

**Follow-up Paper on ESF-EMRC Science Policy
Briefing *Health Research Classification Systems*
– *Current Approaches and Future
Recommendations***

A Summary of Discussions Held at the ESF-EMRC Implementation
Workshop, London, UK, 22 November 2011

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Executive Summary

As has been stated in the European Science Foundation (ESF)- European Medical Research Councils (EMRC) Science Policy Briefing (SPB) *Health Research Classification Systems – Current Approaches and Future Recommendations* published in November 2011¹ it is impossible to properly assess how research funding is performing in terms of output as measured by published findings or through other measures, unless European countries with their multiple languages and research organisations put in place a standardised approach to classifying research portfolios. It has become evident that as organisations funding research “*we have to be smarter in the ways we analyse our activities and the outputs that result,*” as stated by Dr. Ian Viney, Head of Strategic Evaluation at the Medical Research Council (MRC) in the UK who chaired the SPB publication.

Biomedical research is a complex and global enterprise that attracts funding from many different streams, both in private and public sectors. If strategies for the support of research are to improve then better approaches for categorising research inputs are needed. One way of doing this is for multiple research performing and funding organisations to broadly agree on standard systems for research classification. Common classification supports coordination between funders, and thereby helps maximise resources allocated into funding of research that is needed and avoid funding of duplicate research. The ultimate goal is to make the whole of Europe more competitive *vis-à-vis* the US and emerging countries with their increasingly strong and competitive research arenas as currently seen in Brazil, China, and India, while furthering the vision of a globally competitive Europe-wide research strategy as described in the joint ESF-European Heads of Research Councils (EUROHORCs) Roadmap published in 2009².

The purpose of this SPB implementation workshop held by the EMRC in London on 22 November 2011³ was to start the process of identifying ways for stakeholders to implement the recommendations defined in the SPB, the first one being that EMRC strongly encourages the use of the UK Health Research Classification System (HRCS)⁴ as the leading approach for comparison and joint analysis of health research portfolio information. Furthermore, the goal of this workshop was to establish a clear work plan with milestones and timeline (see Table 1, page 16) defining the next steps to be taken to implement these recommendations at national, European and international level, starting in 2012.

The workshop provided opportunities for organisations to share their experience and keep apprised of progress elsewhere. This document summarises the discussions around the current HRCS use by some funders of health research and the trials made by other organisations to find ways to efficiently implement research portfolio classification. It is clear that there will not be universal agreement over a single classification system as research organisations have significantly different research portfolios and stakeholder requirements. Creating a classification system being able to capture information about research infrastructures and private funding and that can be adapted to the needs of tomorrow since science is evolving rapidly was also identified as a challenge. Automated approaches for research classification should significantly reduce the time and effort required to re-classify research portfolios and make it possible to analyse portfolio funding information across many organisations internationally.

¹ Science Policy Briefing N°43 “Health Research Classification Systems – Current Approaches and Future Recommendations”, published in November 2011: <http://www.esf.org/hrcs>. ISBN: 978-2-918428-52-7.

² “EUROHORCs and ESF Vision on a Globally Competitive ERA and their Road Map for Actions”, published in July 2009: <http://www.esf.org/publications/corporate-publications.html>

³ The implementation workshop agenda and slide presentations are available from: <http://www.esf.org/research-areas/medical-sciences/activities/science-policy/health-research-classification-systems-current-approaches-and-future-recommendations/implementation-workshop.html>

⁴ <http://www.hrcsonline.net/>

This follow-up paper should be updated by September 2012 to share new data and experiences with the HRCS implementation. Dr. Ian Viney will coordinate the update and ensure that this will be discussed in the meantime in the UK as well as across and beyond Europe. European performing and/or funding organisations, and particularly the ESF-EMRC Member Organisations, are expected to start internal discussions around the HRCS implementation in parallel to their own classification systems until then.

