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Impact oriented monitoring: A new methodology for monitoring and evaluation of international public health research projects

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Impact oriented monitoring (IOM) is a novel methodology for identifying and assessing the impacts of EU-funded research projects in the area of International Public Health. A framework based on the logic and payback categories is used to categorize, into multi-dimensions, the impacts produced by public health research projects. A set of tools, including: 1) a project results framework; 2) a coordinators' survey; 3) an end users' survey, and 4) an assessment tool (scoring matrix), have been developed for both collecting data on results and activities and helping in assessing impacts. The need to know the impact of the projects based on robust data but, at the same time, to minimize the time and resources required of both the EC officers implementing the methodology and the project coordinators providing data on results and impacts, has led to the development of the IOM methodology. The methodology is expected to provide the DG Research and Innovation of the European Commission (EC) with usable information on how the research projects in the area of international public health are producing impacts. More importantly, this information could improve the performance of existing programmes and also form the basis for supporting research policy planning. The IOM methodology can be easily adapted to other EC-funded research areas and also implemented in other countries by institutions responsible for funding research activities.

Keywords: monitoring and evaluation; international public health; impact identification and assessment; research projects.

1. Introduction

EVAL-HEALTH is an on-going collaborative research project funded by the European Union 7th Framework Programme (FP7). The main goal of the project is to contribute to the strengthening of monitoring and evaluation (M&E) of European Union-funded interventions in developing countries in the specific area of international public health. The project, scheduled to finish in October 2014, is being carried out by a consortium of nine partners from Europe, Africa, Asia, and Latin America. The project is divided into two research components focusing on different facets of the M&E of International Public Health interventions:

- Analysis of the role of evidence in health policy development in low and middle income countries, including research results.
- Design and development of a new methodology to support the Directorate General for Research and

Innovation (DG Research and Innovation) of the European Commission (EC) in their task to monitor and evaluate the impact of research projects that are funded in the area of International Public Health.

This article will cover the second research component, that is, the design and development of a new methodology for the M&E of research projects, from hereon named impact oriented monitoring (IOM). Projects should be understood here as specific collaborative actions funded by the EC under framework programmes (see, for instance, http://cordis.europa.eu/fp7/what_en.html). Thus, IOM methodology will support DG Research and Innovation in collecting and analyzing data from projects in order to: 1) monitor project performance, 2) identify real and potential impacts, 3) assess impacts, and 4) support further *ex-post* evaluations of the overall programme performance. Monitoring, in the context of the IOM methodology, should be understood as a procedure to identify, follow up, and foresee potential impacts and assess their feasible achievement over the medium- and long-term, not only in the period of the project duration but also some years after. Project impacts are normally achieved long after the project has finished, and thus impact monitoring should follow after project completion.

The EC has, over 30 years, financially supported Public Health Research projects in low and middle income countries (European Commission, 2004). The support has made a significant contribution to Public Health Research outcomes as well as strengthening the research capacity of institutions and individuals, giving rise at the same time to solid partnerships. In the EU FP7, international public health and health systems is a sub area of the public health programme that addresses health policy research, health systems and health service research, maternal and child health, and reproductive health in the context of the Millennium Development Goals. Funded projects can be research projects or coordinating and support actions, and are funded as 'Specific International Cooperation (INCO) actions' which is the instrument mostly used by the FP7 for INCO, and it requires the participation of both EU and non-EU partners, including organizations from developing countries. Projects are mostly policy oriented and the main beneficiaries of the research are expected to be the non-EU countries' health systems.

The methodologies and approaches used by the EC to evaluate R&D actions (individual projects and programmes) are only standardized for *ex-ante* project evaluation (selection of the best proposals). For the interim and *ex-post* evaluation of projects or programmes, the methodologies employed vary enormously (Piric and Reeve 1998; Reeve 2010) and there are no specific and tailored methodologies to monitor and assess R&D projects and actions in the field of health.

At present, the EC DG Research and Innovation, which is in charge of managing the Framework Programmes for research, follows up projects through *interim* and final reports that include both scientific-technical and financial issues. Although these reports are useful sources of information for *ex-post* evaluation by external experts, they are difficult to use on a day-to-day basis to get clear and immediate information on how individual projects are performing. Moreover, reporting, as it stands now, does not facilitate the identification of real and potential impacts of the research. In most cases, reports are narrative and oriented towards describing project results, instead of demonstrating how these results may have an impact.

