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Measuring Health R&D

Country: Norway

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Table of contents

1	Summary description of the national health science and innovation system (HSIS), its core and peripheral components and national specificities.....	3
	Source: Norwegian Institute for Studies in Research and Higher Education	4
	The non-market system.....	4
	The market system	7
2	Health related R&D in national S&T budgets and in GBAORD.....	8
3	Measuring health-related R&D in the non-market/-public sector	8
	Coverage and R&D content	9
	Hospitals	10
	Classification, breakdown etc.	11
4	Measuring health-related R&D in the market/-industry sector	12
5	Health related GERD and R&D personnel: Level and structure	13
6	Lessons for national and international survey practice and for the Frascati Manual	15
	Annex 1 List of Norwegian health-related R&D surveys	16

Measuring Health R&D

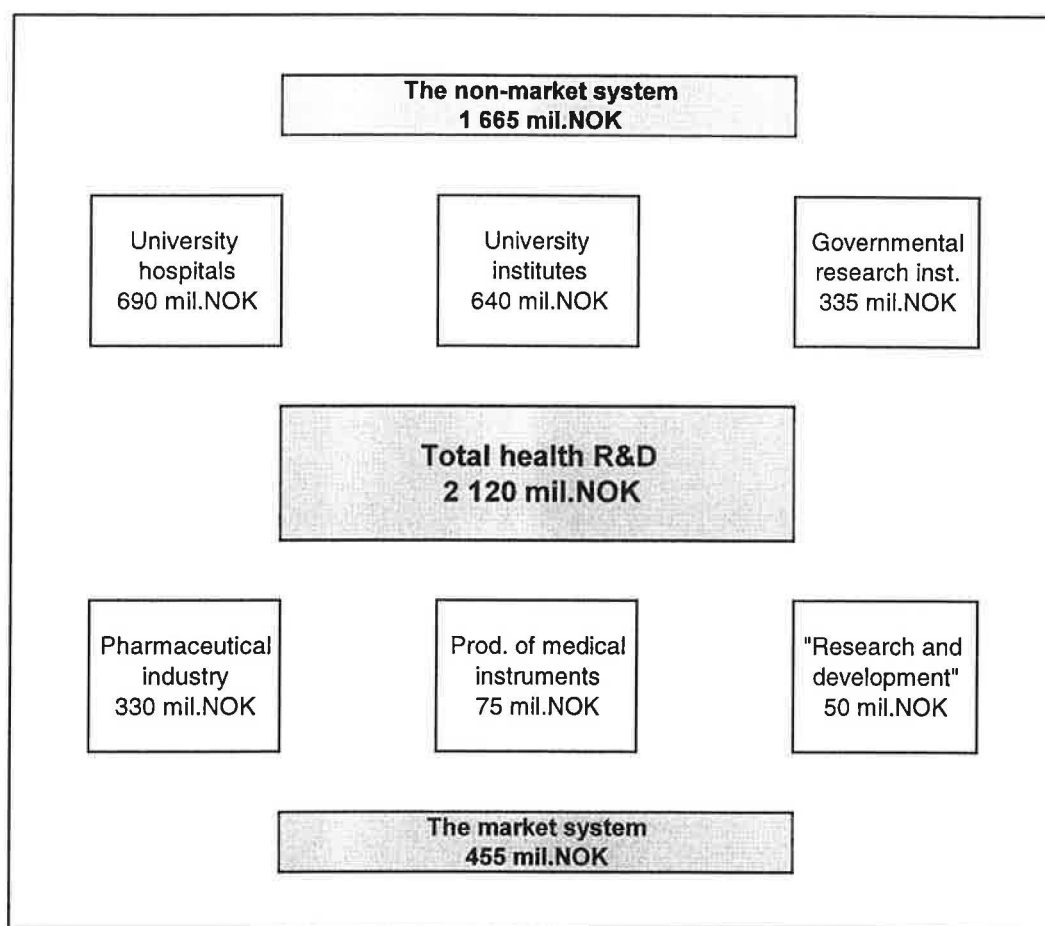
Country: Norway

1 Summary description of the national health science and innovation system (HSIS), its core and peripheral components and national specificities

A starting point for a brief description of the Norwegian health science and innovation system (HSIS) may be the R&D expenditure in medicine and health, based on the R&D statistics for the latest available year (1997), see Figure 1. Norwegian Institute for Studies in Research and Higher Education (NIFU) is both the compiler of R&D statistics in the higher education sector and the government sector and the co-ordinator for national R&D statistics, including the business enterprise sector. Statistics Norway compiles R&D statistics in the business enterprise sector.