Introduction

The specific SPB that this workshop paper follows up on, details the advantages of defining a common classification system in the health research area. The idea behind it was to assist research organisations by addressing the issue of creating consistent approaches to classification systems of research portfolios. Initiated by the MRC (UK), the basis for the report was created during an expert group meeting that met in London in March 2011, assembled by the European Medical Research Councils (EMRC) – the umbrella organisation that gathers all European research councils in the biomedical field⁵. The SPB received contributions from 17 countries including non-EU countries (US, Canada, Australia, New Zealand and Singapore) and key international organisations including the World Health Organization (WHO), the Organisation for Economic Co-operation and Development (OECD) and the European Commission. A total of 23 ESF-EMRC Member Organisations (MOs) plus two non-MOs (the Ministry of Sciences, Education and Sports of the Republic of Croatia, and the Netherlands Organisation for Health Research and Development, ZonMw) are currently supporting its implementation⁶.

EMRC has recognised the strategic advantage that would be gained from being able to analyse medical research portfolios across Europe, and encourages the use of a standard international classification system for health research that may be implemented in parallel to other classification systems already in place and preferred by certain organisations. EMRC has furthermore recognised the need for methodological developments to reduce the costs involved in classification and to increase flexibility. A well-coordinated common approach across organisations at the national, European and international level is also strongly recommended by EMRC.

The HRCS use is encouraged as the leading approach for comparison and joint analysis of biomedical and health research funding. It was developed by the UK Clinical Research Collaboration (UKCRC), a national partnership in the field of clinical research, as a tool for classifying and analysing funding. By providing a common classification language, the HRCS improves knowledge about research being funded and opens up new and better opportunities for cooperation and coordination among the national and international players in the research system. It currently combines 21 health categories⁷ with 48 research activity codes that are divided into 8 groups⁸. The HRCS has already allowed for meaningful comparisons to be made across the different funders' research portfolios in the UK and has underpinned two important reports in 2006 and 2007, with a third one on the way (to be published by mid-2012)⁹.

Since its implementation in the UK in over 20 research organisations, the number of users that have already implemented the HRCS or are considering doing so is on the rise. Outside the UK, the system has so far been implemented in Sweden, Norway¹⁰, Singapore and Hong Kong while Ireland and Canada have tested it before considering it for potential adoption.

⁵ www.esf.org/emrc

⁶ An updated list of Member Organisations who endorsed the SPB is available from: <http://www.esf.org/hrcc>

⁷ HRCS Health Categories: <http://www.hrcsonline.net/hc>

⁸ HRCS Research Activity Codes: <http://www.hrcsonline.net/rac>

⁹ UKCRC reports “UK Health Research Analysis” (2006) and “From Donation to Innovation” (2007): <http://www.ukcrc.org/researchcoordination/healthresearchanalysis/ukanalysis/>

¹⁰ Report of the pilot project under the Research Council of Norway (RCN), Division for Science and Division for Society and Health, “Classifying health-related research using the Health Research Classification System (HRCS)”, published in November 2011. ISBN: 978-82-12-03011-4.

Recommendation #1: Use of the HRCS is encouraged as the leading approach for comparison and joint analysis of specifically health research portfolio information.

What is the relevance of implementing the HRCS outside the UK? Below are three examples of experience by different research councils (Boxes 1-3).

Box 1: HRCS EXPERIENCE: THE SWEDISH RESEARCH COUNCIL

The Swedish Research Council has worked with the HRCS for about three years now. Recent funding distribution information released for 2011 indicated that one third of all project grants were allocated in the area of medicine and health. Pilot projects using the HRCS were started in 2009 in which the panel chairs responsible for evaluating research projects were asked to classify some funded projects of 2007 and 2009. In 2010, the evaluation panel members classified all proposals, and performed a quality check through external coders in the UK. In 2011, panel chairs coded all applications for each panel.

The experience in Sweden demonstrated evidence of a steep learning curve for accurate coding of projects. Between 2010 and 2011 most of the evaluation panel members felt comfortable with the different codes and it did not take them much time to perform the coding, underlining the facility to ease of coding applications in a classification system such as the HRCS.

There is currently also widespread interest in adopting the system more nationally beyond just the Swedish Research Council, with discussions raised at VINNOVA and Västra Götalandsregionen, two other Swedish research organisations. Among the Scientific Council of Medicine and Health, interests and opinions vary, and there has not yet been a decision made to use the HRCS for strategic fund distribution.

