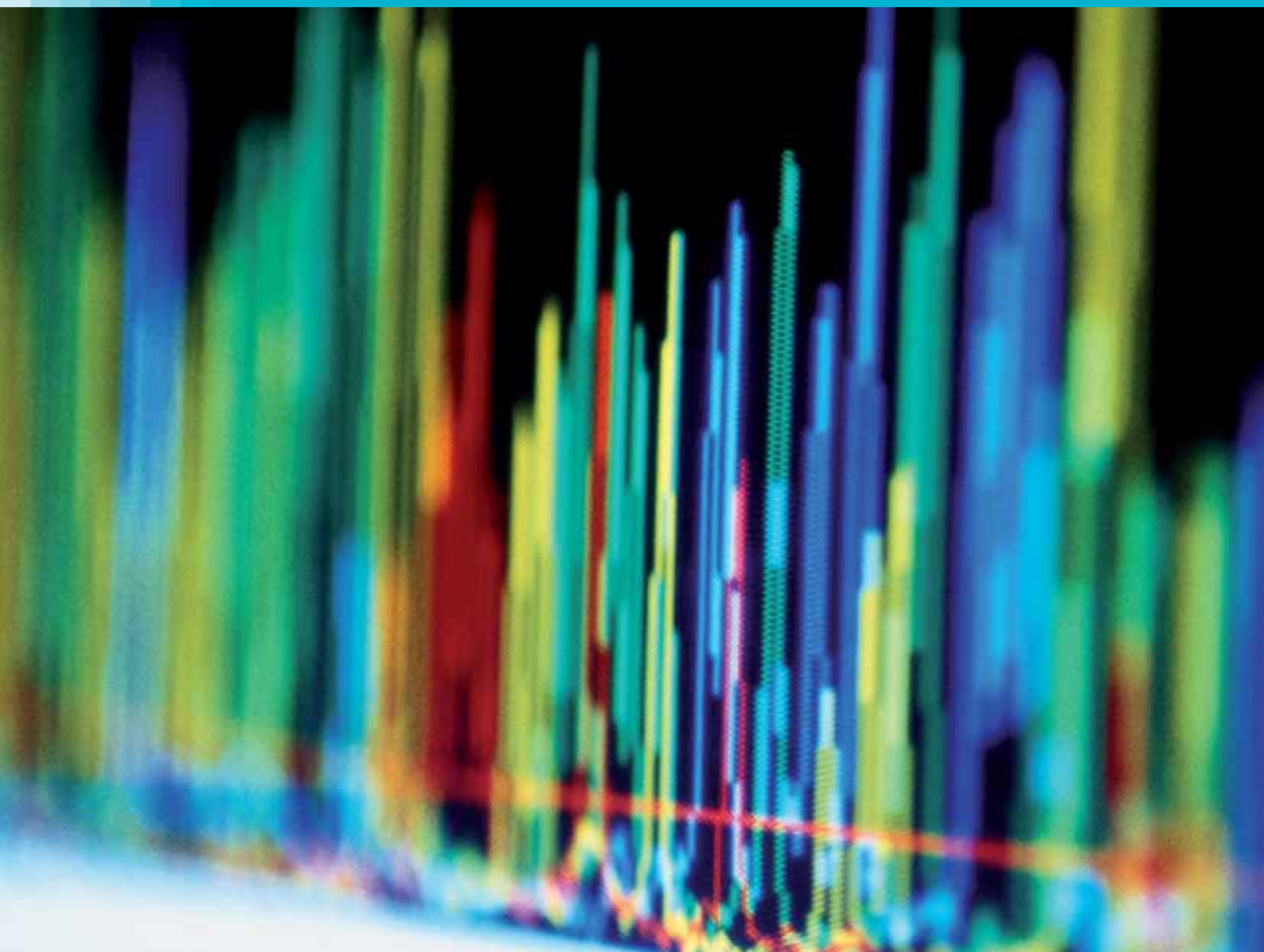


# Medical and Health-related Research

The Research Council of Norway's  
policy for 2007–2012



# Medical and Health-Related Research

The Research Council of Norway's Policy for 2007 - 2012

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# Preface

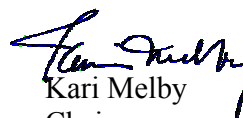
The primary objective of the Research Council of Norway is to promote top-quality research in response to the needs of society. This policy will form the basis for the Research Council's efforts to achieve its goals within the area of medical and health-related research. It must be viewed together with the activities of the other stakeholders and institutions in the research system.

This policy reflects the strategic principles set out for the Research Board of the Division for Science, and has been implemented for the 2007-2012 period. This policy will be followed up and elaborated on in an overall action plan and annual work programmes.

This policy is built upon the Research Council's overall strategy, subject-specific evaluations and programme strategies, guidelines set out by the relevant ministries and reports and other principal government documents.

This policy document has been drawn up by the Research Council's administration on the basis of input and comments from a reference group comprising members with broad scientific expertise as well as from representatives of the Research Council's advisory groups. The document has also been circulated for review to other key stakeholders in the field. The Research Council wishes to express its appreciation for all the valuable points of view that emerged during these efforts.

  
Anders Hanneborg  
Executive Director  
Division for Science

  
Kari Melby  
Chair  
Research Board of the  
Division for Science

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# Summary

The Research Council of Norway's policy for medical and health-related research encompasses activities under all three research divisions – from basic biomedical research to industry-oriented research and innovation.

A summary of the health status of the population and the need for health services is presented to provide a basis on which to describe the state of the art and identify challenges for the relevant disciplines. Certain challenges are given special focus, such as the need to better exploit the potential for cooperation implicit in translational research and cross-disciplinarity. In the same vein, it is necessary to enhance the utilisation of Norwegian health registers and biobanks, as enhanced cooperation at the national level and further development of today's infrastructure will directly benefit research activities and lead to new knowledge. Other key research challenges include efforts to develop a range of technologies to improve diagnosis and treatment, and the need for research on prevention instruments and global health problems.

The policy document also highlights challenges such as the need to increase recruitment of researcher candidates from the medical professions as well as the overall recruitment of women to researcher careers, the need for greater internationalisation, and the need for greater focus on ethical issues and gender perspectives in research.

A description is given of the flow of resources to publicly funded medical and health-related research and the distribution of resources among the research institutions. The document also explores the roles of and interaction between the major players in the research system, with particular focus on the role and functions of the Research Council.

The policy document describes how the Research Council can create added value for medical and health-related research. It concludes by setting out specific goals and priorities for the 2007-2012 period, during which the Research Council will:

- strengthen the best medical and health-related research
- secure more resources for medical and health-related research
- promote international research cooperation
- focus investments and promote national cooperation, particularly within the areas of:
  - molecular biology research including stem cell research
  - neuroscientific research
  - research that utilises Norway's health registers and biobanks
  - imaging technologies
  - large national clinical trials and clinical/basic translational research
  - health and care services research
  - mental health research, particularly relating to children and adolescents
  - public health research
- improve advisory and research dissemination activities
- strengthen research for innovation and industrial development.

# 1 Introduction

During the past century a dramatic improvement in general welfare has taken place in many parts of the world. The causes of this are many and complex, and one of the consequences is that we are living longer and enjoying better health than ever before. Research has played a significant role in the strides that have been made. We now have a better understanding of how to promote good health, how to prevent and treat illness and injuries, how to improve health services, and how to make society as a whole more health-promoting. At the same time there are major global health problems related to poverty that must be dealt with.

New challenges and new questions are continually emerging, creating a need for more research and new knowledge. Progress in medical and health-related research is often a result of the interplay between various disciplines and fields and is dependent on international knowledge development. Norway is in an excellent position to participate in the international research arena, and should do so for several reasons. New experience and knowledge are of considerable value to society in and of themselves, and as a wealthy country, Norway has a particular responsibility to contribute to the international knowledge pool. Research forms the basis for good quality health services and is an important element in industrial development, innovation and value creation. Report No. 20 (2004-2005) to the Storting, *Commitment to Research*, designates health as one of four priority areas. In its inaugural declaration, the Government has made a commitment to intensifying the focus on health research.

The Research Council of Norway will work to strengthen medical and health-related research within the framework of its overall strategy, *Research expands frontiers*. This strategy sets out the following goals:

- Enhanced quality in research
- Increased research for innovation
- Expanded dialogue between research and society
- Increased internationalisation of Norwegian research
- Do more to foster talent

Under each goal specific actions are suggested to meet performance targets. Several of these are of particular relevance in the context of this policy:

- Strengthen schemes for merit-based competition in research
- Increase volume of long-term basic research
- Increase access to scientific equipment and improve equipment utilisation measures
- Establish better task-sharing and cooperation between groups of researchers
- Invest more in the highest quality research environments than is currently the case
- Support scientific innovation by making it easier for researchers to utilise expertise across disciplinary boundaries
- Strengthen links between basic research and applied research
- Promote cooperation with international research groups and R&D institutions

This policy document describes selected priority areas in greater detail, but seeks overall to provide a concise overview. The first half of the document summarises the state of the art and identifies challenges for medical and health-related research. The second half explores the

Research Council's role in the research system with regard to funding and distribution of responsibilities for medical and health-related research. The document concludes with a description of the Research Council's goals and priorities.



## 2 The health status of the population and the need for health services

Norway ranks among the top countries in the world with regard to living conditions, economic conditions and health. Good public health is both a prerequisite for and a result of a productive and value-creating welfare society. Factors that are significant for public health include clean drinking water, proper diet, good social infrastructure and welfare schemes, and, not least, high-quality treatment and efficient, well-functioning health services.

Higher life expectancy, a growing number of elderly, higher expectations relating to individual health and the health care system, as well as new methods of diagnosis and treatment all require the use of substantial resources today – and more will be needed in just a few years' time. Age-related illnesses will rise at a pace with the rapid increase in the number of elderly during the coming decades. The ability to cope with new challenges and needs will depend on high-calibre medical and health-related research that generates effective methods of prevention and treatment, and facilitates the best possible utilisation of societal resources for health-related aims. At the same time, research-based innovation and improved treatment will lead to socioeconomic and individual benefits.

Norway scores high with regard to life expectancy at birth as a measure of the health status of the population. In the past 35 years, life expectancy has increased by over six years to 78.1 years for men and 82.7 years for women in 2006. This is the result of lower mortality associated with cardiovascular disease and very low infant mortality, among other factors. While life expectancy is likely to continue to rise, the gender differences are expected to diminish. Several countries have higher life expectancy than Norway. Japan, for example, has a life expectancy of 78.5 years and 85.5 years, respectively, for males and females born in 2005. At the other end of the scale, life expectancy is as low as 36-37 years in developing countries where AIDS is widespread.