A total of 2 120 mil. NOK was spent on R&D in health sciences in 1997. This is approximately 12 per cent of total Norwegian R&D expenditure. Figure 1 presents total health R&D expenditure by performance, showing that approximately 80 per cent was carried out in the non-market system, the rest in the market system.

Figure 1 Total expenditure on health R&D in Norway 1997, by performance.



Source: Norwegian Institute for Studies in Research and Higher Education and Statistics Norway

The non-market system

In Norway the higher education and government sectors constitute the non-market system. *Higher Education Sector* has a dominating position in regard to health R&D, responsible for about 80 per cent of R&D expenditures in this field of science in 1997. The core in the Norwegian health science and innovation system are the four universities including their university hospitals, performing 95 per cent of R&D in health sciences in the HES in 1997. The remaining five per cent is mainly conducted at the twentysix state colleges, which were established in 1994 with the amalgamation of about one hundred regional colleges offering lower degree education (2 – 4 years) within teaching, engineering, nursing etc.

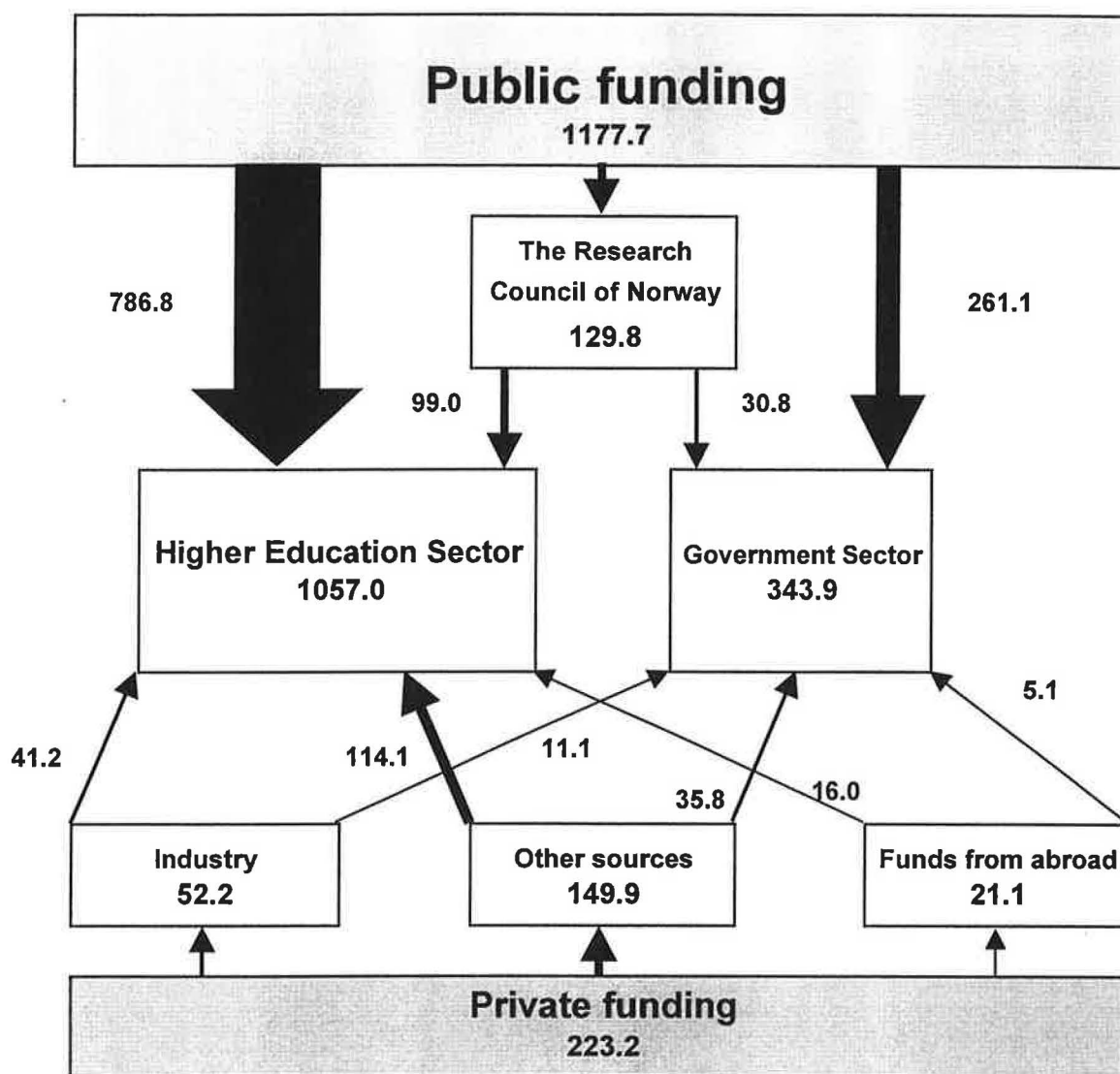
In 1997 more than half of health R&D in the HES took place at the university hospitals which include university institutes situated at the hospitals as well as ordinary clinical departments. Almost twenty hospitals/medical units are included, of considerable variation in size.