The Swedish Research Council has conducted an analysis of success rates across health research using the HRCS, which has informed their prioritisation of research funding. This analysis relied on the ability to categorise all proposals the Swedish Research Council received, not just those it funded. The figure for the average approval rate for project grants is about 25% in 2010 with weak approval rates seen mostly in two key areas: Disease Management and Health & Social Care Services.

“We at the Swedish Research Council believe that we might be on the right path to improve discovery of funding gaps using the HRCS, and that this will be an important instrument for making strategic decisions in the future based on a more complete picture using the knowledge the HRCS use has provided us with.” – Anna Herou (Swedish Research Council)

Box 2: HRCS EXPERIENCE: THE SINGAPORE NATIONAL MEDICAL RESEARCH COUNCIL (NMRC)

Singapore as a country has invested heavily into the science and technology sector in order to maintain competitiveness, and even during the crisis of 2009, it witnessed an estimated 10% growth rate based on this sector alone. To fully realise its vision of promoting excellence in clinical research, the Singapore Ministry of Health has invested heavily into medical research, with a great emphasis on promoting biomedical research capabilities as well as translational and clinical research in recent years. Another agency, the Agency for Science, Technology and Research (A*STAR) is the main driver in the field of basic research. Most of the research institutes are in very close proximity in Singapore, thus facilitating coordination across different agencies. In terms of funding distribution, slightly more than half is allocated to the basic science research areas, with funding invested into biomedical science Research & Development (R&D) on the basis of 5-year periods.

The Singapore NMRC established in 1994 is the funding arm of the country's Ministry of Health. In the past, the council has been determining funding allocation mainly through competitive peer review and under expert guidance without sufficient data-driven strategic planning. The results of awarded projects were classified based on specialty-based categories and the data derived from this classification system were not sufficiently comprehensive to determine strategy development of fund distribution.

Since NMRC started using the HRCS, it has recognised its advantages in providing a more coherent approach to determine the status of funding distribution, thereby enabling need-based funding of healthcare research. NMRC performed a biomedical research analysis that resulted in a descriptive map of research funding by health category and research activity. It has already proved useful for grant portfolio planning to help assess whether funding adheres to the burden of disease in Singapore as measured by the Disability Adjusted Life Years (DALY) rates. HRCS application has thus been useful in assessing gaps and opportunities, as well as suggesting the case for more directed funding for translational and clinical research.

In addition to providing a broad overview of the funding landscape in biomedical science, the council also hopes to use the HRCS tool to identify suitable reviewers for specific grant proposals to improve the review quality by matching the research proposals coded in the HRCS with the HRCS reviewers' profiling. Another future application identified lies in the profiling of institutions and identification of research centres for industrial collaboration.

"A positive outcome experience we made was that the HRCS allows us to track funding trends across different segments over time which helped us realise that there is a need to drive our research funding towards areas we are supposed to be funding. However, we also recognise there are some limitations to the HRCS. For example, indirect costs cannot be attributed to the coding, therefore not capturing all research dollars spent." – **Selly Julianity (Singapore National Medical Research Council)**

Box 3: THE CHALLENGES FACED BY THE CANADIAN INSTITUTES OF HEALTH RESEARCH (CIHR)

The CIHR is made up of 13 institutes across different research sectors, all of which see themselves as having a unique structure and each supporting a broad spectrum of research. CIHR requires a new research classification system that serves everybody's needs to enable it to report on effectiveness and provide strategic direction, as the current system adopted in 1995 no longer adequately reflects the research programmes that it funds.

CIHR is still in the challenging and long process of implementing changes to its system. In Canada there is a need to find a common system allowing both the provincial national and the international organisations to see their research reflected in the classification system. Such a new system should fully address requirements in the areas of aboriginal research, population health, research methodologies, health services and interdisciplinary research areas. It should also be a freely available open source.

Quality assurance is also another challenge in Canada as it is not currently in place. The accurate classification of funded research is important to demonstrate the impact of funding programmes. The entire research community needs to see itself included in a system that is used and includes the social sciences which also receive funding through health research programmes. The system needs to be easily consumable with minimal instruction, but with appropriate granularity of terms in each dimension including the methodology one. A key demand is to adopt a system where it is possible to classify the researchers being funded using the same language as the research projects and to develop a researcher-led approach. Peer reviewer identification would also be helpful.