Disease patterns, morbidity, and use of social insurance benefits give a more comprehensive picture of the health status of the population. The combination of general societal trends and changes in lifestyle, environmental factors, greater social inequality, increasing productivity demands and greater ethnic diversity are changing the range of illnesses among the population. It is essential that research addresses the challenges associated with this.

The number of hospitalisations is rising steadily. Elderly patients account for nearly one-third of all hospitalisations, and men are the primary users of hospital services, when pregnancy and birth-related services are excluded. Cardiovascular disease, cancer and injuries are the most common causes of hospitalisation.

Certain diseases have become less prevalent, including cardiovascular diseases. Myocardial infarction (heart attack) is now primarily a cause of death in later life. There has been particular improvement among middle-aged men as a result of preventive measures and improved

### Key figures 2005

- **3 of 10** state they have health problems that affect their daily lives
- **1 of 4** has a musculoskeletal disorder
- **10-15 %** have mental health problems
- **1 of 8** has been hospitalised in the course of the past year
- **1 of 10** persons of working age receives disability pension
- **24 %** between the ages of 16-74 smoke on a daily basis
- **2 of 5** die of cardiovascular disease
- **8 of 10** consider themselves to be in good health

treatment. Other diseases are becoming more prevalent. There has been a steady rise in the number of cancer cases since the 1950s. Two of five persons will suffer from cancer in the course of their lives. At the same time, treatment methods and survival rates have improved. The increase in the occurrence of cancer is primarily related to an increase in average life expectancy.

Diseases affecting the brain and nervous system pose a wide array of challenges in both human and economic terms. The incidence of such diseases will increase as the population ages, and this will have implications for the capacity of the health care system. There is also a rise in the occurrence of mental health disorders, particularly among the aged and the young. The combination of substance abuse and mental health disorders represents a sizeable problem. According to international surveys, one of two persons will suffer from a mild or serious mental health disorder in the course of his or her life. Mental health disorders are one of the primary causes of the increase in absenteeism due to illness as well as the rising number of persons receiving disability payments. The other primary cause is musculoskeletal disorders, which account for one-half of all long-term sick leave, and comprise the most common reason for granting disability pension. Greater attention is being paid to the quality of life for those living with a chronic disorder – also as a component of higher life expectancy.

**Primary disease groups**

- Cardiovascular diseases
- Cancer
- Asthma, allergies, respiratory diseases
- Musculoskeletal disorders
- Diabetes
- Mental health disorders
- Infectious diseases
- Diseases affecting the brain and nervous system

There is growing use of prescriptive medicines in Western countries, particularly among higher age groups. This may lead to health risks for the individual, as well as to over-use of the health care system's resources.

Both traditional and new infectious diseases are on the rise. Antibiotic-resistant microbes constitute an increasing threat nationally and globally. In the poorest countries, the greatest effort must be focused on combating tuberculosis, malaria and HIV/AIDS.

In the past few decades, lifestyle-related risk factors for illness have become a topic of particular focus. This is especially true for risk factors associated with diabetes, such as obesity and physical inactivity. Overweight and obesity have increased in both children and adults in the past 20 years. Norwegian health surveys (2003) show that one of five persons between the ages of 40-45 suffers from obesity (body mass index over 30). Studies also show that 15-30 per cent in the same age group are inactive, while 9-18 per cent of adolescents are inactive. Smoking-related chronic respiratory diseases are also an important area of focus, and COPD (Chronic Obstructive Lung Disease) is emerging as a significant problem. Various forms of substance abuse cause a number of illnesses and injuries, and represent major challenges for the individual, relatives and society at large.

Social inequalities and differences in living conditions are reflected in morbidity, disability and use of social insurance benefits. Identifying the causes of inequalities in health status and designing measures to rectify these will be a complicated task. There is already considerable pressure on the social insurance scheme and on health and care services, and user participation and patients' rights have been strengthened. Together with demographic trends, cultural changes have contributed to a different, more comprehensive perception of health, to high expectations of treatment, and, not least, to new possibilities for medical and technological development.

# 3 The state of the art and research challenges

## 3.1 The status of and challenges facing the disciplines

The current status of and challenges facing research in this sphere will be described within the framework of the disciplines, divided into three traditional disciplinary groups: basic biomedical research, clinical research, and public health and other health-related research. This may result in artificial boundaries being drawn between disciplines that in reality tend to overlap, and it should therefore be noted that the most important opportunities and obstacles often lie precisely in the interface between basic disciplines and more applied disciplines. It is possible to obtain a comprehensive picture using other approaches as well, for example division into groups of illnesses. The traditional division between disciplinary groups has been employed here because it is still used in national research statistics. The intention is not to give a detailed description of the disciplinary groups themselves, but rather to focus attention on the most important issues within these.

### 3.1.1 Basic biomedical disciplines

Biomedical research primarily revolves around learning about basic biological mechanisms. Research has led to groundbreaking discoveries of major significance for the prevention, diagnosis and treatment of a range of serious diseases. The most recent, and perhaps the most valuable, triumph in biomedical research is the scientific description of the human genome sequence – the genetic material of humans. In the wake of this breakthrough most industrialised countries have become involved in the widespread effort to map gene function. Norway is increasing its expertise in this area through the establishment of 11 technology platforms under the FUGE research programme (Functional Genomics in Norway). It is an extremely demanding process to characterise genes, map how genes and gene products (proteins) interact in complex networks, and identify how environmental factors affect the interaction between genes and proteins.

One of the most complex puzzles involves understanding interaction in biological processes at the molecular, cellular and organismal level. Systems biology encompasses the study of how molecules function together in cell systems in integrated organisms. Various experimental approaches and methods are needed to obtain knowledge about the different levels and the interaction between them.

Knowledge development has brought the biomedical disciplines closer together, and they must be viewed in an overall perspective. Cross-disciplinarity is a key approach that spans all the biological levels. Research in the physiological disciplines is essential for transferring findings at the molecular and cellular level to complex integrated systems. An integrated focus is crucial to generating insight into disease mechanisms and how prescriptive medicines function. In the field of neurobiological research for example, integration and achieving understanding of the interaction between the different biological levels are explicitly stated objectives. Norway has an active research community in this area, and it is vital that this field of research be further developed.

It is crucial that Norway, too, conducts functional genomics research. Norway – like other countries – is unique with regard to genetic background and environmental factors. Its biobanks and health registers offer exceptional potential for carrying out genetic and epidemiological studies. Norway is one of a few countries in the world where it is possible to carry out population-based genetic studies of complex diseases. To exploit this potential, focus must be directed toward developing technology for handling large quantities of samples and data (high-throughput screening). Major resources are being invested in stem cell research internationally, and Norway has established a national network in this field. Stem cell research will lead to knowledge about cell division and cell differentiation, which will in turn be crucial to understanding and treating an assortment of serious diseases.

### **3.1.2 Clinical disciplines**

Clinical research sets the stage for improvements in methods of prevention, diagnosis, treatment and rehabilitation. Aspects such as treatment quality and cost-efficiency are also being afforded increasing consideration in clinical research activity. Patient-related clinical research carried out in the Nordic countries is highly sought-after. The combination of well-functioning health care systems and the ability to follow up study participants provides an excellent foundation for large clinical trials. Norwegian clinical medicine is clearly a valuable research area, but its potential has not yet been fully exploited. This is due in part to the fact that data registers on diagnosis, treatment and outcome cannot yet be optimally utilised, and in part to the fact that we still lack a national overview of and systemic knowledge about the occurrence of disease and diagnosis validity for nearly all diseases.

Norwegian clinical research is characterised by small research groups, smaller-scale studies, studies of patient pathways without control groups, and a lack of randomised controlled clinical trials of sufficient statistical strength. In addition, clinicians indicate that they have too little time to devote to research during the course of their hectic workday.

Norway's pharmaceutical industry is small compared to the other Scandinavian countries. Much of the clinical research being carried out is financed by the international pharmaceutical industry. More funding from Norwegian industry is needed, as is an increase in public funding and product-independent clinical research. Large, industry-independent randomised trials require years of effort and are dependent on an adequate economic framework. Researchers are competing for patients for their research projects, and financial considerations may be a reason why priority is given to well-paid trials initiated by the pharmaceutical industry over projects addressing overarching clinical research questions.

Research that combines system models, controlled interventions, and clinical course and outcome is essential and must be carried out at sufficient scale. This requires greater cooperation across the dividing lines between research groups, disciplines and regions. Enhanced cross-disciplinarity, high-quality translational research, a broader data base and a research community of adequate size are necessary if Norway is to make a significant contribution to international research in the field, establish useful international contacts and increase researcher mobility.

Norway has several active research communities in the mental health field. Psychosis research, treatment research and neuropsychological research are areas of scientific strength. In recent years there has also been growth in research on child psychology and psychiatry. There is a vital need for knowledge about the effect of treatment interventions and about the combination of mental health disorders and substance abuse. Mental health disorders and somatic disorders are often closely linked, and a broad scientific approach is required for dealing with this cluster of problems. It is vital to gain greater insight into the interplay between these types of disorders, as

well as into somatic disorders that are not accompanied by a conclusive diagnosis, such as myalgic encephalomyelitis (chronic fatigue syndrome) and fibromyalgia.

Clinical research in odontology is primarily conducted at the universities, and must be strengthened. The public dental health service has an outreach programme, which provides a good starting point for research on various clinical issues in representative groups. The interface between odontology and medicine is another important area of research.

The incorporation of alternative and complementary medicine into the established health services is gaining wider acceptance, reflecting the increasing use of alternative and complementary medicine among the general public. Although a national research centre for this has been established at the University of Tromsø, in general the amount of research being carried out in the field nationally and internationally is too low, despite the obvious need for knowledge and expertise.

In an international perspective Norwegian primary health services are of high professional quality, but are rooted more in experiential than research-based knowledge. While the specialist health services are required under the statutory framework to carry out research, the primary health services are not. Research in the primary health services encompasses clinical health-related research and public health research. It has a broad scope and is often practice and patient-related. There is a tremendous need for knowledge about, for example, how the primary health services in general, and general practice in particular, function in relation to users and to other health and care services.

Social science and humanities-related approaches to research are increasingly being applied to gain insight into patients' experiences and perceptions in relation to illness or treatment. The challenge is to elucidate aspects outside of the purely biological that will be of use to clinicians and patients when taking decisions regarding treatment measures.

