilisation in the context of population based screening.

Publications from the study

The results of the project can be found in the following three publications:

Variations in pathways and resource use in follow-up after abnormal mammography screening: a nationwide register-based study. Jørgensen SF, Andersen B, Lernevall A, Rebolj M, and Njor SH. In: Breast Cancer Research and Treatment 189: 551-560.

Gaps between recommendations and their implementation: A register-based study of follow-up after abnormalities in cervical cancer screening. Jørgensen SF, Andersen B, Rebolj M, and Njor SH. In: Preventive Medicine 146: 106468.

Adherence to follow-up after the exit cervical cancer screening test at age 60–64: A nationwide register-based study. Jørgensen SF, Andersen B, Petersen LK, Rebolj M, and Njor SH. In: Cancer Medicine 11: 224-237.

Self-reported abdominal symptoms



By Mette Bach Larsen, Senior Researcher



Exploring the prevalence of self-reported abdominal symptoms among men and women eligible for colorectal cancer screening revealed that a high number of respondents experiencing alarm symptoms for more than one month had not consulted a doctor.

Screening is intended to identify disease in an apparently healthy and asymptomatic population. Accordingly, the information material in a screening programme often recommends symptomatic individuals to contact a physician instead of participating in screening. However, this approach may not be optimal in colorectal cancer screening for several reasons.

One reason being that abdominal symptoms are frequent in the general population. In Europe, as many as 10% of consultations in general practice are due to abdominal symptoms but only 0.3% of these result in patients being diagnosed with an incident abdominal cancer within six months.

Another reason is the fact that symptom interpretation is influenced by social and cultural settings as well as psychological processes. The same bodily sensations may be interpreted differently from one individual to another depending on sex, age, and context, among other things.

Finally, as many as 25% of colorectal cancers diagnosed within one year after invitation for screening are diagnosed outside the screening programme, primarily by referral from the general practitioner. Therefore, attention towards abdominal symptoms and participation in colorectal cancer screening is warranted.

Exploring self-reported symptoms

In a study we set out to explore the prevalence of abdominal symptoms in a population eligible for colorectal cancer screening, i.e. men and women aged 50-74 years. A questionnaire was sent to 11,919 men and women eligible for inclusion and 5,870 answered the questionnaire corresponding to a response rate of 49%. Of these, 5,488 were included in the analyses.

Compared to non-respondents, the respondents were more likely women, of older age, Danish, cohabiting, and had higher education and income level.

Prevalence of symptoms

Overall, abdominal pain at least once a week and unexplained tiredness within the last four weeks were the most commonly experienced symptoms, reported by 13.1% and 12.0%, respectively. Fresh blood in the stool was experienced by 0.7% and of these 82.1% had been experiencing this for more than one month. The combination of at least one of the other symptoms with unexplained weight loss or tiredness was experienced by 0.6% and 5.0%, respectively.

As many as one third of those experiencing alarm symptoms for more than one month had not consulted a doctor. Even though rarely experienced, it is critical that less than half of those experiencing very dark or black stool and less than two thirds of those experiencing fresh blood in the stool had consulted a physician. Rectal bleeding is one of the symptoms with the highest positive predictive value for colorectal cancer.

Who experience symptoms?

A greater proportion of women than men reported alarm symptoms at least once a week. Yet, more men than women had symptoms for one month or longer. Also, a greater proportion of those who had not seen a general practitioner seemed to be men. This may be explained by a male tendency of under-reporting health problems, differences in health-care utilisation and help-seeking behaviour among men and women but also by differences in social roles and health behaviour. The older respondents aged 65-74 years were less likely to experience alarm symptoms compared to the younger respondents aged 50-64 years. This may reflect the phenomenon known as 'the paradox of aging'. Older people report greater mental health and well-being than younger people reflecting a gradual change in attitude including higher acceptance of one's physical limitations. Thus, the results may be a sign of differences in expectations to symptoms rather than the actual presence of symptoms.