Since 2004, Canada has been trying to find the perfect model, and the adoption of the UK HRCS has been considered. Overall, the Canadian experience has shown that the HRCS is a model that is in progression and that is believed to be a good fit, but it will need to be adapted to reflect some of the challenges specific to Canada. CIHR is looking to make a parallel system that allows the creation of comparison tables. It looks like Canada is going to come up with some type of hybrid model. The implementation of a new model is being planned for 2012 since CIHR is eagerly looking for increased standardisation of classification of its research where possible.

“Research capacity funding is big in Canada, and the CIHR needs to collect information on and understand the research it is funding. We also need to assure our classification system is relevant, complete and keeping up with the latest science. You cannot continue to use an incomplete system and hope it will meet the demands of our stakeholders.” – **Kristina Casey (Canadian Institutes of Health Research)**

Recommendation #2: Methodological developments are needed to reduce the cost of classification and increase flexibility.

The demands for creating a flexible system are universal to most organisations, as are the needs to reign in costs associated with manual coding. It requires training people to do so and puts additional strains on human resources, a financial burden that most organisations cannot afford. Therefore using an automated approach could reduce costs. It would also enable a flexible system that would allow for one version to be used for one purpose and another version for another purpose, adapting to different countries' requirements. A lot of the obstacles disappear once the resources for investing into coding are lowered.

The Netherlands is, for example, currently looking into setting up a system for its research classification and examining various systems in terms of the flexibility they offer, while taking into account the human resources required (Box 4). Elsevier is on the path to trying to make the process of coding fully automated without sacrificing accuracy. They have been working on finding the appropriate methodology for devising a classification system (Box 5).

Below are described three experiences aiming at finding a low-cost and flexible methodology for automated coding to the HRCS, conducted by the:

- **ZonMw** working with the ERA-NET on Translational Cancer Research (TRANSCAN)¹¹ at the EU level in the translational domain of cancer research (Box 4),
- **NETSCC** (National Institute for Health Research, NIHR, Evaluation Trials and Studies Coordinating Centre, University of Southampton, UK) in collaboration with Elsevier (Box 5), and
- **Deutsche Forschungsgemeinschaft** (German Research Foundation, DFG) which is currently running a pilot project to translate their own classification system into the HRCS with little effort (Box 6).

¹¹ ERA-NET TRANSCAN: <http://www.transcanfp7.eu>

Box 4: INTER-OPERABILITY BETWEEN DIFFERENT RESEARCH CLASSIFICATION SYSTEMS: THE NETHERLANDS ZonMw AND TRANSCAN EXPERIENCE

In the Netherlands, ZonMw is the public medical and health research organisation that funds both thematic and open research programmes. Historically, medical research funding in the Netherlands was the responsibility of the Netherlands Organisation for Scientific Research (NWO) with a focus on basic medical research. In 2001 the medical sciences department of NWO merged with the Netherlands Healthcare Research Organisation, resulting in the birth of the corporate Netherlands Organisation for Health Research and Development: ZonMw. Today, the research projects funded by ZonMw range from basic science to healthcare including translational research. In ZonMw's mission, a substantial part of the funding is also channelled into basic innovative research.

ZonMw does not yet have a research classification system set up and currently performs keyword searches to look for projects. Its searchable electronic database dates back to projects that started in 1995. The Netherlands is considering the implementation of a research classification system for purposes of comparison of other portfolios within the Netherlands and within the EU to survey the type of research done in partnering countries. In the field of cancer research the Netherlands is part of the FP7 European Research Area network project called ERA-NET TRANSCAN, which aims to reduce fragmentation in translational cancer research among EU Member States. Twenty-five partners from 19 countries are part of this network and the coding to be used among the partners under the leadership of Cancer Research UK (CRUK) and the National Cancer Research Institute (NCRI, UK) is the Common Scientific Outline (CSO) specifically developed for cancer research.