The European Court of Auditors (2008) reviewed the Commission's evaluation system, covering the period from FP4 to part of FP6. Although this review determined that the basic requirements for evaluation were appropriate, an important number of areas of potential improvement were also pointed out, such as:

- Absence of a comprehensive evaluation strategy which resulted in inconsistent approaches between the various Commission departments.
- Inadequate methodological guidance (evaluation manual) was provided by the EC.
- Problems in data gathering, making it mainly insufficient for evaluation purposes.
- Evaluation studies focused on short-term issues of programme implementation; no evaluation study was found addressing the longer-term outcomes and impacts of the FPs.
- Innovative evaluation methodologies or techniques were generally not used.
- FP evaluation was under-resourced: approximately 1% of Commission staff and only 0.15% of budgetary appropriations were spent on evaluation.

The Council of the European Union (2009) made some other recommendations to the EC regarding the evaluation and impact assessment of European research framework programmes. The Council highlighted the need to optimize the collection, analysis, and use of robust data on the FPs regarding participation and results, in order to better measure the achievement of programme objectives in terms of outputs, outcomes, and socio-economic impacts. In this regard the Council recommended to "take steps to establish a basis for *ex-post* impact assessments of FPs, including a database of project results (outputs, outcomes, and impacts)…".

Specifically related to the evaluation of EC-funded health research, two reports (DG Research and Innovation 2011, 2013) and one article on the academic output (Galsworthy et al. 2012) have been published recently. These documents clearly show the considerable difficulties encountered in obtaining good data (both in terms of quantity and quality) for project outputs and

impacts, as well as problems regarding the interpretation of the data gathered.

The IOM methodology has been designed to try to solve the abovementioned difficulties (lack of good data and difficulties in analyzing them) by providing an easy and clear method to compile, organize, and discriminate between data on project results and impacts. Structured information is intended to facilitate and underpin the decision making of EC officers in charge of project management, and support them in the design of future research topics and programmes.

As proposed in this work, new efforts and initiatives that are able to provide any evidence to support decision and policy making in health research may be very useful, given the fact that, in general terms, health is normally an area that receives a high R&D budget allocation from both the European Commission (2014) and from national funding agencies (Røttingen et al. 2013).

2. Related works

Considerable background information on the M&E of research projects and programmes is available (Horton et al. 1993; Fayl et al. 1998; Georghiou and Roessner 2000; van Raan 2000; Millstone, Van Zwanenberg and Marshall 2010; Link and Vonortas 2013). Many publications have explored different practices in the evaluation of research outputs, outcomes, and impacts (Luukkonen 1998; Maredia, Byerlee and Anderson 2000; Furman et al. 2006; Grant et al. 2010; Bozeman and Sarewitz 2011; Czarnitzki and Lopes-Bento 2013; Guthrie et al. 2013; Morgan and Grant 2013; Bloch et al. 2014). There is also a growing number of frameworks and methods suitable for evaluating the impact of research in general (Grant et al. 2010; Bornmann 2012; Council of Canadian Academies. Expert Panel on Science Performance and Research Funding 2012) or for specific areas, such as Health Research (Hanney et al. 2004; Banzi et al. 2011), Agriculture (Horton, Galleno and Mackay 2007) or Environmental Research (Boaz, Fitzpatrick and Shaw 2009).

Furthermore, in M&E there is a lot of experience of research in the context of developmental aid, where there are many organizations funding research activities in developing countries, both as research projects and to build and strengthen research capacity. M&E is crucial for providing information about results and impacts in order to justify continued support. But in addition to this, strong M&E is needed: to inform project and programme design; to inform management of the programme; and for organizational learning. There is not a 'one size fits all' methodology to monitor research projects and evaluate results and impact. Each donor organizes M&E activities to suit their specific needs and normally establishes an M&E guide for all their developmental aid actions, including research-related actions.

In the field of health research, a well-known and widely used approach for evaluation of the research impacts is the Payback model (Buxton and Hanney 1996). It was designed by the Health Economics Research Group (HERG) of Brunel University during the 90s and it has become one of the most frequently used frameworks for evaluating research impacts (see Fig. 1; Boaz, Fitzpatrick and Shaw 2008).

Although the Payback model was originally designed to examine the impact of health services research in the UK, it has gradually expanded to other health areas such as basic, biomedical, or even social sciences research. The Payback model originally categorized the types of 'payback' or benefits from research in five domains:

(1) Knowledge production.
(2) Research targeting and capacity building.
(3) Informing policy and product development.
(4) Health and health sector benefits.
(5) Broader economic benefits.