Communication about symptoms

Taking our results into consideration, it is important to emphasise, when communicating to the residents, that alarm symptoms should result in contacting a general practitioner. However, it may be relevant to participate in screening with other kinds of minor discomfort from the stomach. Further research will determine how symptoms are related to screening participation.

Publication from the study

Prevalence of self-reported abdominal symptoms among 50-74-years-old men and women eligible for colorectal cancer screening - a cross-sectional study. Larsen MB, Bachmann HH, Søborg B, Laurberg T, Emmertsen KJ, Laurberg S, Andersen B. In: BMC Cancer 21, 910.

External funding



Focus on external funding

The University Research Clinic for Cancer Screening has worked strategically to increase our external funding. Special focus has been on securing prestigious national and international grants. We currently have a grant portfolio of DKK 13.3 million and the distribution of the type of funding source is shown in the diagram.

In 2021, researchers from the University Research Clinic won grants worth nearly DKK 5 million.

Acknowledgements

We would like to thank the funders of our current projects:

- A.P. Moller Foundation
- Central Denmark Region
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- The Danish Cancer Society

Selected New Projects



CBIG-SCREEN – tackling inequalities in cervical cancer screening



By Rikke Buus Bøje, Post Doc, & Pia Kirkegaard, Senior Researcher



The EU project CBIG-SCREEN will improve access to cervical cancer screening among vulnerable and underserved women bringing together 14 partners from 10 countries in and around Europe.

University Research Clinic for Cancer Screening has become an active part of the EU consortium CBIG-SCREEN – a collaborative European-wide effort to tackle inequalities in cervical cancer screening.

The consortium

CBIG-SCREEN includes 14 organisations from 10 countries in and around EU. Among others, the project partners include WHO's Agency for Research on Cancer, London School of Hygiene and Tropical Medicine, Paris School of Economics, and the French National Institute for Health and Medical Research who is coordinating the project led by Professor Marc Bardou. The University Research Clinic for Cancer Screening participates as both work package leader and deputy leader in significant parts of the project.

Improving access to cervical cancer screening

The objective of CBIG-SCREEN is to improve access to cervical cancer screening among vulnerable and

underserved women as well as to ensure timely follow-up and treatment after an abnormal screening result.

Throughout Europe, cervical cancer screening programmes remain inaccessible and underused by subpopulations of vulnerable women such as women from socially deprived areas, sex workers, migrants, and substance abusers. This is of high concern as some of these populations have an increased risk of HPV infection which is the precursor for the development of cervical cancer.

The EU project will develop context-sensitive interventions which are expected to increase screening participation from 26% to 45%. This will contribute to the achievement of the two major ambitions of WHO: 1) increase cervical cancer screening participation to 70% by 2030, and 2) eliminate cervical cancer as a disease within a few generations.

In CBIG-SCREEN, we will identify and develop strategies to meet the varied and specific needs of vulnerable women, convince policymakers to adopt these strategies, and ensure that cervical cancer screening programmes reach out to communities of underserved women. The project aims to lead to the:

- advancement of local, regional, and national cervical cancer prevention;
- establishment of contextual effectiveness of cervical cancer interventions;
- provision of evidence and recommendations to national programmes and policies;
- prevention of premature death from cervical cancer for an estimated 6,000-7,000 vulnerable women every year.

CBIG-SCREEN uses a variety of methods. This includes co-constructive approaches where vulnerable women and other key stakeholders, e.g. health professionals, NGO staff, and policymakers, are involved in the process of tailoring interventions to meet the objective. Systematic reviews, surveys, discrete choice experiments, and mathematical modelling are also used to explore and identify potential for improvement.

Our involvement

In collaboration with the Association of European Cancer Leagues, the University Research Clinic for Cancer Screening is responsible for mapping existing screening policies in all European countries in order to identify the areas of greatest need within and between countries. We are also responsible for mapping stakeholders on different levels who could be affected by or can affect the implementation of screening strategies.