The main requirements for adopting a new system in the Netherlands are that it be flexible. Since it is a public organisation, ZonMw should be able to share ongoing project information with its partners, while at the same time serving the organisation's need to respond to specific queries for the Ministry. The HRCS – which derives from the CSO – and CSO need to be interchangeable and the codes have to fit in with software and the organisation's current project database. Financial considerations also weigh in, and the increased workload for programme officers has to be taken into consideration if they are required to perform quality control. Solutions for the longer term need to be considered.

“The ERA-NET TRANSCAN expects that by using the CSO it can identify strengths, weaknesses and opportunities for coordinated translational research by mapping the extent of translational research in cancer across the EU and perform analyses for future joint translational calls. As the HRCS and the cancer-specific CSO are closely linked, ZonMw is currently in a preliminary phase in terms of implementing the HRCS.” – Erica Hackenitz (ZonMw)

Box 5: HOW TO AUTOMATE RESEARCH CLASSIFICATION SYSTEMS: COLLABORATION BETWEEN ELSEVIER AND NETSCC (NIHR EVALUATION TRIALS AND STUDIES COORDINATING CENTRE)

Elsevier has been working with the NETSCC to semi-automate research classification to the HRCS and the WHO International Classification of Diseases (currently: ICD-10) employing Elsevier Collexis® fingerprinting technology. The Collexis® software ‘cleans’ text using natural language processing technology and then matches concepts to an underlying *thesaurus*, thus generating a list of keywords and ‘fingerprints’ (research profiles) for all grant abstracts ranked for relevance. Initially, this was used to identify potential reviewers for a project.

Both NETSCC and CRUK approached Elsevier for assistance with research classification. By using a combination of fingerprinting technology and supportive vector machine technology on a coded batch of data from an institution, the system developed by Elsevier tries to match the algorithm with that of the manual coders to then try and automate the process against the ICD-10 and possibly the ICD-11, the CSO and the HRCS.

In working together with CRUK and NETSCC, Elsevier is using a suggestion process by which it currently deliberately suggests too many codes to have the organisations pick the correct ones to train the algorithm. CRUK has been working on automated CSO codes for just over a year based on a historical set of 3,000 ready-CSO-coded CRUK abstracts. The final mechanism used is a vector analysis with good results. A CRUK analysis indeed suggests that about 50% of the automated coding work is taken as is, 75% taken with minor adjustment, and about 90% is ‘acceptably coded’ within the major category but not yet at the minor code level. Errors are fed back into the algorithm to increase accuracy, year on year as this is a learning vector machine.

Why is the selection process not perfect? First, Elsevier’s main difficulty is that it only has access to an internal dataset. With a limited dataset (especially on certain terms) there is a reduced ability to properly predict outcome. Secondly, inappropriate manual allocation creates inconsistencies in the automated system. There is also the issue of precision as more than one term is sometimes needed (only 75% of the HRCS Research Activity Codes (RAC) at NETSCC is coded to just one term). Access to a larger dataset would improve the process.

The benefits of having an automated system instead of doing manual coding with a large overhead are evident. It would also allow organisations to keep up with the rapid changes in science as an automated system could easily be updated, and would allow for a retrospective exercise for any organisation that has never coded to the HRCS before.

“Based on its experience so far, Elsevier believes that automated HRCS coding for both Research Activity Codes and health categories could be done to a degree of accuracy that is almost as good as manual coding, given sufficient data and some feedback mechanisms. We are currently working with the MRC (UK) to consider how best to install such a system considering the process, system, interfaces, etc.” – Giles Radford (Elsevier)

Box 6: INTEGRATION OF EXISTING RESEARCH CLASSIFICATION SYSTEMS: TRANSLATION OF THE DEUTSCHE FORSCHUNGSGEMEINSCHAFT (DFG)'S CLASSIFICATION SYSTEM INTO THE HRCS (PILOT PROJECT)

The DFG is the main self-governing organisation for research in Germany and funds research projects in all fields of science and the humanities. The DFG has developed its own classification system of subject areas which covers all disciplines. Each proposal is classified and coded along the classification system by the DFG head office as soon as it is submitted. This coding then determines to which review board the proposal is allocated and which reviewers are chosen. Therefore the DFG is in a relatively comfortable situation because the projects are already classified on a detailed level. These assignments can at least in part be mapped to the HRCS.