The Payback model has been used for research impact evaluation by a wide range of organizations including, among others, the UK National Health Service (Raftery et al. 2009), the Ireland Health Research Board (Barrett and Curran 2010), ZonMw in the Netherlands (Oortwijn et al. 2008), the Canadian Academy of Health Sciences (Frank and Nason 2009; Panel on Return on Investment in Health Research 2009), the Hong Kong Health and Health Services Research Fund (Kwan et al. 2007), and the Australian Primary Health Care Research and Information Service (Kalucy et al. 2009). The major challenge when using this framework is the strategic selection of indicators that are sensitive and specific enough to address evaluation questions, while not being too time-consuming to collect. An important lesson learnt from the use of this model by different agencies under different circumstances is the need to adapt the model to reflect the particular situation and context of the R&D funding institution whose research programmes are being evaluated.

Apart from Payback, there are many other empirical approaches, models, and frameworks used for assessing the impact of health research as pointed out in the review by Banzi et al. (2011). Recently, Boyd et al. (2013) made another exhaustive review of different frameworks for the evaluation of 'health research capacity strengthening', which is being considered as an important area for action to improve health in low and middle income countries and to address global health challenges. In this review, the ESSENCE framework is described and analyzed. ESSENCE is a collaborative framework involving several funding agencies active in developmental aid, to optimize research capacity by improving the impact of investments in institutions and people.

Regardless of the framework or model used, an effective M&E system requires a good and clear understanding of

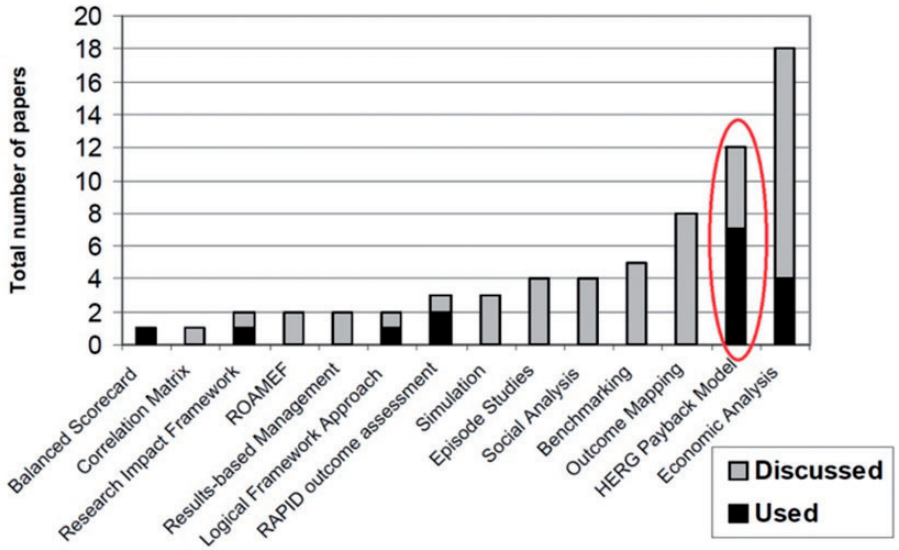

Figure 1. Frameworks for structuring and interpreting data.

the research cycle: what the results (outputs and outcomes) of the research are, how the results are used and applied by the end users and what impact the results can have on both academic and non-academic spheres. Moreover, suitable M&E methodologies and tools to help identify and evaluate the research results and impacts need to be developed, considering beforehand the intended use of M&E findings as well as the resources available to carry out M&E (budget and time availability mainly).

Despite the large number of tools and varied methodologies for project M&E, there are important challenges in identifying and measuring the non-academic impact of research. These challenges have been previously reviewed by several authors (OECD 2008; Morgan and Grant 2013; Penfield et al. 2013) and they refer mainly to: 1) *Attribution* for determining the contribution of specific research projects (versus other factors) to the expected long-term impacts, such as positive changes in health or improved health care; 2) *Time lag* between the research and its impacts which can significantly hinder or even foreclose the identification of any evidence of long-term impacts of research; 3) The '*halo effect*' perceiving only positive effects from research and not taking into account, for instance, the opportunity cost; 4) The *dynamic nature of impact*, as impact changes over time and these changes can result in an increase or decrease in the degree of impact.

In addition to the above-mentioned difficulties inherent to any research impact assessment, a different type of challenge comes from the fact that in some countries there is a low awareness or even a negative perception among the research community of the benefits of assessing research outputs, outcomes, and impacts. The assessment will help to continuously improve public funding as well as to tailor research towards broader societal needs.