Health R&D in the *Government Sector* is performed in research institutes, most of which directly placed under and financed by the Ministry of Health and Social Affairs. The institutes are of very different size, with two or three dominating institutions in respect to R&D performance. Included in the government sector are hospitals/clinics outside the university system. These units are surveyed every tenth year and estimates are made for the statistical years in between surveys.

Figure 2 shows the flow of funds into health R&D in the non-market system. Public sources financed 84 per cent of the health R&D performed in the non-market system in 1997. The Ministry of Education, Research and Church Affairs is the main public source for financing R&D, representing 41 per cent of total public expenditure on R&D in the HES and government sector as a whole. The Ministry is also responsible for approximately one third of The Research Council of Norway's budget. However, when it comes to health R&D, The Ministry of Health and Social Affairs plays an important role as the contributor of about 40 per cent of public finances on health R&D in the non-market sectors. Public funding also includes allocations from counties and municipalities.

One of the funding categories included in private funding, "other sources", plays an important role in medical and health sciences compared to the other fields of science. Other sources covers mainly funding from private foundations and charity organisations.

Figure 2 Current expenditure on health R&D in Norway in 1997 in the non-market system (HES and Government Sector¹), by source of funds. Mil. NOK.



Source: Norwegian Institute for Studies in Research and Higher Education

¹ When reporting statistical data on R&D in an international context the Norwegian "Institute Sector" is reclassified. This implies inclusion of industry-directed institutes into business enterprise sector and the public institutes thus constitute government sector. Health R&D in the OECD government sector is not broken down to the same levels as the national institute sector. For this reason, when presenting data by source of funds, we let "institute sector" represent "government sector" in this paper. The gap in total R&D expenditures is only approximately 20 mil. NOK.

The Ministry of Education, Research and Church Affairs is responsible for public education institutions, including education at all levels, research and supporting activities. When it comes to health R&D, the Ministry of Health and Social Affairs plays an important role as responsible for the Norwegian health services. The Ministry is funding all activities at the state hospitals (university clinics), including research. In addition R&D performance at county municipal hospitals in the university system is calculated from a special grant from the Ministry (see module 3). Health research institutions in the government sector are placed under and receive their main funding from the Ministry of Health and Social Affairs. R&D at non-educational county municipal hospitals in the government sector is funded by the counties.

All Norwegian institutions of higher education are linked through the so-called "Network Norway". This concept presupposes that the higher education institutions will be further developed within a national integrated system. "Network Norway" will require closer cooperation and a better division of labour on teaching courses and research between the various institutions.

An example of institutional links by topics of R&D is the organisation of health education and research at the University of Oslo. This takes place at several institutions/hospitals, and institutes within similar medical topics are linked in "institute groups", for example the Institute Group of Laboratory Medicine.