In 2012 DFG is conducting a pilot project on using the HRCS by translating the DFG's classification system in the field of medicine into the HRCS health categories. This enables an automated assignment of each proposal in the field of medicine to a HRCS-discipline, in addition to its original discipline based on the DFG system. The mapping of both systems based on a concordance (mapping) table is complemented by an automatic keyword search in project titles of all proposals. This ensures that not only DFG proposals in the field of medicine can be considered but also projects with health relevance that are not primarily assigned to medical research fields.

The administrative officers in the DFG head office as experts in the respective research fields they are in charge of have developed the mapping table and delivered the keywords for the different health categories that are used for the keyword search. On the basis of this preliminary work a defined sample of project applications in 2010 and 2011 will be transferred into the HRCS in the process as described above. Finally, the DFG's officers will manually verify the assignments.

As financial and personnel resources are limited, using the HRCS at the DFG will only assert itself if it is supported by automated processes which result in valid assignments. Depending on the quality of the results of the automated translation process (i.e. the proportion of correctly assigned projects, as determined by the manual check), the DFG will assess the outcome of the pilot study and decide about the HRCS implementation as a secondary classification system by the end of 2012.

"The long-term objective is to use the HRCS to analyse both the input and the output of funded projects. This would give the opportunity for international comparisons and joint analyses of health research." – **Katharina Fuß (Deutsche Forschungsgemeinschaft)**

Recommendation #3: Coordination of a common approach is needed across organisations at the national, European and international level.

It is clear that a “community of practice” is needed to maintain a consistent and relevant approach over the long term. Those organisations that wish to manage and coordinate a common classification approach will need to work together to discuss, agree and share guidelines for the continued, consistent operation of the approach. The experience of the International Cancer Research Partnership (ICRP) in using joint data classification and analysis in the UK since implementing the CSO in 2000, has offered a unique opportunity for 55 member organisations to collaborate and share information, and appears to be the best example of common approach over the long-term available so far to adopt more internationally (Box 7).

However, individual nations as well as international organisations have different requirements as was seen in particular through the Canadian experience described in Box 3. In addition WHO believes that applying the HRCS as the leading system would not suit its requirement to consider public health investment on a global scale or analyse specific needs in resource-poor settings. The European Research Council (ERC) has also recently implemented a new categorisation approach for its projects¹². These examples highlight the fact that different organisations have different requirements: some fund research that tends to be more clinical than basic, others that is more national than international, and that there will continue to be challenges in analysing research portfolios across funders and across disciplines. We can only urge that organisations carefully consider the merits of existing approaches, and their comparability for joint/international analysis.

¹² The ERC established a panel structure consisting of 25 panels, grouped in three disciplinary domains, covering the entire spectrum of science, engineering and scholarship: Social Sciences and Humanities, Life Sciences, Physical Sciences and Engineering. http://erc-staging.csn.eu/sites/default/files/document/file/erc_panel_descriptors_2012.pdf

Box 7: THE INTERNATIONAL CANCER RESEARCH PARTNERSHIP (ICRP) EXPERIENCE OF JOINT DATA CLASSIFICATION AND ANALYSIS

ICRP's central mission is to add value to cancer research efforts internationally by fostering collaboration between cancer research organisations, and it serves as an example of success in creating a joint classification and analysis system. Since its inception in 2000, ICRP has gone through a remarkable evolution, from the initial 7 partner organisations to today's 55 member organisations. ICRP receives support in part through the US National Cancer Institute (NCI) which has invested into database and website infrastructure and provides ongoing support. Membership fees from organisations provide complementary funding.