3. IOM methodology

The IOM methodology is based on the hypothesis that proper recording of appropriate indicators during and after the project life can provide sufficient data to identify and assess immediate and short-term impacts, as well as some evidence of future long-term impacts. The methodology incorporates different tools to facilitate both the capturing and further assessment of data. Figure 2 summarizes the tools and components proposed in the IOM methodology.

As shown in Fig. 2, the IOM methodology has two well-differentiated components:

- The *Theoretical framework* component, designed to analyze, describe, and represent in a condensed and systematic way the main elements of research projects and programmes. In this way, inputs, activities, outputs, and impacts generated by research can be identified and further classified through different approaches, for instance, according to time or categories.
- The *Impact Monitoring System*, which includes the *data collection* component and the Assessment tool. The first includes tools designed for the purpose of gathering consistent data from projects from project coordinators and end users (*The Results Framework, the Coordinators' Survey, and the End users' opinion survey*). The *assessment tool (Scoring Matrix)* has been designed to support officers in the preliminary assessment of project impacts. Some of these tools were tested, but using a limited sample of research projects from FP5 and FP6 programmes.

The components and tools of the IOM methodology are described below.

3.1 Theoretical framework

The IOM conceptual model (see Fig. 3) uses a logic model approach (W. K. Kellogg Foundation 2004) to describe the process from research inputs to project outputs and impacts in the context where the IOM methodology will be applied: the EC Framework programme. The model illustrates the theoretical pathways underlying the research cycle, and how the various results are translated into immediate, short-term, and long-term impacts. The model identifies what in theory can be expected as the main outputs of the projects: that is, the direct results (scientific publications, patents, better trained researchers, educational programmes, etc.). These results can be measured and can be easily attributed to the funded project. The use of these results by different stakeholders can have an immediate/short-term impact, revealing a benefit brought by the project.

The following figure represents the IOM conceptual model constructed as a logic model, representing the research process. It supports the development of the IOM methodology for the identification and assessment of the impacts of public health research projects funded by the EC as part of the FP7.

Together with this model, the IOM methodology will use the impact categories for health research proposed by Buxton and Hanney (1996) in the Payback model, in order to guide the operability of the IOM model and its implementation. This model facilitates the organization and classification of expected impacts of health projects by means of a set of predefined categories. A short description of the impact categories and how we expect to gather evidence for each of them in order to assess the impact of projects is provided in Table 1.

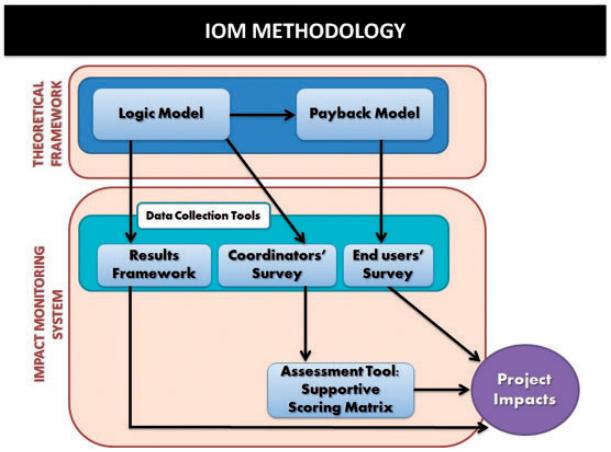

Figure 2. IOM methodology: tools and components.