In addition, we coordinate, develop and manage 'collaborative user boards' in seven countries: Bulgaria, France, Romania, Estonia, Italy, Portugal, and Denmark. A collaborative user board is an advisory board in which stakeholders engaged in cervical cancer screening at different levels provide perspectives on challenges with and possible solutions to increase cervical cancer screening uptake in a constructive dialogue. Currently, we have established local collaborative user boards in Aarhus and Norddjurs Municipality with representatives of women with alcohol and drug abuse, sex-workers, general practitioners, social workers, nurses working with vulnerable women, NGO staff, gynaecologists, and representatives from the municipality. The first collaborative user board workshops will take place in March and April 2022.

Finally, the University Clinic for Cancer Screening is responsible for the exploration of vulnerable women's perceptions of cervical cancer screening challenges in Romania and France. We explore this through interviews with women from the most prominent vulnerable subpopulations across Europe.

Facts about the project

CBIG-SCREEN began March 1, 2021, and will run for five years. From the University Research Clinic for Cancer Screening, Professor Berit Andersen, Senior Researcher Pia Kirkegaard, and Post Doc Rikke Buus Bøje are participating. The project has received funding from the EU Horizon 2020 research and innovation programme under Grant Agreement No 964049.

For further information, please see the project webpage: www.cbig-screen.eu



A novel cervical cancer screening tool



By Mette Tranberg, Post Doc

This postdoctoral project funded by the Independent Research Fund Denmark will contribute to the development of a novel and accurate urinary screening tool which will allow women to collect the screening sample at home.

In July 2021, Mette Tranberg was awarded a 2-year international postdoctoral grant from the Independent Research Fund Denmark for her project 'Urinary HPV and DNA methylation testing as a novel cervical cancer screening tool: A diagnostic test accuracy study'.

Developing a new screening tool

Fifty percent of all cervical cancers occur among the 25% of women not attending cervical cancer screening. The overall goal of the project is to contribute to the development of a novel, cost-saving, easily accessible, non-invasive, and accurate urine-based cervical cancer screening tool. A tool that can improve screening attendance among the under-screened women, who has the highest risk of cervical cancer, and thereby reduce the incidence and mortality of the cancer.

The new urine-based screening tool tests for high-risk human papillomavirus (HPV) infection. However, only if HPV testing using this tool is clinically non-inferior to HPV testing using clinician-collected cervical samples, which is used today, it can be adopted into the screening programmes. Accordingly, the aim of the project is to establish if urinary HPV testing is non-inferior to HPV testing on clinician-collected cervical samples with respect to detection of high-grade cervical pre-cancer.

Adding a new triage method

Another goal of the project is to assess if DNA-methylation testing is suitable as a colposcopy triage test among women with HPV-positive urine samples.

When a woman is tested HPV-positive following cervical cancer screening, triage is required as the specificity of HPV testing is too low to identify women in need of treatment. Women with an HPV-positive urine sample would therefore have to visit their GP for additional cervical sampling before possible colposcopy referral. This two-step triage approach is often associated with failure to follow-up and diagnostic delays.

The two-step triage approach could be simplified by triage testing directly on HPV-positive urine samples using molecular biomarkers such as DNA-methylation testing. If DNA-methylation testing is suitable as a colposcopy triage test, it could prevent unnecessary colposcopies and overtreatment of women without clinically meaningful HPV infections.

If successful, the project could revolutionise today's screening programmes.

International collaboration

One of the purposes of the international postdoctoral grants awarded by the Independent Research Fund Denmark is to increase researcher mobility. As part of her project, Mette Tranberg will be visiting University of Antwerp in Belgium for one year.

At University of Antwerp, Mette Tranberg will be working in close collaboration with Professor Alex Vorsters and Post Doc Severien Van Keer in Professor Vorsters research lab at the Vaccine & Infectious Disease Institute.

Professor Vorsters is a world-leading expert in optimising accuracy of urinary HPV and DNA-methylation testing in cervical cancer screening. He was the first to demonstrate the feasibility of HPV DNA-detection in urine.

Facts about the project

The project has a budget of DKK 1.4 million, starts in March 2022, and continues for two years. In addition to the international collaborators, Department of Pathology, Randers Regional Hospital, and the Department of Gynaecology at Randers, Gødstrup, and Horsens Regional Hospitals will contribute to the project.