The partnership with ICRP offers a unique opportunity for cancer research organisations to share experiences and **resources** described below:

1. The ICRP **database** currently contains information on over 57,000 grants for cancer research with new data added every month. It is estimated that ICRP includes a significant percentage of the world's cancer research funding, which still leaves a gap to be filled. Whether the ICRP database could be replicated for use as a shared repository of HRCS-coded portfolio information should be considered.
2. ICRP's **website** gives partners full access to an international dataset. A public site (<https://www.icrppartnership.org/>) provides users with the ability to search for research awards - a valuable tool for identifying potential collaborators worldwide. A special feature of the website is an analytical tool that allows individual organisations to conduct their own analyses of international portfolios, providing an international perspective for strategic planning.
3. The initial ICRP group developed the cancer research-specific **CSO coding**. It was challenging to find one system that worked across different countries. ICRP is now looking at mechanisms to improve coding facility and maintain coding quality, and pilot projects are underway to link award data to research outcomes.

One of the ICRP partners, CRUK, has gained some experience with automated CSO coding. As manual coding is time-consuming, a project was initiated with Elsevier's Collexis[®] software to integrate automated coding into the grant management software. CRUK handles between 700 and 900 research funding applications per year and is in the process of evaluating the first 700 awards coded in this way after a period of 7 months to accumulate a representative dataset.

What are the results so far? As described in Box 5, the first cross-check showed that almost half of the awards were coded to the same corresponding CSO sub-codes by the expert and automated coder, and that 92% have total or partial overlap between the major CSO codes applied. Reasons for inaccuracies are currently being explored and Collexis[®] is working closely with CRUK to feed all unclear errors back into the system. One big question that remains is to assess whether auto-coding is adequate for successful coding of awards *versus* manual coding (see also Box 5).

"In 2012 we will continue to work with Collexis[®] to improve the system which is designed to 'learn' - and this is the first learning round. If the results are good enough, we will stop manually coding unsuccessful applications." – **Lynne Davies (Cancer Research UK)**

Table 1. Action plan table with milestones and timeline

This Table was created as an outcome of the discussions at the implementation workshop. It represents the work plan with milestones and timeline defining the next steps to be taken to implement the recommendations of the ESF-EMRC SPB *Health Research Classification Systems*¹ at national, European and international level, starting in 2012.

Recommendations	Stakeholders	Action needed, milestones, implementation steps
Use of the HRCS is encouraged as the leading approach for comparison and joint analysis of specifically <i>health</i> research portfolio information.	• Research performing and/or funding organisations • Funding agencies • Evaluation bodies • Charities • Governments • Ministries • Coordinators of ERA-NETs • Private companies	• Provide common terminology and definitions • Adapt classification systems to organisations (make them fit for purpose)
Methodological developments are needed to reduce the cost of classification and increase flexibility.	• Research performing and/or funding organisations • Elsevier	• Find ways to map organisations' systems to any common system to re-classify research portfolios using automated approaches • Define correspondence tables: ◦ Further refine CSO coding translation into HRCS ◦ Translate DFG's classification system into HRCS and test mapping validity in a pilot study
Coordination of a common approach is needed across organisations, at the national, European and international level.	Within UK: • Health Research Analysis Forum (HRAF) Europe: • Experts of ESF MO Forum Evaluation of Publicly Funded Research • European Research Council • European Commission Internationally: • ICRP • G8 Working Group on Research Assessment • WHO	• UKCRC to publish new report using HRCS to analyse research spend in the UK (by mid-2012) • Partner and cross-talk with ICRP and use their best practices • Share best practice, guidance, training, quality control measures • Make a trial comparing researchers' and referees' classifications with next call for FP7 proposals • Update this follow-up paper by September 2012 with new data and experience

Conclusions and next steps

The SPB HRCS implementation workshop that took place in London on 22 November 2011 highlighted that the HRCS is already being actively used by funders of health research, and this work is already providing useful information for strategy development within organisations and across regions. Many organisations were still testing ways to efficiently implement research portfolio classification, and ensure consistent results. Opportunities for organisations to share their experience and keep apprised of progress elsewhere were agreed to be helpful.

One of the conclusions of the meeting was that there would not be universal agreement over a single classification system, as organisations, and particularly ESF-EMRC Member Organisations which were the major focus of the SPB recommendations, had significantly different research portfolios and stakeholder requirements. However the meeting served to ensure that organisations were aware of the need to consider ways to “map” information about the research they fund to portfolio information from other organisations.