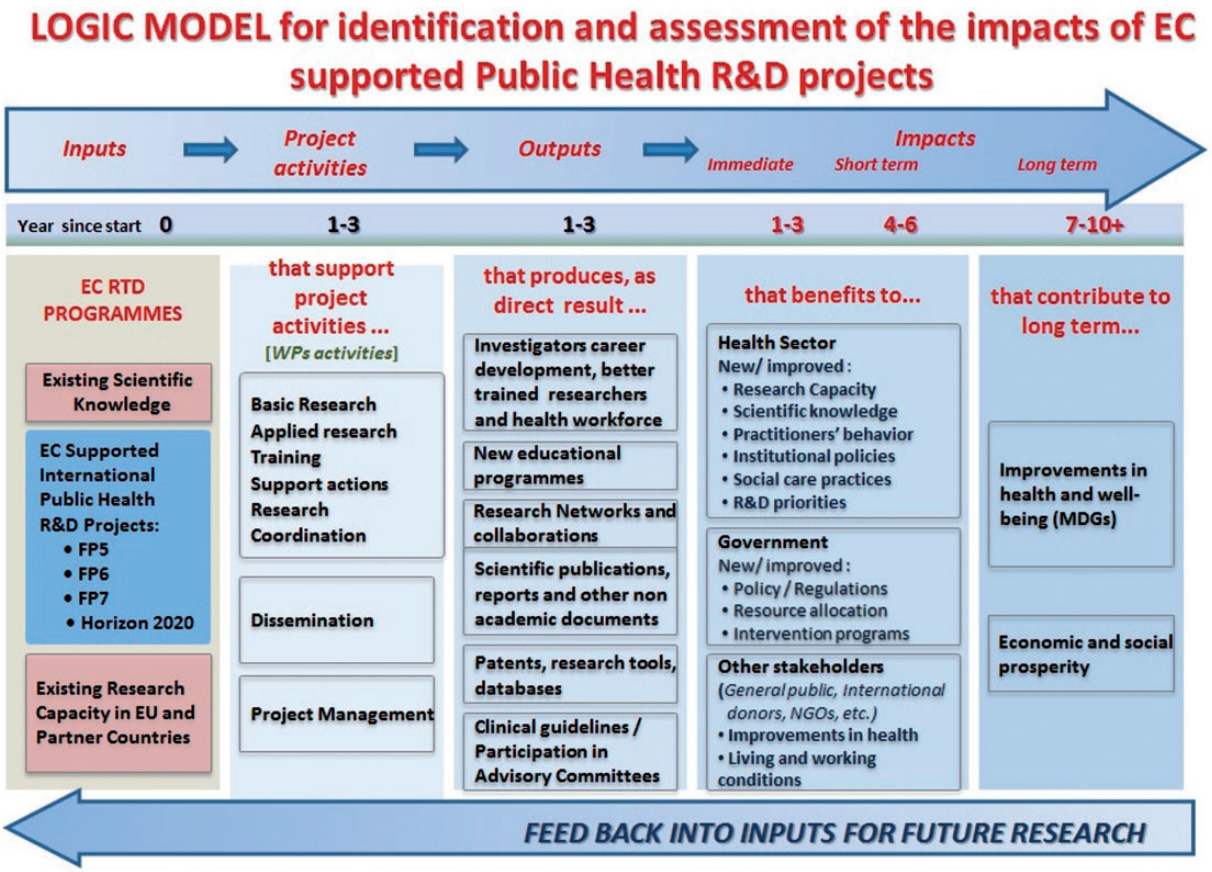

Figure 3. Proposed logic model for identification and assessment of the impacts of EC-supported public health R&D projects.

Table 1. Impact categories in the IOM methodology adapted from the Payback model

Impact categories	Description	Example of indicators
Advancing knowledge	Impacts of the research in advancing knowledge by contributions to scientific literature, presentations, books, grey literature, etc.	• Scientific peer-review publications • Contributions to scientific congresses, conferences, and symposiums
Capacity building and research targeting	Impacts of the research in the development and enhancement of research skills in individuals and teams	• Career advancements • Additional funding attracted for new projects
Informing decision-making, practice and policy	Impacts of the research in the areas of science, public, clinical, and managerial decision-making practice and policy	• Results or findings used for policy/decision-making/health practice • Participation of members of project consortium in health-related policy/advisory committees
Population health and health sector benefits	Impacts of the research in advances in prevention, diagnosis, treatment, and palliation	• Project contribution to improvements in the health systems/health service delivery of partner countries
Pathway to impact		
Dissemination and knowledge transfer	Activities developed to better transfer and communicate the outputs of the project	• Final conference with stakeholder and key users • Engagement with end users

On the basis of the dissemination interface originally introduced in the Payback model (Buxton and Hanney 1996), we decided to include a specific category termed as 'Dissemination and Knowledge Transfer' in the IOM model, as we consider that identifying, and if possible measuring, dissemination activities during the whole project life could provide good evidence for long-term impacts. It is clear that the nature and degree of impact any research may have relies greatly on the effort made by the research team to disseminate the research results and findings and actively engage with key project stakeholders and end users. This is even more important for research focused on creating evidence for policy or decision-making, as the impact greatly depends on an active uptake of research findings by those who have to make decisions or implement specific health policies. Results need to be shared and used at the level of policy and decision-making to have a positive impact further on, for example, strengthening health systems and improving health. Through the case studies work carried out by the EVAL-HEALTH project to develop the methodology, we were also able to confirm that successful projects had worked hard to actively engage with all important stakeholders, such as the Ministry of Health, local authorities, or health practitioners, especially in those countries where the research could be applied to improve and strengthen the health system.