The International Postdoctoral Grant was awarded by the Independent Research Fund Denmark under Grant Agreement No 1057-00018B.





Three cancer screenings in one



By Anne Dorte Lerche Helgestad, PhD Student, & Mette Bach Larsen, Senior Researcher



This intervention study will evaluate if offering home-based cervical and colorectal cancer screening to women attending breast cancer screening can enhance participation in the cervical and colorectal cancer screening programmes.

'Cross-programme synergies' is one of the main research topics in University Research Clinic for Cancer Screening. This project is an example of research within this area.

The motivation behind the project

A high participation rate is a key factor in securing the effectiveness of a cancer screening programme. In Denmark, the participation rate in the breast cancer screening programme exceeds 80% whereas the participation rates only reach 61% in the cervical and the colorectal cancer screening programmes.

In view of that, we wanted to explore if addressing the women attending breast cancer screening on site could offer a solution to the low participation rates in the other two screening programmes. At site, we will have one-to-one communication with the women and ask about their overall screening status. If the women's cervical or colorectal cancer screening status is overdue, we will offer them homebased cervical and colorectal cancer self-sampling screening kits.

The intervention

On selected days, the five breast cancer screening units in Central Denmark Region are randomly allocated to serve as intervention unit or control unit in the ratio 1:4. Women attending breast cancer screening in the intervention unit are offered information regarding their cervical and colorectal cancer screening history. If their cervical and/or colorectal cancer screening is overdue, they are offered self-sampling screening kits. If the woman is not up to date with cervical cancer screening, she is offered to receive a vaginal self-sampling kit for HPV testing. If she is not up to date with colorectal cancer screening, she is offered a kit to obtain a Faecal Immunochemical Test (FIT). Women attending breast cancer screening in the control units receives standard care i.e. screening-mammography and standard invitations in the other two screening programmes.

A few days after the intervention days, a questionnaire is sent to all women who attended breast cancer screening in the intervention as well as the control units. The women are asked about their experience while attending breast cancer screening. Women in the intervention group are also asked about the intervention.

In total, 100 intervention days have been selected with each breast cancer screening unit in Central Denmark Region serving as intervention unit 20 times. This corresponds to 5,200 women allocated to the intervention group and 20,800 to the control group. The data will enable us to detect a difference in screening coverage as low as 2.5% in cervical cancer and colorectal cancer screening.

What we expect to learn

The main outcome of the project will be the difference in cervical and colorectal cancer screening coverage six months after the intervention between the intervention and the control groups. In addition, we will be able to see if there is any difference in participation rates six months after the intervention for those who were overdue with cervical and/or colorectal cancer screening at the time of the intervention.

Secondary outcomes of the project will be screening related outcomes, clinical follow-up, process outcomes, and overall satisfaction with breast cancer screening.

Perspectives

We expect that the high participation rate in breast cancer screening can be used as a leverage to enhance

screening participation in cervical and colorectal cancer screening. By reducing logistic challenges and taking advantage of a more personalised communication with the women, the strategy may encourage participation in women who has not yet taken the deliberate choice not to participate.

Facts about the project

The enrolment for the project started in September 2021 and is expected to go on for one year. The intervention is carried out by Research Secretary Marianne Rævsbæk Pedersen and Project Assistant Charlotte Riff. The project is part of a 3-year PhD project conducted by Anne Dorte Lerche Helgestad and supervised by Berit Andersen and Mette Bach Larsen.



Bibliometrics and collaborations

Increase in research output and impact

Since the Department of Public Health Programmes established its research group, the number of scientific publications and citations has increased steadily. The development from the start in 2011 until the first year of the University Research Clinic in 2021 is shown in the diagram below (data on citations retrieved from Web of Science, data on publications from own records due to journals not being indexed in Web of Science).

The increase in research output would not have been possible without our many collaborators. Local, regional, national, and international collaborators have been and continue to be a vital part of our research as the map showing our co-author institutions illustrates.