The main demander for data on R&D is the Ministry of Education, Research and Church Affairs. In medical matters The Research Council of Norway (see also module 3), Medicine and Health Division, is demanding data on health-related R&D, being the advisor for the Government in these matters.

The market system

In the R&D statistical surveys in the market system, or business enterprise sector (BES), the enterprises constitute the survey objects. This makes it possible to draw out information on R&D on enterprise level, before aggregating to a higher level.

When measuring health R&D in terms of R&D expenditure, approximately 20 per cent of total R&D expenditure on health sciences in 1997 was related to the market system. Around 70 per cent was spent by enterprises within pharmaceutical industry, slightly over 15 per cent by enterprises producing medical instruments and the rest (*estimated*) by units classified in the OECD industry category "research and development". Almost 90 per cent of health R&D expenditure in the BES is funded by industry itself, whereas public funding accounts for less than five per cent.

Included in the BES R&D questionnaire are questions on collaboration, both national and international, and also on extramural expenditures; R&D purchased from other national enterprises, research institutes or universities or from units abroad. These "collaborating" units may be looked upon as peripheral elements in the market system.

2 Health related R&D in national S&T budgets and in GBAORD

The Norwegian GBAORD covers all budget appropriations or outlays for R&D on central government level. All budget items are considered regarding R&D content, and R&D shares are estimated by the use of R&D coefficients based on the R&D statistical surveys. For some budget items other sources are consulted to establish the R&D coefficients.

The Ministry of Health and Social Affairs is the core element with regard to health R&D in GBAORD. In the government sector as performer of R&D, the state budget funding is classified as own funds, whereas these allocations are classified as general university funds (GUF) or as direct funding in the HES. GBAORD is distributed between objectives according to the budget items' main objective for R&D. Funding from the Ministry of Health and Social Affairs is included in the health-objective category, whereas GUF is included in "advancement of knowledge". Hence, all university medical faculties are in the advancement of knowledge category in the GBAORD.

Health-related R&D for developing countries is included to the extent it represents a separate item in the budget. Funding by the ministries' underlying agencies is not included.

Regarding sector of destination, the HES is the recipient of about 40 per cent of state budget's "health objective" category. Sub-classifications outside main objective and sector of destination are not available.

3 Measuring health-related R&D in the non-market/-public sector

We will not go into a detailed description of the statistical method for compiling R&D statistics in this short paper, just point out factors we consider to be important for health R&D. In general, the Norwegian R&D statistics follows the recommendations in the Frascati Manual.

The statistical surveys are conducted biannually. Concerning higher education the entire sector is surveyed, including departments at all university hospitals. Every individual

department or corresponding basic unit receive the questionnaire for reporting the R&D activity. Supplementary sources of information are surveys on staff members' use of time, information on both personnel and expenditure from an institution's central administration, the Research Council of Norway and medical foundations.

Basic for identifying health-related R&D is the fact that each R&D performing unit (institute/department) is attached to a certain field of science, based on information on the main subject of R&D performed. In medical and health sciences we have information on fields of science on a broken-down level which implies that we are able to present data on the different subjects within medicine and health (Table 2). It also implies that units not underlying medical faculties may be included in the health field and vice versa. Thus, field of science is not attached to institution or faculty, but to the R&D performing unit.

As a main rule in the HES, research within medical sciences is performed at universities and university hospitals, whereas health R&D is performed at the state colleges. In the government sector some institutes are classified as performers of health R&D while others as performers of medical sciences.

The government sector is also covered by complete surveys. Questionnaires are sent to research institutes and other institutions expected to perform R&D activity. In addition, estimates of R&D resources at museums and non-university hospitals are included.

Coverage and R&D content

As pointed out above, R&D surveys in the non-market system are total surveys. For the few higher education institutes neglecting to fill in the questionnaire, information is constructed by means of the register of all R&D personnel in the non-market system, data from central administrations and information from the Research Council of Norway and the main private funders of health R&D.

Table 1 shows the performance of health R&D in the HES at university institutes and university hospitals and the role of the funding bodies. GUF is composed of funding from the Ministry of Education, Research and Church Affairs and the Ministry of Health and Social Affairs. The Research Council of Norway is funding research training for doctoral degrees and also contribute to the financing of scientific equipment. However, funding from the Research Council is less important for health sciences than for the other fields of science in the HES. The category "other sources" is important for health R&D. Private charity foundations (ex. Norwegian Cancer Society, Norwegian Council of Cardiovascular Diseases) are the main bodies in this category.