Following the previously explained IOM conceptual model, which has also taken into account the conceptual time path for technology diffusion and expected impacts (Ruegg 1999; Tassey 2003), we have developed a hypothetical example to visualize how the different types of impacts that can be expected from research projects evolve over time (see Fig. 4).

This figure makes clear the need to implement a monitoring methodology for identifying and assessing the impacts of R&D projects not only during the project life, but also for several years after its completion, which is the case for the IOM methodology.

3.2 The impact monitoring system

A wide variety of results are produced during and after the research process of any project. Capturing this information becomes a key issue when it comes to identifying and assessing impacts. The IOM methodology provides the tools to track, identify, document, and assess the results coming out of research projects as well as the way these are translated into and used to achieve impacts. Three main tools for collecting relevant data have been developed: 1) the results framework; 2) the Coordinators' survey; and 3) the end users' opinion survey. However, each has a specific purpose and time for its use. Also, to help in the preliminary assessment of project impacts, an Assessment tool has been designed as part of the methodology. Table 2 summarizes the purpose of the IOM tools, together with their format, timing, and the final use of the information collected.

A short description of each tool is provided below.

3.2.1 Project results framework. As part of the IOM methodology, we propose that the project coordinator prepares a project results framework during the grant negotiation process. The results framework is a simplified version of the logical framework that helps coordinators to organize important project information by linking

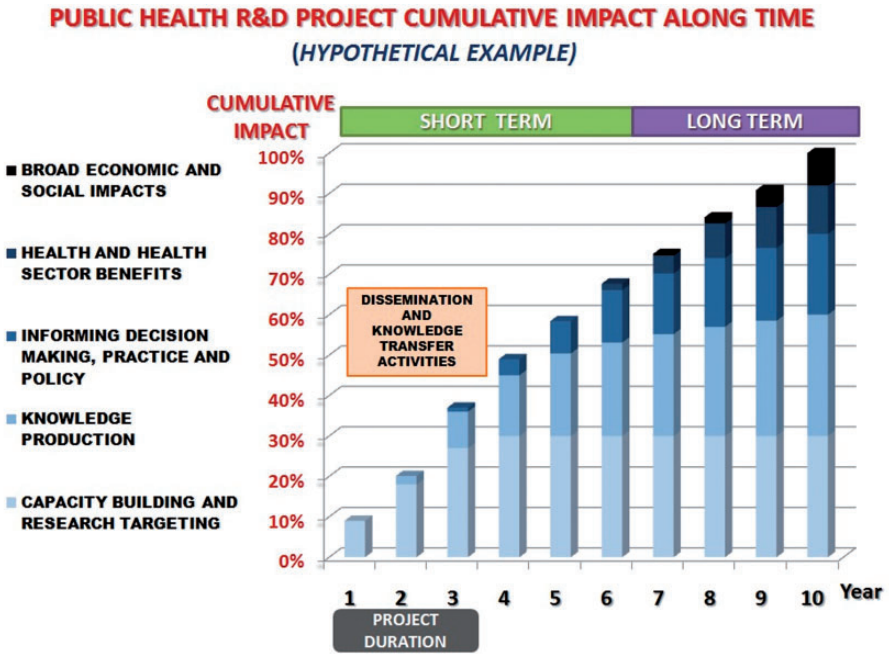

Figure 4. Public health R&D project cumulative impact overtime.

Table 2. Summary of the IOM tools

	Purpose	Format	Timing	Final use	Status
Project results framework	To help to structure the expected project results and impacts To help to assess specific short-term project impacts	Online/web tool	Prepared by the coordinator during Grant Agreement, completed at mid-term and final reporting of the project.	• Project management • Project assessment	Proposed
Coordinators' survey	Main data collection tool for capturing project results and evidence of research impacts	Web-based questionnaire	• Middle of the project (only for projects lasting 4 or more years) • End of the project • 3 years after the project	• Project management (monitoring) • Project assessment • Programme evaluation	Piloted/Refined
End users' opinion survey	Data collection tool to gather end users' opinions on the non-academic impact of projects	Web-based questionnaire	• End of the project	• Support the assessment of non-academic impacts of individual projects. • Help in the identification of high impact projects	Proposed
Assessment tool (Scoring matrix)	To facilitate a quick estimate of the level of impact of individual projects on fixed domains (knowledge production, capacity building and research targeting, policy and decision-making, and population health and health system)	Spreadsheet	• End of the project • 3 years after the project	• Project assessment • Comparative analysis of funded projects • Programme evaluation	Piloted

objectives with activities, results, and impacts in an easy-to-follow way. The logframe is a very useful tool for project planning and monitoring.