A special thanks to our collaborators

Aarhus University • Aarhus University Hospital • American Cancer Society, USA • Association of European Cancer Leagues, Belgium • Azienda Unita Sanitaria Locale Di Reggio Emilia, Italy • Bispebjerg University Hospital • Copenhagen Business School • European Institute Of Women's Health, Ireland • Finnish Cancer Registry • Gødstrup Regional Hospital • Health Psychology Research Center, Bulgaria • Horsens Regional Hospital • Hvidovre Hospital • Institut national de la santé et de la recherche médicale (INSERM), France • Instituto De Saude Publica Da Universidade Do Porto (ISPUP), Portugal • International Agency for Research on Cancer (IARC), France • Karolinska University, Sweden • King's College London, UK • London School of Hygiene and Tropical Medicine, UK • McGill University, Canada • Medical Practice Brogaard & Skibsted • National Cancer Institute, USA • Norwegian Cancer Registry • Nykøbing Falster Hospital • Odense University Hospital • Paris School of Economics (PSE), France • Psykiatriens Hus • Perron 4 • Randers Regional Hospital • Reference Centre for Epidemiology and Cancer Prevention, Italy • Research Unit for General Practice, Aarhus • Rigshospitalet • Statens Serum Institut • The Oncology Institute "Prof. Dr. Ion Chiricuţă", Romania • Trinity College Dublin, Ireland • Universitatea Babes Bolyai, Romania • University of Copenhagen • University of Heidelberg, Germany • University of Melbourne, Australia • University of Tartu, Estonia • Uppsala University, Sweden • Queen Mary University of London, UK

Scientific Dissemination

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Presentations

Presentations (as presenting author) at national and international conferences and meetings:

- The PhD Day (arranged by the PhD Association and the Graduate School of Health, Aarhus University, January 22):
 - 'Variations in performance and resource use in diagnostic work-up after abnormal mammography screening' oral presentation by Susanne Fogh Jørgensen
 - 'Performance of p16/ki67 dual stain-cytology triage in older Women with abnormal cervical cancer screening results' presentation by Line Winther Gustafson who also co-chaired a flash talk session
- Det Nationale Screeningsmøde (arranged by the Danish Cancer Society, virtual, March 3):
 - 'Commentary: How do you gain the most from self-administered decision aids in cancer screening?' rapid fire presented by Rikke Nicoline Stokholm
 - 'Detection of HPV in urine samples a future screening offer?' rapid fire presentation by Mette Tranberg
 - 'Follow-up after cervical cancer screening to what extent are the recommendations followed?' rapid fire presented by Susanne Fogh Jørgensen
 - 'Introduction of p16/Ki67 dual stain cytology in a Danish routine screening laboratory: lessons learned' rapid fire spresentation by Line Winther Gustafson
 - 'Screening women with immigrant background: creating tailored cancer screening interventions for ethnic minority women in social housing areas a qualitative study' rapid fire by Pia Kirkegaard
- EUROGIN (EUropean Research Organisation on Genital Infection and Neoplasia, virtual, May 30 June 1)
 - 'Adherence to follow-up after positive HPV-tests among women aged 60-64 a Danish register-based cohort study' oral presentation by Susanne Fogh Jørgensen
 - 'Introduction of p16/Ki67 dual stain cytology in a Danish routine screening laboratory: lessons learned' oral presentation by Line Winther Gustafson
 - 'Screening participation after a false positive result' oral presentation by Pernille Thordal Larsen
 - 'Urine HPV-DNA detection for cervical cancer screening analytical comparison of two HPV assays presented' oral presentation by Mette Tranberg
- Danish Cancer Research Days (arranged by DCCC and DMCG, Odense, August 26-27):
 - 'Balancing risks: Qualitative study of attitudes, motivations and intentions about attending for mammography during the COVID-19 pandemic' oral presentation by Pia Kirkegaard
 - 'Effect of screening for colorectal cancer in Denmark' oral presentation by Mette Bach Larsen
 - 'Gaps between recommendations and their implementation: A register-based study of follow-up after abnormalities in cervical cancer screening' poster presented by Susanne Fogh Jørgensen
 - 'Research protocol: Can we kill three birds with one stone? A randomised controlled trial to increase participation in cervical and colorectal cancer screening' poster presented by Anne Dorte Lerche Helgestad
- IPVC 2021 (the 34th International Papillomavirus Conference, virtual, November 15-19):
 - 'CIN2+ may be underestimated in older women when using punch biopsies as outcome measure' oral presentation by Line Winther Gustafson
 - 'Performance of p16/ki67 dual stain-cytology for detection of cin2+ among older women with a transformation zone type 3' oral presentation by Line Winther Gustafson
- Kræftdag 2021: Screening og tidlig opsporing Overvejelser, nationale erfaringer og fremtidige programmer (arranged by Dagens Medicin, Copenhagen, October 7):
 - 'The effect of cancer screening and new initiatives to ease access to screening' invited oral presentation by Berit Andersen
- Klinisk Kvalitetskonference (arranged by the Danish Clinical Quality Program (RKKP), Aalborg, November 2-3):
 - 'Adherence to follow-up after non-negative HPV-tests among women aged 60-64 and the associated resource use: A register-based cohort study' oral presentation by Susanne Fogh Jørgensen