Table 1 Total expenditure on health R&D in the HES in 1997, by source of funds. Mil. NOK.

Source of finance	University institutes	Hospital institutes	Total
General University Funds (GUF)	437.0	525.9	962.9
• <i>Min. of Education, Research and Church Affairs</i>	434.6	168.7	603.3
• <i>Min. of Health and Social Affairs</i>	-	357.2	357.2
• <i>Other ministries</i>	2.4	-	2.4
External funding	204.8	161.2	366.0
• <i>Min. of Education, Research and Church Affairs</i>	1.5	0.3	1.7
• <i>Min. of Health and Social Affairs</i>	19.6	18.1	37.7
• <i>Other ministries, counties, municipalities</i>	26.9	6.5	33.4
• <i>The Research Council of Norway</i>	72.5	40.5	113.0
• <i>Other sources</i>	51.9	67.2	119.1
• <i>Business enterprise</i>	19.1	24.4	43.5
• <i>Funds from abroad</i>	13.3	4.2	17.5
Total	641.8	687.1	1 328.9

Source: Norwegian Institute for Studies in Research and Higher Education

Hospitals

Almost twenty hospitals and medical institutions are included in the HES as university hospitals. They vary by size and medical field. Some are state hospitals, others are administered by counties. For state hospitals, R&D activities are financed through their own budget chapters in the state budget. For county municipal hospitals, a special allocation from the Ministry of Health and Social Affairs covers research, teaching and related activities. The R&D share for these activities is estimated by NIFU and is included as a particular per cent, with great variation between hospitals. The estimation is based on the number of personnel paid by hospital (mainly physicians at different levels) and engaged in R&D and their share of R&D working time. This R&D coefficient is based on a special survey on medical R&D from 1990, including all personnel engaged in medical R&D. The results are later (1996) confirmed in a special survey at the university hospitals.

Hospitals, medical centres and clinics outside the university system, slightly over 100 elements, are included in the government sector. These units are surveyed every tenth year and estimates are made for the statistical years in between surveys.

Classification, breakdown etc.

As mentioned in module 1, institutions classified as university clinics are included in the HES, whereas other hospitals are placed in the government sector, in line with Frascati recommendations. Standard Frascati breakdowns are directly available for health sciences (source of funds, type of costs, type of activity etc.). In national publications we have presented detailed classification by medical subject. Table 2 is an example of this type of breakdown. A further breakdown by funding sources is also available. Thus we are able to identify R&D funding from the European Commission, which is interesting in many contexts.

Data on extramural expenditure by destination are available for the government sector, not for the HES. Data on project co-operation with international institutions (number of projects, expenditures) are also available for the government sector. On behalf of the Ministry of Education, Research and Church Affairs NIFU has in the nineties conducted annual surveys on international research collaboration. In these surveys GBAORD data have been useful.

Regarding staff change mobility within the public sector NIFU has conducted many surveys on different fields of subject. The register of research personnel is basic in these surveys. The register includes all scientific personnel (ISCED level 5A and 6) in the HES and government sector, see also module 5.

Table 2 Total R&D expenditure in clinical medicine at university hospitals 1997, by source of funds and subject. Mil. NOK.

Subject	Industry	Public funding	The Research Council of Norway ¹	Other sources ²	Funds from abroad	Total
Neurology	0.4	18.5	1.1	1.4	0.1	21.6
Dermatology	0.1	23.3	0.4	0.5	-	24.3
Gynecology and obstetrics	-	15.1	0.4	0.5	-	16.0
Psychiatri	0.2	29.8	3.9	1.3	-	35.1
Pediatrics	1.1	21.8	1.8	6.2	1.1	32.0
Reumathology	0.6	3.8	1.3	3.2	-	8.9
Oncology	0.5	20.4	-	6.7	-	27.5
Radiology	-	18.3	-	0.2	-	18.5
Physical medicine and rehabilitation	-	1.3	0.3	0.5	-	2.1
Anaesthesiology	0.3	7.4	0.4	0.2	-	8.3
Internal medicine	9.8	76.5	7.9	13.0	0.3	107.6
Surgery	3.8	74.0	4.3	5.5	0.4	87.9
Clin. med. nec	0.1	6.1	0.3	0.2	0.0	6.8
Total	16.7	316.3	22.2	39.5	1.9	396.6