### **3.1.3 Public health and other health-related disciplines**

Public health research deals with the health status of the entire population or groups of the population. It addresses factors such as living conditions and social conditions, and explores how the health services and various measures meet the needs of and promote public health. Public health research is often cross-disciplinary and has close links to the social sciences.

Norway has nationwide registers containing detailed health information. Population-based studies have been conducted in all regions of the country, and there are a number of collections of human biological material. Together this gives the country an advantage in terms of research. There is a strong epidemiological research community in Norway, and with a future nationwide patient register with complete personal identification, the country can become a leader in register-based epidemiological studies. A number of the population-based health surveys include samples of biological material in addition to details about lifestyle and the environment. This provides a good starting point for studying how biological factors and environmental and lifestyle-related factors may interact to cause future illness. Linking population surveys with endpoint registers (new cancer cases, cause-specific mortality, information about diseases) makes it possible to study how biology and the environment/lifestyle, either separately or in conjunction with one another, affect specific diseases.

Epidemiological knowledge provides a basis for preventive efforts, but in many areas there is a lack of knowledge about effective disease-preventing activities and about the causes of growing social inequalities in health. Instrument-related research explores how various measures and

incentives may be employed to promote change. Research questions also involve the implementation of measures and identification of impact in relation to targets and target groups. While this research is often cross-disciplinary, research groups have been too small and too fragmented. Report No. 16 (2002-2003) to the Storting, *Prescriptions for a healthier Norway*, and Report No. 20 (2006-2007) to the Storting, *National strategy to reduce social inequalities in health*, have signalled an intention to enhance research on prevention and social inequalities in health.

Health-related research is often a component of cross-disciplinary research on clinical and community medicine. Key topics include lifestyle-related problems and diseases, care services and rehabilitation. There is a lack of knowledge about a number of aspects of the health and care services, from patient perspectives to the effects of measures implemented in practice. There is growing interest in the integration of various scientific traditions in joint projects that may incorporate biomedical, social science and humanities-related approaches. There are well-established health-related research groups at the universities, the largest university colleges and under the regional health authorities. There has been an increase in research activity and researcher training, particularly in the nursing and physiotherapy professions. All university colleges are required to carry out research. This means that expertise and research activity are widely dispersed, for example, among more than 25 locations in nursing alone. Activities that are spread too widely do not promote an effective research environment that can generate high-calibre research.

Health services research encompasses a broad range of disciplines and topics. Research adds to the knowledge base for political and organisational decision-making, and may provide significant socioeconomic benefits. Key topics include resource utilisation, management, organisation and financial management models. Report No. 25 (2005-2006) to the Storting, *Mestring, muligheter og mening* (“Coping, opportunities and meaning”, Norwegian only), emphasises the need for research on care services for new user groups and for the rapidly escalating number of elderly persons. As from 2007 the Norwegian patient register contains information about all hospitalisations and outpatient treatment. This opens up new research opportunities and will generate new knowledge about how processes are performed in and use of health services. Research on the coordination between and within the various service levels is also a key topic. Health services research has been carried out by a number of small research groups, but in recent years there has been trend toward consolidating resources in certain fields of research into larger, more permanent centres of competence.

## **3.2 Specific challenges**

### **3.2.1 Enhancing translational research and cross-disciplinarity**

Translational research involves the transfer of research findings between different disciplines, answering scientific questions through the use of new and diverse methodological approaches. In a broad perspective, translational research can be used to transfer knowledge between clinical research and, for example, medical technology research and behavioural science research, or between epidemiological and population-based studies and clinical and basic medical disciplines. Traditionally, translational research has been used to transfer knowledge from basic medical research to clinical research (“from bench to bed”) and vice versa.

Many research questions are so complex and wide-ranging that they cannot be solved by individual researchers or small teams of researchers alone. Larger research groups that possess differentiated expertise and competence in different fields are in a better position to address such questions in new, more cohesive ways. Increasingly, cross-disciplinarity is emerging as a key

element of the ability to conduct high-calibre research, procure new knowledge of significance for prevention, diagnosis, treatment and rehabilitation, and conduct good-quality translational research. Cross-disciplinary research requires professional dialogue over time as well as acknowledgement and equal status among researchers. Establishing an effective cross-disciplinary research environment is a time-consuming process, and reaching a minimum critical mass is crucial to success. This can only be achieved by providing skilled cross-disciplinary research groups with adequate long-term funding.

When it comes to solving the pressing health problems we are facing, there is much to be gained from making even better use of the potential for cooperation than is currently the case. The Research Council is in a unique position to support cross-disciplinary research. Through the utilisation of various measures, guidelines and funding instruments, researchers who would normally not be in contact with one another can be brought together in shared initiatives.

### **3.2.2 Improving utilisation of health registers and biobanks**

There is an acknowledged need to enhance national cooperation on and further develop current infrastructure for large-scale databases, including the structuring, quality control and accessibility of data. The Research Council proposed this as a strategic area in its input to *Commitment to Research*.

Over the past 10-20 years there has been increasing integration between epidemiological and molecular biological research, which has given rise to a need for much larger studies, for example to analyse the interaction between genetic factors and various environmental factors. These studies may in turn provide an important basis for preventive measures. The utilisation of health registers and biobanks in research requires long-term public funding. Funding for the collection of endpoint data is particularly important for creating medical quality registers and diagnosis registers in the specialist health services that can serve as a national resource for research.

Methodological expertise in epidemiology, genetics, functional genomics, statistics and data analysis is required to optimally utilise health registers and biobanks as knowledge sources. As modern technological analysis methods are very resource-intensive, the establishment of national expert groups and cooperation agreements is advisable.

### **3.2.3 Medicine in the future – challenges facing health services?**

In future, medicine will be characterised by an increasing degree of specialisation and greater application of technological fields such as biotechnology, imaging technologies, data technology and nanotechnology. Although these will provide a range of new treatment possibilities, they will also pose a number of challenges for the health services.

The mapping of the human genome and the development of functional genomics and new technology have resulted in a paradigm shift in biology and medicine. This has led to the development of bioinformatics and systems biology based on integration and mathematical analysis of large series of data. This, in turn, has facilitated the introduction of personalised medicine – the diagnosis and treatment of the individual patient based on knowledge about that individual's genetic variations and systems biology. The availability of Internet-based medical information, which enables patients to obtain knowledge about their illness and participate at a whole new level in their own treatment, represents another major adaptation.

There are high expectations associated with gene therapy. In clinical practice the challenge is not only to succeed in replacing and modifying disease-causing genes, but also to address a range of questions relating to patient information and counselling, early identification of potential disease, and, not least, difficult ethical choices in treatment and prioritisation of patient groups.

The ability of stem cells to grow and differentiate holds unique potential for treating various major public health diseases. Stem cells from the patient himself or herself, or from a donor, are used today in clinical practice as part of established treatment (bone marrow transplants, growth of new skin, cartilage and bone tissue). Treatment with embryonic stem cells is still years in the future. Many researchers believe that future treatment methods will involve stimulating the body's own stem cells, which will be made possible by implementing knowledge about which factors regulate growth and differentiation.

The production of images of internal body structures – medical imaging – has become widely utilised in research, prevention, diagnosis and treatment. The pioneering development of various imaging techniques would not have been possible without data technology. Nanotechnology and nanomedicine will provide radical new strategies for targeted cancer treatment, nanorobots for cardiovascular surgery and functional biomaterials to replace dead tissue.

A society characterised by the rapid flow of vast amounts of information and ever-higher levels of knowledge will have an impact on the role of health care workers. The modern patient is no longer the object of a physician's treatment, but rather a partner in cooperation in a joint project. User participation and interventions that promote patient participation in clinical decisions and enhance patients' coping skills are essential in this context.

As life expectancy and the number of elderly rises, health services will be confronted with a mounting need to provide good chronic care. Different incentives often steer resources away from care services toward acute and highly-specialised health services. As the public's level of knowledge rises, so do its expectations regarding and demands for advanced individual treatment. It may increasingly be the case that resources – not knowledge – set the limits for services offered to patients and to the public at large. This will inevitably give rise to complex assessments, prioritisation processes and debate about which types of treatment and care the public health services will be able to offer. It is therefore crucial that treatment and care services are founded on *research-based* knowledge.

It is also vital that medical and health-related research focuses on cost-efficiency in the health care system. New, expensive diagnostic and treatment methods may in many cases reduce costs if they result in shorter hospital stays, faster patient rehabilitation and more rapid return to normal levels of functionality for patients.

One health policy aim is to “prevent more to treat less”. This requires intensifying research activity on causal factors, disease mechanisms and preventive measures. Particular attention will be focused on children and adolescents. A healthy lifestyle and an environment free from health-damaging factors are essential for good public health. The need to strike a balance between society's responsibility and the responsibility of the individual for his or her health is an ongoing debate that will become increasingly important in light of the rise in lifestyle-related illnesses and growing social inequalities in health.

Less than 10 per cent of expenditures on health research worldwide is devoted to health problems in developing countries, while these represent 90 per cent of all global health problems. Norway has an obligation to carry out research on global poverty-related health problems. With regard to prevention, a major Norwegian initiative on vaccine research is underway, but greater focus is



also called for on epidemiological research, diagnosis, treatment and rehabilitation. The implementation of new and existing measures under resource-poor conditions is a challenging task. Effort and resources are needed, and Norway has a high-quality research community with much to offer.