- 'Performance of p16/ki67 dual stain-cytology triage in older women with abnormal cervical cancer screening results' oral presentation by Line Winther Gustafson
- Annual Research Meeting at the Department of Clinical Medicine (Aarhus, November 23):
 - 'Urine HPV-DNA detection for cervical cancer screening' oral presentation by Mette Tranberg
- Randers Regional Hospital's Annual Research Symposium (Randers, November 2):
 - '3 i 1: Tilbud om selvopsamlede prøver til kvinder i brystkræftscreeningen, der ikke er rettidigt screenet for tarmkræft og livmoderhalskræft' poster presented by Anne Dorthe Lerche Helgestad
 - 'Adherence to follow-up after non-negative HPV-tests among women aged 60-64 and the associated resource use: A register-based cohort study' poster presentation by Susanne Fogh Jørgensen
 - 'DFF International Postdoc Urinary HPV detection' short oral presentation by Mette Tranberg
 - 'Diagnostic challenges in women with transformation zone type 3: a cross sectional study' poster by Line Winther Gustafson
 - 'Improving diagnostics in cervical dysplasia' poster presented by Vibe Munk Bertelsen
 - EU Horizon 2020 project CBIG-SCREEN' short oral presentation by Pia Kirkegaard
 - 'Making decisions on your own: Self-administered decision aids for colorectal cancers screening a systematic review and meta-analysis' poster presented by Mette Bach Larsen
 - 'PhD project See and treat' short oral presentation by Line Winther Gustafson
 - 'The efficacy of mammography screening on the reduction of breast cancer mortality among breast cancer survivors' poster presented by Bayan Sardini
 - 'TIMING: Timely follow-up in colorectal cancer screening' poster presented by Pernille Thordal Larsen
 - 'University Research Clinic for Cancer Screening' short oral presentation by Berit Andersen
 - 'Urine HPV-DNA detection for cervical cancer screening' poster presentation by Mette Tranberg
 - 'Working collaboratively with vulnerable women to identify the best implementation gains by screening for cervical cancer more effectively in European countries: CBIG-SCREEN' poster presented by Pia Kirkegaard



Publications

Publications in international peer-reviewed journals:

- Badre-Esfahani S, Petersen LK, Tatari CR, Blaakær J, Andersen B, Seibæk L. Perceptions of cervical cancer prevention among a group of ethnic minority women in Denmark - A qualitative study. PLoS ONE 16(6): e0250816.
- 2. Bulliard J-L, Beau A-B, Njor S, Wu WY, Procopio P, Nickson C, Lynge E. Breast cancer screening and overdiagnosis. International Journal of Cancer 149: 846–853.
- Fogh K, Strange JE, Scharff BFSS, Eriksen ARR, Hasselbalch RB, Bundgaard H, Nielsen SD, Jørgensen CS, Erikstrup C, Norsk J, Nielsen PB, Kristensen JH, Østergaard L, Ellermann-Eriksen S, Andersen B et al. Testing Denmark: A Danish nationwide surveillance study of COVID-19. Microbiology Spectrum 9(3): e01330-21.
- Gustafson LW, Booth BB, Kahlert J, Ørtoft G, Mejlgaard E, Clarke MA, Wentzensen N, Rositch AF, Hammer A. Trends in hysterectomy-corrected uterine cancer mortality rates during 2002 to 2015: mortality of nonendometrioid cancer on the rise? International Journal of Cancer 148: 584–592.
- Gustafson LW, Petersen LK, Bor P, Andersen B, Hammer A. Cervical cancer prevention among older women – challenges in screening, diagnostic workup, and treatment. Acta Obstetricia et Gynecologica Scandinavica 100(8): 1364-1368.
- 6. Jørgensen SF, Andersen B, Lernevall A, Rebolj M, Njor SH. Variations in pathways and resource use in follow-up afterbased study. Breast Cancer Research and Treatment 189: 551-560.
- 7. Jørgensen SF, Andersen, B, Rebolj M, Njor SH. Gaps between recommendations and their implementation: A registerbased study of follow-up after abnormalities in cervical cancer screening. Preventive Medicine 146: 106468.
- 8. Jørgensen SF, Andersen B, Petersen LK, Rebolj M, Njor SH. Adherence to follow-up after the exit cervical cancer screening test at age 60–64: A nationwide register-based study. Cancer Medicine 11: 224-237.
- Kirkegaard P, Edwards A, Andersen B. Balancing risks: Qualitative study of attitudes, motivations and intentions about attending for mammography during the COVID-19 pandemic. Scandinavian Journal of Public Health 49: 700-706.
- Larsen MB, Stokholm R, Kirkegaard P, Laursen HS, Gabel P, Andersen B. Making decisions on your own: Self-admini-

stered decision aids about colorectal cancer screening – A systematic review and meta-analyses. Patient Education and Counseling. E-pub ahead of print.

11. Larsen MB, Bachmann HH, Søborg B, Laurberg T, Emmertsen KJ, Laurberg S, Andersen B. Prevalence of self-reported abdominal symptoms among 50-74-years-old men and women eligible for colorectal cancer screening – a cross-sectional study. BMC Cancer 21: 910.

12. Larsen PT, Rasmussen M, Njor SH. Data from the Nielsen

- et al. study does not support their suggestion. Colorectal Disease 24(1): 133-134.
- Njor SH, Andersen B, Friis-Hansen L, de Haas N, Linnemann D, Nørgaard H, Roikjær O, Søndergaard B, Rasmussen M. The optimal cut-off value in fit-based colorectal cancer screening: An observational study. Cancer Medicine 10: 1872-1879.
- 14. Njor SH, Rasmussen M, Friis-Hansen L, Andersen B. Varying fecal immunochemical test screening cut-offs by age and gender: a way to increase detection rates and reduce number of colonoscopies. Gastrointestinal Endoscopy 95(3): 540-549.
- St-Martin G, Viborg PH, Andersen ABT, Andersen B, Christensen J, Ejersbo D, Heje HN, Jochumsen KM, Johansen T, Larsen LG, Lynge E, Serizawa RR, Waldstrøm M. Histological outcomes in HPV-screened elderly women in Denmark. PLoS ONE 16(2): e0246902.
- St-Martin G, Thamsborg LH, Andersen B, Christensen J, Ejersbo D, Jochumsen K, Johansen T, Larsen LG, Waldstrøm M, Lynge E. Management of low-grade cervical cytology in young women. Cohort study from Denmark. Acta Oncologica 60(4): 444-451.
- Tatari CR, Andersen B, Brogaard T, Badre-Esfahani S, Jaafar N, Kirkegaard P. The SWIM study: Ethnic minority women's ideas and preferences for a tailored intervention to promote national cancer screening programme - A qualitative interview study. Health Expectations 24(5): 1692-1700.
- Wilhelmsen M, Njor SH, Roikjær O, Rasmussen M, Gögenur I. Impact of screening on short-term mortality and morbidity following treatment for colorectal cancer. Scandinavian Journal of Surgery 110(4): 465-471.