The Project Results Framework is prepared during the planning and design phase of the project and can be updated throughout the project life, adapting itself to the on-going research work. The coordinator can use the framework to report periodically on the project based on the results indicated in this tool, as part of the periodical reporting activity mandated by the EC. A first version of

the proposed Results Framework for the IOM is presented in Annex 1.

3.2.2 Coordinators' survey. In the EC jargon, the project coordinator is not equivalent to the lead investigator but rather 'the member of the consortium who is the principal point of contact on behalf of the members of the consortium in relations with the Commission or the relevant funding body' (see https://www.iprhelpdesk.eu/glossary).The selected tool for tracking results overtime in our methodology is a web-based questionnaire that gathers information from the project coordinators. To do so, we focused on previous approaches proposed by Hanney, Davies, and Buxton (1999) where a questionnaire based on the Payback model and categorization was designed to evaluate research funded by the North Thames National Health Service Executive, or Wooding et al. (2009) who designed and implemented web-based surveys to collect data from the Arthritis Research Campaign in an attempt to map and catalogue (using Payback categories) the impacts generated by funded research. Another appropriate tool for collecting information and tracking outputs, outcomes, and impacts coming from research funded by the Medical Research Council is Research Fish Ltd (2012) (formerly MRC e-Val). Thus, this advanced system was launched and commercialized almost in parallel with the design and development of IOM methodology.

To the greatest extent possible, the questionnaire has included closed questions covering a series of response choices. These types of questions are normally easier to complete and analyze although harder to formulate (it is necessary to cover all possible pieces of information so as not to leave important issues out). Open-ended questions or space for comments after certain closed questions are also introduced into the questionnaire in order to improve understanding of project status.

The coordinators' survey has been designed to gather the largest possible range of public health research benefits, so it is applicable to all the projects under study. At the same time, it has been devised to be completed in a short time (max. 1 h) by the project coordinator.

The questions were arranged following the IOM impact categories defined previously, together with a specific section for 'Dissemination and knowledge transfer'.

- *Advancing knowledge:* This section will mainly collect data (quantitative and qualitative) on academic and technical literature which can be used to assess the contribution of the project to scientific knowledge: literature indexed by scientific databases (Web of Science and Scopus), patents, posters, etc. In addition, some other significant outputs from research, such as tests, software/database, designs, or protocol/guidelines among others, will be included.
- *Capacity building and research targeting:* Capacity Building refers to the growth and improvement of research skills in individuals, teams, and institutions. Research targeting focuses on how a project or research leads to new areas of research and research activities. These items will be measured through the collection of data on the number and type of personnel involved in the project, exchange of personnel, networking, infrastructures, and future projects.
- *Informing decision-making, practice, and policy:* This section identifies how far the project reached decision makers. It provides valuable data about the type of decision makers approached during the project life, the importance of decisions taken as a result of the project, and the geographical influence of these decision makers.
- *Health and health sector benefits:* This section identifies how the project may have an impact on the health of the target population and/or make an improvement in the health systems of developing countries. Impact at population level is difficult to attribute to a specific research project, but also most of these impacts will only be visible many years after the project has concluded. Thus, anticipated impacts are included as a proxy (may be achieved even without supporting evidence).
- *Dissemination and knowledge transfer:* This part of the questionnaire gathers relevant data and information on active and passive dissemination activities carried out during the project and is useful to assess how far the consortium has worked towards having a greater and wider impact. It includes identification and engagement of end users as well as issues related to sustainability of the project over time, dissemination tools used, meetings attended, participation in social networks, etc.

To facilitate and simplify the questionnaire as much as possible, coordinators are mostly asked about issues regarding the project and its activities. In this way, coordinators should be able to report and respond easily. Furthermore, we propose that the survey should be mandatory and included in the grant agreement.

The survey needs to be sent twice for each project, at the end of the project life and 3 years after project completion. For projects lasting more than 4 years, a midterm survey is recommended. Monitoring projects after they have finished is very relevant in order to obtain real evidence of outputs and impacts that are only achieved some time after the project has ended. An evident and interesting instance of this refers to the number of publications generated as a consequence of the project research. Figure 5 shows percentages for publications published within the project life, and those published once the project had finished. Data were taken from the results of the coordinators' survey carried out during EVAL-HEALTH research with real projects funded by the EC FP5 and FP6.