### 3.3 General challenges

#### 3.3.1 Recommendations from evaluations

From 2000-2004 the Research Council carried out two major subject-specific evaluations of biomedical, clinical, public health, psychological and other health-related research in Norway. In 2006 two additional evaluations were conducted: one of pharmaceutical research and one of the 11 national technology platforms funded over the FUGE programme. The first two evaluations resulted in a number of common recommendations:

- Increase funding
- Improve infrastructure (equipment and researcher positions)
- Enhance national and international cooperation and mobility
- Establish larger researcher groups
- Strengthen professional management and strategic, targeted planning
- Increase the percentage of women in researcher positions
- Facilitate researcher recruitment and career paths

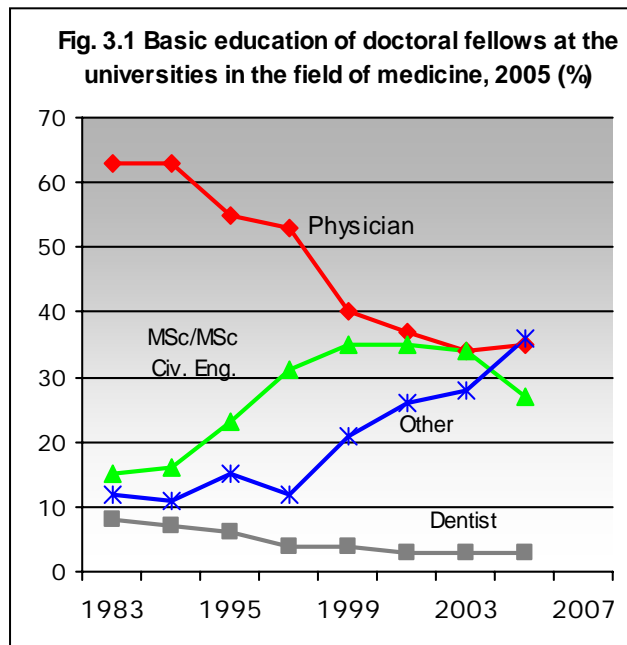
An assessment of institutional follow-up of the biomedical research evaluation showed that the institutions had by and large implemented the panel's recommendations. The recommendations that proved difficult to follow up were primarily linked to budgetary considerations. Subject-specific evaluations make up an important part of the foundation underlying the Research Council's strategic activities and use of funding instruments, and have resulted in the implementation of various measures to improve framework conditions and strengthen research (see Chapter 4.2).

#### 3.3.2 Recruitment

Access to recruits in the field of medical and health-related research is generally adequate. However, recruitment of *researcher candidates from the medical professions* is inadequate. This particularly applies to physicians and dentists, with psychologists and pharmacists close behind. The percentage of physicians and dentists among doctoral fellows in the field of medicine has declined by 50 per cent in the past 20 years. In 1983 63 per cent of doctoral fellows were physicians; by 2005, this figure had dropped to 35 per cent. For dentists the corresponding figures are eight per cent and three per cent, respectively. However, the decline in the percentage of physicians appears to have reached its lowest point in 2003, at 34 per cent. Physicians have primarily been replaced by graduates in other health professions and the social sciences, as well as by graduates in natural science, mathematics and engineering subjects. The number of Masters of Science degrees awarded has risen by over 40 per cent in the past decade, and many of these have been earned in the field of medicine.

The fall in recruitment has led to a significant drop in the number of physicians among permanent academic personnel, particularly in the basic biomedical disciplines. Many of the smaller clinical disciplines also suffer from a critical lack of qualified professional applicants for permanent

researcher positions. The increase in the number of researchers with non-medical education is both natural and desirable. There is, nevertheless, a lower limit, not only for the percentage of, but for the actual number of persons with a background in medicine. The provision of good, up-to-date health services to the population at large is contingent upon research-based training of physicians, and the availability within the health service system of physicians who can utilise their own and others' research findings for prevention, diagnosis and treatment.



The most important measure implemented to counteract the decline in recruitment among health professionals is the 2002 establishment by the university medical faculties and the Research Council of the Medical Student Research Programme. The halt in the downward trend in percentage of fellowship-holders with medical degrees indicates that the measure has begun to have an impact (Figure 3.1). This may, however, also be related to the increase in research allocations to the regional health authorities. In order to safeguard the comprehensive need for research-based clinical practice in the specialist health services, the regional health authorities must also give priority to doctoral programmes for personnel with a basic education in other health professions.

### 3.3.3 Research infrastructure

Modern medical and health-related research requires good research infrastructure and extensive specialist expertise. Research infrastructure encompasses advanced scientific equipment, biobanks, health registers and large population studies. There is a need for greater coordination and cooperation between institutions with regard to investment, use of equipment, and research infrastructure, for example in relation to major national investments in PET (Positron Emission Tomography) equipment. The Research Council will draw up a national strategy for research infrastructure for all the disciplines in 2007.

There is also a need for international cooperation on infrastructure. In certain disciplines the experimental equipment is so costly that only a few international laboratories are able to offer the most advanced infrastructure. In the near future, the European Molecular Biology Laboratory (EMBL), one of the world's leading research laboratories, will enter into a partnership agreement for a Nordic centre of molecular medicine with nodes in Norway, Sweden and Finland. At the European level, the European Strategy Forum on Research Infrastructures (ESFRI) has developed the European Roadmap for Research Infrastructures, which underlies initiatives under the EU Seventh Framework Programme for Research and Technological Development. It is essential that the Norwegian research community takes part in this cooperative effort as well.

### 3.3.4 Internationalisation

The subject-specific evaluations revealed that both national and international researcher mobility at Norwegian research institutions is relatively low. In order for Norway to be a cutting-edge research nation, the quality of Norwegian research must be enhanced via increased mobility and

international cooperation. Norway's formal participation in EU and other arenas of international cooperation has led to greater focus on internationalisation and inspired the active involvement of a growing number of Norwegian researchers.

A main challenge for the Norwegian research community under the EU Seventh Framework Programme (FP7) will be to fully exploit the possibilities offered under the thematic priority area "Health" and sub-areas involving health-related topics under other thematic priorities. The EU has also launched its first-ever research initiative free from thematic restrictions and political objectives. Funding is administered by the European Research Council, and will be allocated solely on the basis of scientific merit and innovativeness. The Norwegian research community must participate in this arena as well.

Norwegian researchers are active in a number of European researcher networks, including the Joint Committee of the Nordic Medical Research Councils (NOS-M), European Cooperation in the Field of Scientific and Technical Research (COST), and the European Science Foundation (ESF). The Research Council has entered into bilateral agreements for research cooperation with several countries and in several regional areas. The USA, Canada, China and Japan are particularly important partners for research cooperation, and collaboration with India and Russia will be expanded. The Research Council also promotes international cooperation through contact with the research councils and embassies of other countries.

#### ***FP7 – Health***

Framework programmes have been employed since 1984, and are the primary funding instrument utilised by the EU to support R&D in a large number of thematic areas and disciplines. Health is one of 10 thematic priorities under the Cooperation Programme, although health-related topics are also addressed under other thematic priorities. While there is a great degree of scientific continuity between FP6 and FP7, research on health and care services and public health now falls under one of three priority areas under Health:

1. Biotechnology, generic tools and technologies for human health
2. Translating research for human health
3. Optimising delivery of healthcare to European

### **3.3.5 Ethics and legitimacy in research**

Ethical guidelines for research are crucial when conducting research on human beings. Some of the most difficult ethical dilemmas the world is facing are related to new medical technologies that are continually expanding the boundaries for treatment and intervention. Technology can generate extremely sensitive information about individuals – information that *may* be misused. Researchers must demonstrate great caution, and society must be guaranteed transparency as well as a certain degree of influence. Research institutions must establish effective routines for addressing questions of research ethics, and bodies charged with primary responsibility for dealing with these questions must be given adequate room for action. The individual researcher is responsible

#### ***The National Committees for Research Ethics in Norway***

are independent committees that deal with questions of research ethics in all scientific disciplines. There are three national committees: the National Committee for Medical Research Ethics (NEM), the National Committee for Research Ethics in Science and Technology (NENT), and the National Committee for Research Ethics in the Social Sciences and the Humanities (NESH). NEM is a coordinating body for seven Regional Committees for Medical Research Ethics (REK), which review all medical and health science projects involving humans or

#### ***Investigative Committee***

A national committee for investigating misconduct in medical and health-related research was discontinued in 2001 in anticipation of a new committee that would cover all scientific disciplines. The National Commission for the Investigation of Scientific Misconduct was established in 2007.

for ensuring that research activity seeks out genuine truths and is conducted properly, and that legislation and guidelines are complied with. It is vital that tough ethical choices and good research conduct remain topics of ongoing debate within the research community and among the public at large. Greater

attention should also be focused on these issues in the training and guidance of researcher recruits.

Research institutions have the primary responsibility for dealing with questions of research ethics. The Nylenna Committee (2003) was appointed to map out current regulation of medical and health-related research and evaluate its efficacy. In Official Norwegian Reports 2005:1 *God forskning – bedre helse* (“Good research – better health”, Norwegian only) the committee proposed new legislation that simplifies and harmonises the regulatory framework. The Ministry of Health and Care Services proposed a bill based on the Nylenna Committee’s report in summer 2007.

### **3.3.6 Gender equality and gender perspectives in research**

In health research, as in other research, there are two main challenges associated with gender: firstly, to achieve a gender balance in *recruitment* to researcher careers; and secondly, to generate research findings and highlight their *relevance* and *significance* for both genders.

Women make up the majority of students in medicine, odontology, psychology and a range of other health-related fields. Women have accounted for more than 50 per cent of doctoral fellows in the field of medicine since 1997. Nevertheless, in 2005 only one of five professors in the field was a woman. The percentage of female academic personnel (top and mid-level positions) varies among the four faculties of medicine in Norway, from 23 per cent at the University of Bergen to 34 per cent at the University of Tromsø. Norway is by no means unique; the situation is the same in a number of European countries. In addition to being a democratic challenge, gender imbalance in recruitment means that intellectual resources are not being optimally utilised. This is a critical issue for the research system, not least in light of the generational shift that is underway.

In recent years, greater attention has been focused on women’s health. This is in part because a number of diseases that occur more frequently among women than men have been subjected to relatively little research, and in part because women suffering from various types of disease, such as cardiovascular disease, have been given inadequate or improper treatment because of a lack of gender-specific knowledge about symptoms and the efficacy of treatments. A stronger focus on gender differences in health research is essential if the health care system is to promote both women’s and men’s health in an equitable manner. The natural course of a given disease may vary for women and men, and risk factors for disease may be of different significance. Certain diseases are best understood in light of gender-specific biological knowledge, while others are best understood in light of gender-specific knowledge about social conditions and other societal factors. Regardless, gender differences will have an impact on the choice of prevention strategies and treatment plans for women and men alike.

# 4 The research system – funding, coordination and distribution of responsibilities

## 4.1 National resources for medical and health-related research

In Norway medical and health-related research is conducted under the auspices of universities and university colleges, regional health authorities and independent research institutes, as well as trade and industry. Universities and university hospitals (hospital institutions with an integrated university function) represent the largest arena for publicly funded medical and health-related research. In 2005 just over NOK 3 billion was used for research in the field of medicine in the university and university college sector. Operating expenses accounted for NOK 2,570 million (payroll costs and other operating expenses), while capital expenses accounted for NOK 440 million (scientific equipment and new construction).