1 The Research Council of Norway is a public source.

2 Other sources covers mainly funding from private foundations and charity organisations.

Source: Norwegian Institute for Studies in Research and Higher Education

4 Measuring health-related R&D in the market/- industry sector

R&D statistical surveys in the business enterprise sector (BES) are conducted biannually by Statistics Norway. NIFU is responsible for integrating the results to a total R&D statistics for Norway and for reporting data to international organisations (OECD, Eurostat, Nordic statistics).

From 1995 all enterprises with more than ten employees are included in the survey, for some of these figures are estimated. The survey object is an enterprise with main activity bound to one industry subgroup. This makes it possible to gain information on product fields; financing, type of costs, number of employees etc. Product groups relevant for health R&D

are pharmaceutical industry and production of medical equipment. In addition comes some enterprises in the "research and development" group.

Statistics Norway comment that the register on enterprises (based on NACE) may be used for picking out elements from the health or medicine point of view and then aggregate data to the area required. Standard Frascati classifications are available for the NACE groups. For figures on R&D in the BES or market system, see modules 1 and 5.

Innovation surveys have been carried out by Statistics Norway for the years 1992 and 1997. Survey objects are identical to the enterprises in the R&D surveys, and information available by NACE group; such as innovation expenditure, number of innovative enterprises, motivation for innovation activity, collaborators in the innovation activity etc.

5 Health related GERD and R&D personnel: Level and structure

Tables 3 and 4 show total R&D resources on health R&D in 1997; expenditure and personnel. As mentioned before funding may be further broken down.

Table 3 Total expenditure on health R&D in 1997, by sector of performance and source of funds. Mil. NOK.

Sector of performance	Total	Industry	Public funding	Other sources	Abroad
Higher Education					
Sector	1 328.9	43.5	1 146.4	121.4	17.5
Government Sector ¹	343.9	11.1	291.9	35.8	5.1
Business Enterprise					
Sector ²	454.0	404.5	20.1	-	29.4
Total	2126.8	459.1	1458.4	157.2	52.0

1 Current expenditure, see also footnote 1, Figure 2.

2 Pharmaceutical industry and production of medical instruments. Also included is health R&D from the category "Research and Development" which accounts for approximately 50 mil. NOK, and estimates by sources of funds are made on the basis of total R&D services.

Source: Norwegian Institute for Studies in Research and Higher Education and Statistics Norway

Table 4 Total R&D personnel in health sciences in 1997, by sector of employment and formal qualification. FTE.

Sector of performance	FTE; all personnel	FTE; university degrees
Higher Education Sector	1 863	1 211
Government Sector	586	382
Business Enterprise Sector ¹	531	371
Total	2 980	1 964

1 Pharmaceutical industry and production of medical instruments. In addition (not included in the figures) health R&D accounts for approximately 50 mil. NOK (personnel not estimated) from the category "Research and Development".

Source: Norwegian Institute for Studies in Research and Higher Education and Statistics Norway

Statistics on R&D personnel in the HES and government sector are based on NIFU's register on research personnel, scientists and engineers. The register is updated every second year, prior to the R&D surveys. Detailed information on R&D personnel is available. In the HES the register forms the basis for calculation of R&D expenditure. In national publications on R&D personnel in the HES is presented by position (table 5) and scientific field or institution. For calculation of FTE, each position or group of positions has its unique R&D coefficient from time-budget surveys. The R&D coefficients differ between scientific fields and institution.

Table 5 Number of academic staff (headcounts) in the HES in 1997, by position.

Position	All fields of science	Health sciences
Professor	2 062	365
College reader	93	2
Associate professor	2 545	213
Assistant professor	816	55
Senior lecturer	154	13
University/college lecturer	3 081	525
Researcher, post.doc. fellowshipholders	933	212
Physicians at university hospitals	1 093	1 093
Fellowship holders	2 608	592
Scientific assistants	334	35
Student fellowshipholders	66	30
Total	13 785	3 135

Source: Norwegian Institute for Studies in Research and Higher Education

6 Lessons for national and international survey practice and for the Frascati Manual

The greatest national challenge concerning health R&D statistics is related to resources for medical R&D at the university hospitals and other hospitals/centres as well.