Another challenge that came up in discussions was how to create a system that is good enough today but at the same time can be adapted to the needs of tomorrow, ideally through some form of automated system, since science is a rapidly evolving field.

There was indeed significant discussion about the promise of automated approaches for research classification. Automation should significantly reduce the time and effort required to re-classify research portfolios. This should make it possible to analyse portfolio funding information across any number of organisations internationally, if information about projects (scientific abstracts) of sufficient quality can be compiled. The presentation from Elsevier was encouraging, but the work to test the vectoring approach is still at an early pilot stage.

It was noted in the SPB that classifications focussed on research projects and programmes, and in the main did not address infrastructure funding. In addition information on R&D in the private sector was often not available for analysis. Some thought on standard ways to present the investment in research infrastructure may be helpful and ways to capture/estimate private sector spend by therapeutic area are needed given the substantial contribution to research from this sector.

In the UK, the Health Research Analysis Forum (HRAF), a group with representation from 12 funding agencies that support health-related research, is currently working on an analysis of UK health research spend in 2009/2010 using the HRCS that should be published by mid-2012. This will lead to discussions about the merits of adopting an approach similar to the ICRP but for all health research in the UK, which may then be spread to as many European research performing and/or funding organisations as possible, and even beyond Europe.

It was agreed that this paper should be updated by September 2012 as a way of encouraging attendees and the organisations they represent to share new data and experiences with the HRCS implementation. Dr. Ian Viney agreed to coordinate the update, ensuring that this was discussed in the UK via the HRAF, across Europe via the ESF Member Organisation Forum on Evaluation of Publicly Funded Research¹³, among others (e.g. European Commission, ERC), and that international colleagues from, e.g., the WHO and the ICRP, were re-contacted prior to this date. In April 2012, the Fonds de la Recherche Scientifique (F.R.S.-FNRS, Belgium) shared its internal methodological discussions around the HRCS implementation in parallel to its own ERC-based classification system (Box 8). More European performing and/or funding organisations, and particularly the ESF-EMRC Member Organisations, are expected to do so during the course of this year.

¹³ <http://www.esf.org/activities/mo-fora/evaluation-of-publicly-funded-research.html>

Box 8: HRCS IMPLEMENTATION DISCUSSION AT THE F.R.S.-FNRS

The Fund for Scientific Research (F.R.S.-FNRS) is a research funding agency that promotes and supports basic scientific research in the French-speaking community of Belgium. F.R.S.-FNRS fosters research in all scientific fields, following a bottom-up approach of investigator-driven research.

The F.R.S.-FNRS recognises the strategic need for a harmonisation of health research classification and has recently modified its own research classification on the basis of the ERC nomenclature. Therefore, it was decided that the HRCS system would be introduced in parallel to the ERC descriptors for information and tracking purposes only.

Most internal discussions concerned the methodology. Indeed, as other agencies, the F.R.S.-FNRS had the choice among four options:

1. The classification could be implemented by the applicants themselves using the online submission system. The HRCS descriptors would be introduced in a new section of the application process. Although this option relies fully on the scientists' interpretation, it could be initiated quickly at a low cost and with very little consumption of internal resources.
2. Software could be used to determine the HRCS classification based on the abstract or project content. This fully automated system has not been tested at a large scale yet. It would, therefore, require an important development phase. This automated system would consume very little internal resources, but its cost remains unknown.
3. The HRCS classification could be carried out by scientific officers at F.R.S.-FNRS. Although this option could be very efficient, it might require a lot of internal resources and the concerned officers should be trained.
4. The HRCS classification of biomedical and medical projects could be carried out by a centralised team of trained scientists/officers. It would be the more coherent way to proceed, but its cost and implementation modalities remain unknown and it would require a common agreement among all participating agencies.

"Due to financial and resources constraints, the F.R.S.-FNRS decided to initiate option 1. The preliminary implementation plan will be established in the coming weeks with the objective to start around January/February 2013." – **Arnaud Goolaerts (Fonds de la Recherche Scientifique - FNRS)**

Annex: Acknowledgements

The SPB HRCS including full lists of expert group members, additional contributors and organisations that endorsed the recommendations is available from: <http://www.esf.org/hrcs>

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