This represents a growth rate of 39 per cent from 2003. Growth has primarily occurred at the university hospitals (53 per cent), but has also been substantial at the universities (29 per cent). This is due to two main factors: a steep increase in the number of research-concentrated positions (doctoral and post-doctoral fellowships, researcher positions) at the university hospitals, and changes in the data base as a result of the establishment of Stavanger University Hospital. Another important factor is that greater focus on research has led to improved registration and reporting. According to a study conducted by NIFU STEP (Studies in Innovation, Research and Education), most of the growth is real but has actually taken place over several years. Nevertheless, it cannot be ruled out that the strong focus on research has resulted in an over-reporting of research activity during the last period.

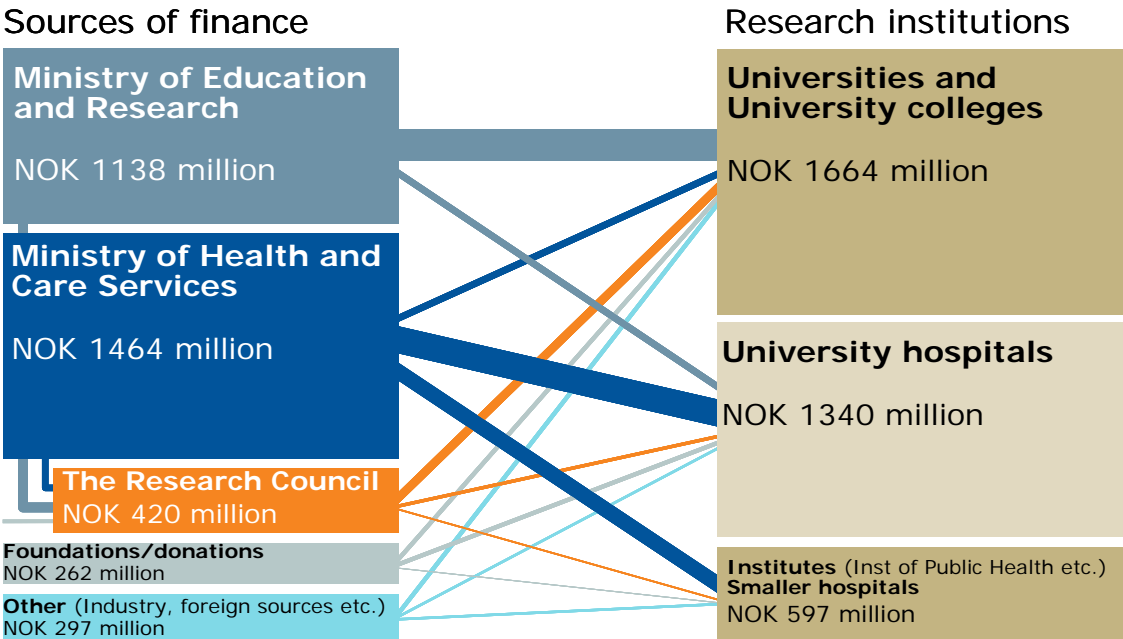


Fig. 4.1 Total resources for research in the field of medicine in 2005 (NOK million)

In 2005 a total of NOK 597 million was spent in the institute sector, which includes independent research institutes (the Norwegian Institute of Public Health, SINTEF Health Research, etc.) as well as non-university hospitals. Figure 4.1 breaks down R&D expenditures by funding source and research-performing institution.

NIFU STEP has compiled new statistics for R&D resources for medical and health-related research in the Nordic countries (not including R&D conducted by industry). Although coverage differs somewhat, the numbers have been made as comparable as possible. Figure 4.2 shows that Norway spent NOK 780 per capita on medical research in 2005, while Sweden spent substantially more – over NOK 1,000 per capita – when converted to purchasing power parity (PPP) NOK. Denmark and Finland spent NOK 600 per capita, while Iceland spent NOK 550 per capita.

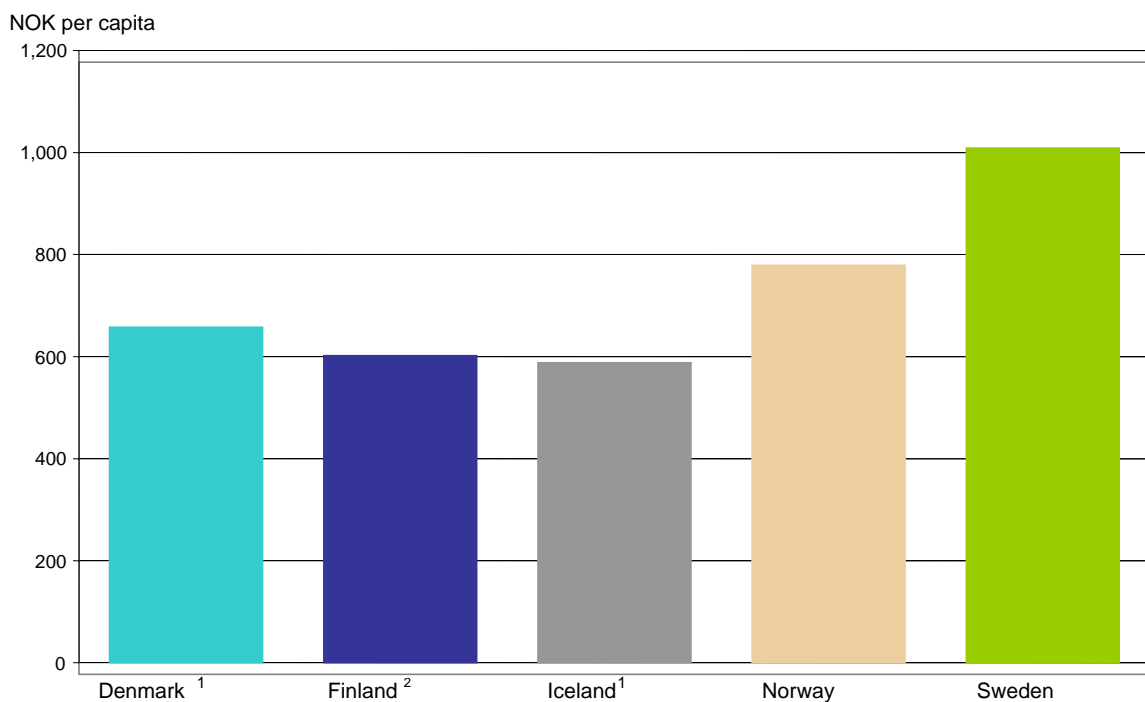


Fig. 4.2 Expenditures on medical research in the public sector in the Nordic countries (per capita) in 2005 or most recent year adjusted to 2005 level. Converted to PPP NOK.

- 1) Figures for Denmark and Iceland are from 2004 and 2003 respectively and adjusted to 2005 level.
- 2) Figures for Finland are somewhat underestimated as they do not encompass R&D conducted at non-university hospitals

Substantially more R&D is conducted by trade and industry in the other Nordic countries than in Norway. When the pharmaceutical industry's R&D expenditures are added to public sector expenditures, Sweden's position as the leader in spending is strengthened, and Denmark surpasses Norway by a wide margin. The statistics from Finland and Iceland are not specific enough for comparison in this context.

On a national basis the field of medicine<sup>1</sup> comprised 21 per cent of all operating expenses for R&D conducted in Norwegian universities and university colleges and the independent institute

<sup>1</sup> The national R&D statistics compiled by NIFU STEP are classified according to the system used by the Norwegian Association of Higher Education Institutions. The field of medicine encompasses the following disciplinary groups: basic medical/odontological disciplines, clinical medical disciplines, health disciplines, clinical odontological disciplines, sports medicine, and other and common medical disciplines.

sector combined in 2005 (NOK 16 billion in total). This figure has increased considerably during the past decade: in 1993 it was 14 per cent. The field of technology comprised an equal amount (21 per cent), while mathematics/natural sciences and social sciences each totalled nearly the same (20 per cent). The humanities accounted for seven per cent, while agriculture and fisheries disciplines/veterinary medicine accounted for 10 per cent in the university and university college sector (Figure 4.3). The figure shows that relatively little R&D in the field of medicine is carried out in the independent institute sector.

Funding for medical research in the public sector is allocated by a number of sources. The Ministry of Education and Research, at 38 per cent, is the primary source of funding for the higher education sector, closely followed by the Ministry of Health and Care Services, at 34 per cent. These two ministries are also the primary sources of funding channelled through the Research Council to medical research in this sector (13 per cent). Private associations, funds and donations are a third source of funding (eight per cent), and play a more significant role in the field of medicine than in other fields. The proportion of external funding in the fields of technology, mathematics/natural science, and agriculture and fisheries disciplines/veterinary medicine is higher than in the field of medicine, and this funding is primarily provided by industry. The smallest sources of funding for the field of medicine are industry (two per cent) and foreign sources (three per cent). The latter has increased in recent years, a trend that is expected to continue.

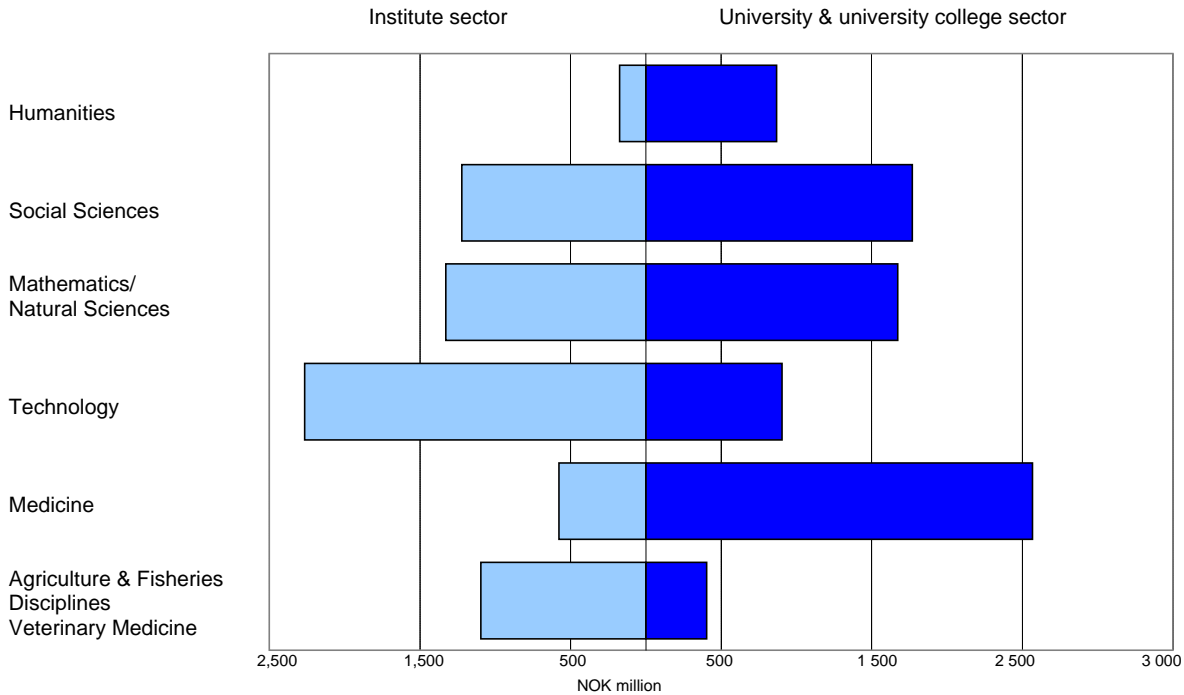


Fig. 4.3 Operating expenses for R&D in the university and university college sector and the institute sector according to field. NOK million.