The university hospitals have in the 1990-ies received a block grant from the Ministry of Health and Social Affairs to cover research and experimental development, education of medical students and advanced medical treatment. On the basis of time-budget surveys among physicians, mean wages for these types of personnel and other factors, such as differences in health expenditures in different regions of Norway, NIFU has calculated a part of this grant for R&D.

In the government budget for 1999 the Ministry of Health and Social Affairs has decided to allocate a defined amount of money for R&D in the university hospitals. This allocation is far from the expenditures we have calculated at NIFU for medical R&D at university clinics in the last years' R&D statistics. We assume the Ministry has not taken into consideration the problems concerning R&D performed outside ordinary working hours, overhead expenditures etc. Thus, this is the most important task we have to deal with in relation to health R&D in the national 1999 statistics.

We also feel a need for looking deeper into calculation of R&D FTE for personnel performing R&D at the university hospitals. Many of these employees have more than one position; full time chief physician/part time professor or other position combinations. In Norway normal working time per week is 38 hours. Time-budget surveys for university tenured personnel indicate about 50 hours work per week as a mean. A special survey at the university hospitals in 1996 show that more than 50 per cent of personnel performing R&D at the hospitals spend over 50 hours at work per week. According to the Frascati Manual one person can only represent one full time equivalent, which we follow in the Norwegian R&D statistics. Thus "free time" R&D is also included. We consider it of great importance to deal with these matters in an international context, as this is basic for compiling R&D statistics.

Concerning R&D performance in other hospitals/centres (included in government sector) other questions arise, like how to define them, how to make forecasts/estimations. From bibliometric studies we know many do R&D surveys/write articles.

Central authorities and the Research Council of Norway often demand international R&D statistics to make comparisons between countries. There is a special interest for data on R&D by fields of subject. Many problems are involved in presenting these types of information; such as deficiency of data, coverage, sector classification etc. This is especially true for the health sciences, involving hospitals and thus R&D performed by physicians paid over hospitals' budgets.

Annex 1 List of Norwegian health-related R&D surveys

Norwegian Institute for Studies in Research and Higher Education has conducted several surveys on health R&D. Most of them are based on the national R&D Statistics, including the Register on Research Personnel. A separate survey (5) including all physicians at university hospitals was carried out in 1997. With one exception (3), the publications are in the Norwegian language.

In the 1990-ies the publications listed below are issued; the Norwegian titles have been translated into English:

1. Olsen TB. *Research at Norwegian hospitals. A mapping of R&D activities at hospitals outside the university system, including a general view on total resources for medical R&D in Norway*. Report 5/91. Oslo: Norwegian Institute for Studies in Research and Higher Education 1991.
2. Skodvin OJ. *Recruitment to medical research. Status and perspectives towards year 2000*. Report 6/91. Oslo: Norwegian Institute for Studies in Research and Higher Education 1991.
3. Sundnes SL. *Research fellowships for medical students in Norway*. Medical Education 1996; 30: 459-60.
4. Sundnes SL, Maus KW. *Resources for medical R&D 1993. Extract from the national R&D Statistics*. NIFU skriftserie nr.7/97. Oslo: Norwegian Institute for Studies in Research and Higher Education 1997.
5. Sundnes SL, Mørland B. *Conditions for medical R&D at university hospitals 1996*. NIFU skriftserie nr. 8/97. Oslo: Norwegian Institute for Studies in Research and Higher Education 1997.
6. Sundnes SL. *Resources for medical R&D. Extract from the national R&D Statistics with emphasis on 1995*. NIFU skriftserie nr. 29/97. Oslo: Norwegian Institute for Studies in Research and Higher Education 1997.
7. Nerdrum L. *Recruitment to research within medicine and health disciplines. Description of today's situation and estimated needs towards year 2015*. Report 5/99. Oslo: Norwegian Institute for Studies in Research and Higher Education 1999.