### 4.2 Medical and health-related research – funders

Most research funding in the field of medicine is allocated directly to research institutions in the form of *basic allocations*. These basic allocations entail that universities, university colleges and hospital institutions with an integrated university function (university hospitals) have the main responsibility for research, research-based education and researcher recruitment for their entire range of disciplines and courses of study. The regional health authorities are responsible for

research and teaching within the specialist health services, with the particular – but not sole – responsibility for clinical patient-oriented research. Independent research institutes carry out research in defined thematic areas.

In addition to basic allocations, there are three main sources of health research funding awarded on the basis of an application process: 1) public funding from various ministries channelled through the Research Council, 2) allocations from the regional health authorities via the mandatory cooperative body established between the regional health authorities and the universities, and 3) financing from private associations and foundations that engage in fundraising. These sources have different roles to play in the research system, and efforts should be made to achieve both optimal differentiation of these in relation to one another and the best possible coordination of allocations and strategic initiatives.

#### 4.2.1 The Research Council of Norway

As shown in Figure 4.1, the Research Council provided project funding totalling NOK 420 million in the *field of medicine* in 2005 in the higher education and independent institute sectors. This comprised 12 per cent of overall resources allocated to the field. The Research Council also funded research of *relevance to health* for a substantially larger sum.

Projects at the Research Council are categorised (coded) according to several types of variables. One variable involves the thematic and technological priorities set out in the government white paper *Commitment to Research*. Health (health-relevant research) as referred to in the white paper has a broader scope than the category defined by national R&D statistics in the field of medicine, which is limited to research at institutes/units classified within the field. In the Research Council's own statistics, the thematic area of health also encompasses health-relevant research projects carried out at psychology and other social science institutes as well as natural science and technology institutes, and in addition includes some projects conducted by private enterprises. According to the Research Council's own portfolio analysis, allocations totalled NOK 666 million in 2006.

The majority of health research projects are funded under the Division for Science, which has the responsibility for all basic and applied medical and health-related research at the Research Council. There are two main funding instruments used to finance projects: *funding for independent projects*, which is open to all medical, odontological, psychological and other health-related research questions, and *research programmes*, which have a defined thematic scope. The Division for Strategic Priorities and the Division for Innovation also provide funding for health research projects in a few larger-scale programmes. National funding announcements are issued for thematically independent funding and for funding over individual programmes, and both of these instruments can thus be said to represent *national arenas for competition*.

The instruments employed by the Research Council to enhance the *quality of research* are funding schemes in which scientific merit is the sole or primary criterion. These comprise the Centres of Excellence (CoE) scheme, large-scale researcher-initiated projects (STORFORSK) and funding for independent projects. The major difference between these is the size of the allocations and the duration of the projects. In addition, the Outstanding Young Investigators (OYI) scheme targets younger researchers at the post-doctoral level. In accordance with the EU Seventh Framework Programme for Research and Technological Development, the primary objective of these instruments is to promote “frontier research” – groundbreaking research that crosses traditional disciplinary dividing lines and research types (basic research, applied research), when this is appropriate.



As shown in Figure 4.4, some 35 per cent of funding within the thematic area of health is allocated via quality-enhancing instruments, first and foremost through funding for independent projects and the CoE scheme. This funding largely stems from the Ministry of Education and Research and the National Fund for Research and Innovation. Approximately 45 per cent is allocated over various research programmes (including the FUGE programme), and 11 per cent via user-driven innovation projects (trade and industry).

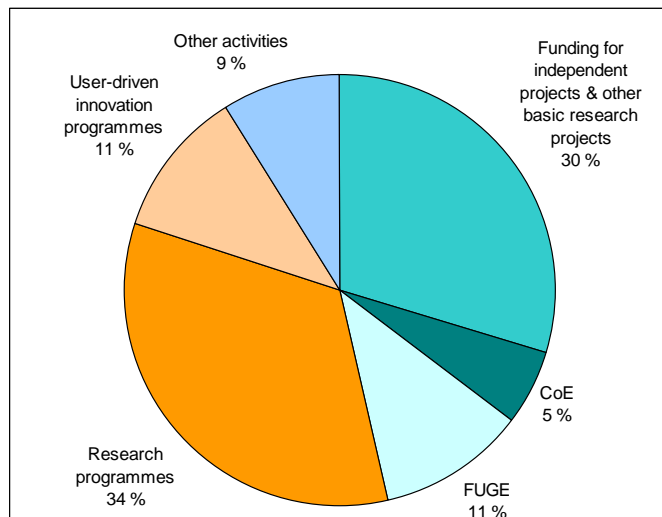


Fig. 4.4 Overall funding for health research via primary instruments in 2006

In addition to thematically independent funding from the Ministry of Education and Research and the National Fund for Research and Innovation, the Research Council receives allocations from the Ministry of Health and Care Services for health research. The purpose of this funding is to enable the ministry to fulfil its sectoral responsibility for research, and the ministry instructs the Research Council to allocate funding over thematically defined research programmes. Programmes primarily involve thematic areas, disciplines and research fields in which there is a need to intensify research

activity in order to meet social and health policy objectives. The programmes themselves issue funding announcements for *researcher-initiated* projects. Many researchers believe that funding for the research programmes diminishes the amount of funding available for independent projects. This is not the case. Funding from the Ministry of Health and Care Services is thematically earmarked, and cannot be alternatively allocated to independent projects.

#### Health-related research programmes and initiatives at the Research Council

##### Large-scale Programmes

- Functional Genomics in Norway (FUGE) some 1/3 of its budget is used for health-related objectives

##### Other programmes

- Global Health and Vaccination Research
- Mental Health
- Health and Care Services
- Public Health
- Clinical Research
- Alcohol and Drug Research
- Environment, Genetics and Health
- Absenteeism due to illness and exclusion from working life

##### Research initiatives

- NevroNor
- Cancer research
- Stem cell research
- Ageing research
- EMBL node – molecular medicine
- Gambling addiction

The greatest relative increase in allocations over the past decade has come from the Ministry of Health and Care Services. The ministry is by far the largest source of funding for health-related research programmes at the Research Council, although funding is provided by other ministries as well. Health-related research programmes and initiatives at the Research Council are listed in the box to the left. Health research projects are also carried out under programmes with different primary objectives.

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## 4.2.2 Regional health authorities

The regional health authorities bear the main responsibility for broad-based, patient-oriented clinical research and translational research within the specialist health services. This is reflected in their research strategies. In 2005 research allocations from the Ministry of Health and Care

Services earmarked for the five (now four) regional health authorities totalled NOK 394 million. For 2007 this sum is nearly NOK 409 million. Allocations from the ministry are comprised of two components: basic funding (40 per cent) and performance-based funding (60 per cent), which is allocated on the basis of average research results in the past three years. The regional health authorities supplement the earmarked research allocations with resources of their own, often on a substantial scale. They have their own research commissions, and most of the research funding is administered and allocated via formal cooperative bodies for research that incorporate representatives of the regional health authorities and the universities in a specific region. The Research Council participates in these bodies as an observer. There are four cooperative bodies that allocate funding to researchers in their own region. Although this takes place in various ways, all the cooperative bodies employ two main types of funding: *strategic funding*, which is not awarded on a competitive basis but directly to specific research fields to meet strategic objectives, and *funding awarded on the basis of a competitive application process*, which is primarily open to researchers employed at a health institution in the region and which is generally awarded on the basis of scientific merit.

#### **4.2.3 Voluntary foundations and donations**

The Norwegian Cancer Society, the Norwegian Foundation for Health and Rehabilitation, and the Norwegian Council on Cardiovascular Diseases (under the auspices of the Norwegian Public Health Association) are the three largest non-government players that issue funding announcements. In 2005 these three associations, together with several smaller associations and funding sources, accounted for one-tenth of the research resources in the field of medicine. These associations issue national funding announcements for research funding which is awarded on a competitive basis within limited thematic areas associated with specific diseases (Norwegian Cancer Society, Norwegian Council on Cardiovascular Diseases) or with groups of diseases (Norwegian Foundation for Health and Rehabilitation). Annual meetings are held between the Research Council and these associations, along with the Norwegian Council for Mental Health, to exchange information, experience and views related to tasks and roles. Research activity in a specific area such as cardiovascular disease under the auspices of a private foundation does not imply a reduction in activity in the corresponding area at the Research Council.

### **4.3 Cooperation and distribution of tasks in medical and health-related research – the role of the Research Council**

A national cooperative group (*Nasjonal samarbeidsgruppe for medisinsk og helsefaglig forskning*, abbreviated NSG) was established in 2005 to facilitate dialogue and coordination for medical and health-related research. The NSG consists of representatives from the universities, the regional health authorities, the Norwegian Institute for Public Health, the Research Council, the Norwegian Knowledge Centre for the Health Services, and the Directorate for Health and Social Affairs. The Ministry of Education and Research and the Ministry of Health and Care Services – the two major research funders – participate as observers. The NSG serves as a strategic advisory forum for its members and works to promote optimal utilisation of research resources by, among other things, providing input relating to cooperation and division of responsibility.

The members of the NSG have discussed collaborating on areas of special national interest, i.e. areas in which the various stakeholders will work together and individually to draw attention to, strengthen and prioritise research activities.

The areas under discussion are:

- NevroNor (neuroscientific research)
- Unikard (cardiovascular research)
- Cancer
- Back and muscle pain
- Infrastructure for biobanks and health registers

Mental health research with a focus on psychosis has also been a topic of discussion and may be launched as an individual area of focus. The Research Council already has funding instruments in place that cover or are open to projects in all of the above areas of interest, but is in addition making a concerted effort to boost *neuroscientific research* through the NevroNor initiative. The Research Council has also taken on the responsibility of preparing a report on how to make the best use of the national competitive advantages and potential inherent in Norway's *health registers, large population studies and biobanks*. Broad consensus and support from all the relevant players – as well as a start-up phase that is neither too fragmented nor drawn out – are essential for the successful implementation of national initiatives.

Given that the regional health authorities, via the cooperative bodies with the universities, have the responsibility and resources for funding clinical research in their own regions, the Research Council will consider directing its limited resources toward large-scale national or multi-regional patient-related clinical research projects.

As the national administrative body for research funding from the Ministry of Health and Care Services, the Research Council bears the responsibility for enhancing research within *health policy-related and strategically important thematic areas and disciplines*. This is explicitly stated in the research strategy of the Ministry of Health and Care Services for 2006-2011. There are areas in which there is already ample research activity that would greatly benefit from further strengthening, as well as areas and disciplines in which research activity is inadequate and must be bolstered by building research expertise.

The Research Council is the only funder able to administer national competition for thematically independent research funding. In this open arena for competition the Research Council will seek to support the development of *specialist expertise and research of a high international standard*. As resources for independent research funding are limited, the Research Council neither can nor should be responsible for scientific development and researcher recruitment across the entire scope of relevant subjects.

Funding allocated through the Research Council represents a relatively small portion of the overall public funding to medical and health-related research in Norway. The Research Council's ability to target its funding strategically works to the advantage of the research community. Funding from the Research Council – often in synergy with funding from other sources – provides the added thrust needed not only to create change, but to step up the pace of change as well. Strategically targeted funding may facilitate the establishment of new centres of competence in selected areas, for example in response to specific research needs or in new fields of research. It may promote collaboration between research environments that have not traditionally worked together, and the utilisation of research findings by industry. Similarly, extra support over time may give highly qualified research groups the additional boost they need to reach the top, which in turn will attract international funding and expertise.

As the national funding agency for research activities in all subject areas, the Research Council bears the overall responsibility for funding large-scale research projects, promoting and

facilitating cross-disciplinary projects, and coordinating and establishing national research initiatives and networks. In the international research arena, the Research Council's instruments and resources can be used to help the research community to increase its participation in EU and other key forums.

## **4.4 From research to application – the role of the Research Council**

### **4.4.1 Advisory and strategic functions**

The Research Council serves the government administration in an advisory capacity and provides input on research policy issues. In the context of medical and health-related research, the Research Council's activities are chiefly directed toward the Ministry of Education and Research and the Ministry of Health and Care Services, and toward other ministries that provide smaller allocations. *Vis-à-vis* the Ministry of Education and Research, the Research Council offers guidance on research policy issues in general, as well as on recruitment, quality-promoting measures, international activities, and the need for infrastructure and scientific equipment.

*Vis-à-vis* the Ministry of Health and Care Services, the Research Council focuses on input relating to questions of medical and health-related research, strategies and instruments for competence-building, and use of research funding. The Directorate for Health and Social Affairs, an administrative agency under the auspices of the Ministry of Health and Care Services, is responsible for commissioning and following up research activity. The Directorate represents the Ministry of Health and Care Services in relevant programmes at the Research Council. It ensures that health policy questions are incorporated into programme activities and that the public administration has access to research findings and activities.

The Research Council's strategic and advisory function is what enables it to foster development within subject fields and establish specialist circles in selected areas. Identifying future knowledge needs is a key element in this, as is designing strategies and action plans. The subject-specific evaluations comprise part of the Council's advisory function – in relation to both general research policy input and subject-specific guidance. The Research Council creates and commissions statistical information and fact bases. Moreover, efforts in various committees, research findings, reform evaluations and widespread contact with the researcher community have laid a sound basis for strategy development and advisory activities.

### **4.4.2 Knowledge transfer and implementation**

Research is essential for the further development of knowledge-based medical and health science practice. Results from research on health services and clinical research and the systematic synthesis of existing research findings provide new knowledge that must be disseminated to practitioners and implemented in the health services. Several players are involved in this effort, with the Directorate for Health and Social Affairs, the Norwegian Knowledge Centre for the Health Services and the regional health authorities at the top of the list. The Research Council will work to ensure that high-quality research is widely disseminated, but it does not have the direct responsibility for the implementation and practical application of research findings.

### **4.4.3 From research findings to innovation and industrial development**

The Norwegian health sector purchases goods and services for NOK 15-20 billion each year. Of this, Norwegian products comprise some 5-25 per cent depending on the product area. The Research Council will encourage Norwegian industry to develop a broader range of products and

services based on medical and health-related research, both to meet national needs and for export. Relevant products include new medications, preventive treatments, vaccines, bioinformatic and diagnostic tools, and databases. Medical technology – particularly biotechnology, medical imaging and ICT for the health services – is an area of considerable national and international activity. Innovation in medical technology must take place in close cooperation between the universities, independent research institutes and Norwegian companies that perform research. The Research Council's programmes for User-driven Research-based Innovation (BIA) and Commercialising R&D (FORNY) are designed to develop research-intensive industry and create value through the commercialisation of research findings. The intention is to promote industrial investment in R&D, for example by providing security through extra funding and by co-financing more ambitious projects that companies would generally not be able to carry out alone. Projects are selected on the basis of scientific merit, degree of innovation and value-creation potential. Health-related topics comprise a large part of the project portfolio.

#### **4.4.4 From research to renewal in the public sector**

The primary responsibility for R&D for innovation and change in the public health sector lies with the relevant ministries, but the Research Council has certain responsibilities in this field as well. Enhancing research-based innovation is vital to solving challenges related to capacity, treatment quality and efficiency in the health sector. The Research Council will facilitate the incorporation of research findings into innovation and renewal activities. In 2007 the Ministry of Health and Care Services and the Ministry of Trade and Industry launched a joint initiative on need-driven innovation in the health sector. The Research Council is a key player in this initiative, along with the regional health authorities, InnoMed and Innovation Norway.

# 5 Priorities and value added strategies of the Research Council

In light of the mandate and role of the Research Council and the limited resources for medical and health-related research at its disposal, it is necessary to assign priorities. It is also important to distribute tasks among the various research funders. The designated priorities indicate the Research Council's commitment to intensifying activity in selected research fields and promoting certain measures. The basis on which the priorities have been set varies. They may be related to international research policy trends (such as the EU Seventh Framework Programme), to the needs and guiding principles of the health authorities, or to the strategies of the universities, university colleges and regional health authorities. The overall strategy of the Research Council provides the basic framework for these efforts, and evaluations and input the Research Council has received from the researcher community have also been incorporated.

The Research Council does not provide funding across the entire scope of medical and health-related research. The universities, university colleges and regional health authorities are responsible for research-based education and treatment, also in smaller, nationally less developed fields of research. One of the Research Council's specific objectives is to concentrate funding in areas that offer optimal added value. The concept of added value applies to a wide range of activities and areas in this context, including:

- promoting quality research through national competition and use of effective assessment systems
- supporting the best research groups and fostering new talent
- promoting cross-disciplinary research cooperation
- enhancing international research activity and positioning Norwegian research in the international arena
- providing input on coordination of new and existing research funding
- establishing national research initiatives and networks
- boosting less developed fields of research of strategic significance to health policy aims
- developing national strategies and research policy guidance in processes involving other stakeholders and the research community
- creating links between research and innovation in specific initiatives where relevant

## 5.1 The Research Council's goals and priorities for medical and health-related research

The Research Council activities in this sphere extend across a wide range, and are primarily rooted in research policy and health policy needs and guidelines. If the Research Council is to fulfil an optimal role, it must be given room to manoeuvre without the constraints of highly detailed rules and principles. Adequate, long-term resources are essential for funding research in priority thematic areas, independent researcher-initiated projects and national research initiatives. The objective of this policy is to set a course for a more targeted and prioritised use of the Research Council's instruments and resources in the 2007-2012 period.

## **Goal no. 1: The Research Council will focus on further enhancing the strongest medical and health-related research**

The national subject-specific evaluations confirm that Norway has a number of active, internationally prominent health research groups, but indicate equally clearly that there are too few groups at this level. One of the Research Council's main responsibilities is to enable the best research groups to further strengthen their position and to ensure that a larger number of research groups have the opportunity to develop cutting-edge skills. This is primarily achieved through the use of funding instruments that involve broad-based national competition for thematically independent research projects, *but also through* competition for funding under large-scale initiatives and programmes. In order to promote excellence in research it is necessary to identify and cultivate talented younger researchers, encouraging them to establish a researcher career. The Research Council bears particular responsibility for this at the post-doctoral level.

Moreover, the method for selecting projects for grant awards must be based on international best practice for application processing and referee assessment. This will enable the Research Council to identify not only the good research projects but also those that are groundbreaking, which will often incorporate a cross-disciplinary approach.

The Research Council will

- work to ensure that a greater number of Norwegian researchers achieve a position at the international forefront of their field;
- work to ensure that Norwegian researchers participate in the competition for, and are successful in obtaining, funding under the European Research Council (FP7 Ideas), which is the European arena for excellence in research;
- work to ensure that the quality of Norwegian medical and health research – as measured by bibliometric indicators – reaches the same level as that of the other Nordic countries within five years.

## **Goal no. 2: The Research Council will work to increase the resources for medical and health-related research**

The health services consume a major share of society's resources. The health sector is extremely knowledge-intensive and dependent on comprehensive research activity. Although public funding of medical and health-related research in Norway has increased in recent years, it is still substantially lower than in Sweden. In addition to expanding the universities' budgets, it is essential to boost allocations over the Research Council. The proportion of overall public resources for medical and health-related research over the Research Council is currently too small, and must be increased through budget growth in this sphere in the years to come. The Research Council's resources must more adequately reflect the role and tasks it is expected to fulfil. This is vital for strengthening the Research Council's impact as a research policy facilitator, and its ability to realise added value.

National research initiatives require effective preparatory processes involving task-sharing and co-financing. Once the basis for a larger-scale initiative has been secured, the start-up phase must be as brief as possible to allow strong, cohesive initiatives to keep their momentum. The Research Council must have sufficient resources to facilitate the efficient implementation of national initiatives.

Medical and health-related research requires substantial investments in scientific equipment and infrastructure. In order to meet future challenges it is essential to establish cross-disciplinary

researcher groups, ensure that research communities have adequate funding to conduct advanced scientific research, and recruit a sufficient number of new researchers.

The Research Council will

- work together with the university faculties and other stakeholders to ensure that the proportion of overall public research funding allocated to medical and health-related research stays at the current level once the target for overall investment in research totalling three per cent of GDP by 2010 has been met
- work to ensure that its share of the growth in overall resources for the field is increased
- work to increase the amount of funding allocated to thematically independent research
- work to improve the conditions for research by investing in research infrastructure and promoting functional cooperation on operations and utilisation

### **Goal no. 3: The Research Council will promote international research cooperation**

International research cooperation is an essential component in the effort to enhance research quality and scientific development. Breakthroughs and developments in research literally know no boundaries. Norwegian health researchers have a long tradition of cooperating with researchers in other countries, particularly in the USA, but increasingly in European countries as well. Nonetheless efforts are still needed to increase researcher exchange and more fully exploit the opportunities available via many different international cooperation agreements and research institutions.

The development of the European Research Area has picked up speed with the implementation of the EU Seventh Framework Programme, and Norway's presence must be felt. The thematic priority area Health and sub-areas involving health-related topics under other thematic priorities hold greater potential than ever before for the Norwegian research community. The Research Council is responsible for promoting synergies and coordinating the interplay between funding for national initiatives and funding for participation in international research cooperation.

The Research Council will

- design framework grant schemes and guidelines to enable a greater number of Norwegian health researchers to spend time abroad and a greater number of prominent international researchers to participate in Norwegian research communities
- work to achieve a higher success rate for Norwegian medical and health-related research under the EU Seventh Framework Programme than that achieved under the Sixth Framework Programme
- enhance information activities to encourage Norwegian researchers to utilise a greater number of arenas for international cooperation

### **Goal no. 4: The Research Council will target its initiatives and promote national cooperation**

The Research Council's central, independent role in the research system puts it in a unique position to support a national strategic perspective. The Council's position enables it to supplement the roles of other stakeholders, contribute to regional and national cooperation, and support and coordinate major national initiatives. Relevant instruments include network-building, investment in infrastructure, and establishment of centres of specialist expertise and technology



platforms. The Research Council's activities encompass all disciplines and all types of R&D activity, which in turn gives it an exceptional opportunity to promote cross-disciplinary research and collaboration within the research and innovation system. The clear dividing line between clinical research and basic research is fading, and translational research holds the key to major future advances. It will therefore be vital to facilitate bridge-building in research.

The Research Council will

- promote fields of research in which Norwegian research groups demonstrate strength, and in which Norway has national competitive advantages, specific needs and which encompass the largest public health challenges
- collaborate with the universities, regional health authorities and other stakeholders to achieve optimal division of responsibility, as well as take the lead in selected fields in particular give priority to and promote:
  - *molecular biology research*, including *stem cell research*, which will be of great significance for the field of medicine in the future
  - *neuroscientific research*, in which Norway has an active research community that can achieve top-level international standing by working together
  - research that utilises Norway's *health registers and biobanks*, where the national challenge is to create a better framework for utilisation
  - *imaging technologies*, which through cross-disciplinary cooperation can lead to improved methods, new areas of application for diagnosis and treatment, and new business development opportunities
  - *large national clinical trials and clinical/basic translational research*
  - *health and care services research*, in order to meet the challenges posed by a growing number of elderly and chronically ill persons and a resource-intensive health care system
  - *mental health research*, particularly with regard to *children and adolescents*
  - *public health research*, with a focus on greater cross-disciplinarity to provide health benefits to all population groups through preventive measures and health-promoting activities

### **Goal no. 5: The Research Council will work to enhance advisory and research dissemination activities**

There is a need to improve the Research Council's advisory function and research dissemination activities in the field of medical and health-related research. The public administration and allocating authorities are key users of research findings, and effective dissemination is crucial to ensuring that these findings are incorporated into the basis for decision-making and are applied in practice by the health services. State-of-the-art reviews, seminars, topic-oriented meetings and better dissemination via popular science material are essential if research is to benefit the public at large. Research should make an active contribution to public debate, thereby securing its legitimacy and position.

The Research Council will

- enhance the knowledge base and statistical basis regarding research
- provide better input by compiling state-of-the-art reviews and overviews
- encourage more research dissemination activities targeting the general public
- carry out research-based evaluations of health policy reforms and questions

## **Goal no. 6: The Research Council will work to strengthen research for innovation and industrial development**

The health sector is a sector with a strong research tradition; however, the utilisation of research findings for business development and industrial aims in this sector is somewhat less developed. At the international level, biotechnology in particular has created a basis for new industry, for example, in connection with medicines, vaccinations, diagnostic tests and efficient food production. It is estimated that in a few years 40 per cent of the global economy will be linked to biotechnology. Medical imaging is playing an increasingly important role in prevention, diagnosis and treatment, and the market is growing rapidly. In biotechnology and imaging technology alike, we are on the cusp of a paradigm shift if the potential of nanotechnology is truly harnessed. Other areas that hold great potential for linking together research findings and business interests include ICT and chemical technology for diagnosis and treatment. The ability to rapidly implement new knowledge and technology will become a key competitive factor, and Norway must take active part in international developments. The three divisions of the Research Council cover the entire scope of research activities, from basic research to innovation. The Research Council's unique structure and its collaboration with Innovation Norway provide an excellent foundation for transforming research findings and business ideas into competitive industrial activities.

The Research Council will help industry to achieve its share of the three per cent target for research expenditures by

- enhancing integration and cooperation between biomedical, medical and technology researchers as the basis for new industrial development
- increasing value creation with the help of research-based business ideas generated by the scientific community
- raising awareness about patenting and securing the rights to commercialisable research findings
- promoting a culture of innovation within the health services

# Appendices

## Appendix 1 – Key documents

(Where English title appears in quotes document is only available in Norwegian)

- Ressursinnsatsen i medisinsk og helsefaglig forskning i 2005, rapport 9/2007, utdrag fra FoU-statistikken med nordiske sammenligninger (“Resources for medical and healthrelated research in 2005, Report 9/2007, summary of Nordic R&D statistics and comparisons”). NIFU STEP, February 2007.
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- FP7 – Health, Cooperation Work Programme. DG Research, European Commission.
- Sosial ulikhet i helse (“Social inequalities in health”). Fact sheet. Directorate for Health and Social Affairs, 2007.
- Report No. 20 (2006-2007) to the Storting, National strategy to reduce social inequalities in health. Oslo: Ministry of Health and Care Services, 2007.
- Proposition No. 1 (2006-2007) to the Storting, Ch. 6, National Health Plan for Norway (2007-2010). Ministry of Health and Care Services, 2007.
- Utviklingstrekk i helse- og sosialsektoren (“Development trends in the health and social services sector”). Report. Directorate for Health and Social Affairs, 2007.
- Helse- og omsorgsdepartementets forskningsstrategi 2006-2011 (“Research strategy for the Ministry of Health and Care Services 2006-2011”). November 2006.
- Report No. 9 (2006-2007) to the Storting, Work, Welfare and Inclusion. Ministry of Labour and Social Inclusion, 2006.
- Report No. 25 (2005-2006) to the Storting, Mestring, muligheter og mening (“Coping, opportunities and meaning”). Ministry of Health and Care Services, 2006.
- Utviklingstrekk i helse- og sosialsektoren (“Development trends in the health and social services sector”). Report. Directorate for Health and Social Affairs, 2006.
- Nasjonal strategi for kreftområdet 2006-2009 (“National cancer strategy 2006-2009”). Ministry of Health and Care Services.
- Official Norwegian Reports 2005:1 God forskning – bedre helse (“Good research – better health”).
- Official Norwegian Reports 2005:3 Fra stykkevis til helt – en sammenhengende helsetjeneste (“From piecemeal to unified – cohesive health services”).
- ... og bedre skal det bli! – Nasjonal strategi for kvalitetsforbedring i sosial- og helsetjenesten (2005-2015) (“... And it will only get better! – National strategy for improving the quality of the health and social services (2005-2015)”). Oslo: Directorate for Health and Social Affairs, 2005.
- Report No. 20 (2004-2005) to the Storting, Commitment to Research. Ministry of Education and Research.

- Research Strategies 2005-2008: Medical Research for Health, Quality Health Care and Economic Growth. Swedish Research Council, 2003.
- Report No. 16 (2002-2003) to the Storting, Prescriptions for a healthier Norway. Ministry of Health.
- Report No. 26 to the Storting (1999-2000), Om verdier for den norske helsetjenesta (“On values in the Norwegian health services”). Directorate for Health and Social Affairs.
- Visjon helse 2015 – muligheter og utfordringer for norsk helsetjeneste (“Health vision 2015 – opportunities and challenges for the Norwegian health services”). Report. Mandag Morgen and NSH.

Research Council publications:


- Pharmaceutical Research in Norway – an evaluation. Research Council of Norway, 2006.
- FUGE An Evaluation of the Eleven National Technology Platforms founded by the Functional Genomics Programme in Norway. Research Council of Norway, 2006.
- Report on Science and Technology Indicators for Norway. Research Council of Norway, 2005.
- The Strategy for the Research Council of Norway 2004-2010, Research expands frontiers.
- Work programmes
  - Programme on Alcohol and Drug Research 2007-2011, work programme. Research Council of Norway, 2007.
  - Programme on Global Health and Vaccination Research (GLOBVAC), work programme. Research Council of Norway, 2007.
  - The Public Health Programme 2006-2010, work programme. Research Council of Norway, 2006.
  - Programme on Clinical Research 2006-2010, work programme. Research Council of Norway, 2006.
  - Research Programme on Health and Care Services 2006-2010, work programme. Research Council of Norway, 2006.
  - Research Programme on Mental Health 2006-2010, work programme. Research Council of Norway, 2006.
  - Research Programme on the Environment, Genetics and Health 2006-2010, work programme. Research Council of Norway, 2006.
  - Action Plan for the FUGE Programme 2005-2008.
  - FORNY Programme Description – Commercialising R&D
  - BIA Programme Description – User-driven Research based Innovation
- Evaluation of clinical, epidemiological, public health, health-related and psychological research in Norway. <http://www.forskningsradet.no>
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- Fra grunnforskning til bedre helse. 22 eksempler på at grunnforskning lønner seg (“From basic research to better health. 22 examples of how basic research pays off”). Research Council of Norway, 2001.
- Medisin og helse anno 2020 – en forskningsodyssé (“Medicine and health in 2020 – a research odyssey”). Research Council of Norway, 2000.
- Statistics Norway website
- Norwegian Institute of Public Health website
- Directorate for Health and Social Affairs website
- World Health Organisation (WHO) website
- Allocation letters from the Ministry of Health and Care Services

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