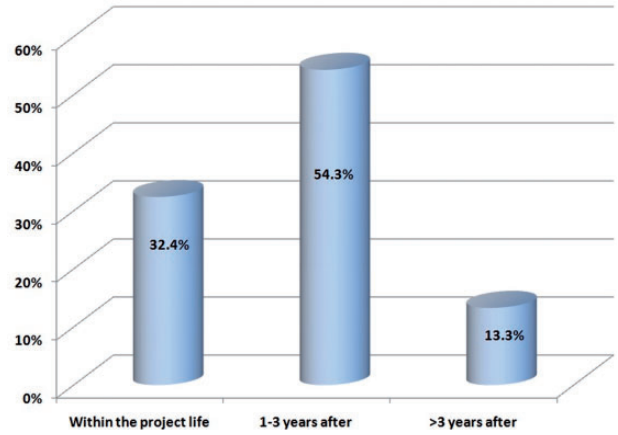

Figure 5. Distribution of project publications over time.

It shows how the majority of publications were published 1–3 years after the project.

During the EVAL-HEALTH project, we tested the coordinators' survey by sending it out to a total of 116 INCO projects on health and related fields, funded by the EC FP5 and FP6 and which involved the participation of cooperation partner countries. We obtained responses from 28 projects that were useful in refining the questions and validating the utility of the tool. Complete surveys from 19 projects were also used to develop and test the assessment tool (scoring matrix).

To further validate the questionnaire, we performed case studies. Nine projects were selected from the pool of projects whose coordinators had responded to the questionnaire, based on two criteria: the geographic area (Asia, Africa, Latin America, and Mediterranean countries) and the type of project (Collaborative research projects, and Coordination and Support actions). The validation work involved checking if the questionnaire was gathering the correct information and the validity of the data for the purposes of identifying and assessing research impacts. In our study, it was also important to check if the coordinators' survey was able to record evidence of impacts that could be significant for cooperating partner countries participating in the project.

The full questionnaire prepared for the coordinators' survey is included in Annex 2.

3.2.3 The end users' opinion survey. The IOM methodology makes use of sound tools for gathering data, such as the results framework and coordinators' survey, but in both cases relies only on the coordinator to provide this information. Some kind of data triangulation to compensate for the possible bias derived from collecting data only from the coordinators' side could be achieved by getting some feedback from the potential or actual end users of the research results. Feedback on the usefulness and practical applicability of the results and findings of the project from the potential or actual key users is valuable for the non-academic impact assessment of the projects. We can define end users as the *specific intended groups of 'users' or beneficiaries of the project's results*. For the area of health research, *End-users are those who are affected by issues under study (e.g., community groups or populations affected by illness), or those positioned to act on the knowledge generated by research (e.g., clinicians, community leaders, health managers, patients, and policy makers*) (Jagosh et al. 2011).

However, involving end users in the evaluation process presents many difficulties, above all, targeting the right actors and motivating them to participate in the process (Vullings, Meijer and Mostert 2008). In our specific case, it also requires two other important conditions: 1) that researchers involved in the projects are able to clearly identify the most relevant end users for their project (which is not always done); and 2) more active participation on the part of project officers in the monitoring and assessment of individual projects, as they have to be in charge of contacting end users, asking them to participate in the survey and analyzing the results.

In the IOM methodology, project coordinators are asked to provide the names of the organizations engaged as end users and this will facilitate identification. It will be important to identify the person(s) from these organizations who have been contacted by the project and thus are aware of the project, its goals, and activities, etc., since they can give an opinion on the project impact.

The end user survey should be conducted directly at the end of the project by the EC project officer. It should be short and easy to answer, and only seek the opinion of the person who answers the survey. He or she should not be asked to answer on behalf of the organization as this may hamper the response.

The questions proposed for the end users' opinion survey can be found in Annex 3.

3.2.4 IOM assessment tool: the scoring matrix. In contrast to reporting, monitoring should involve some assessment of the data collected during the progress of the research projects or actions. In our case, although an assessment of project performance can be achieved by analyzing the results of coordinators' survey, we have considered that a tool providing an overall and summarized picture of the project impacts for each dimension could be very valuable to facilitate and underpin the decision-making process.

Scoring tools are normally used in all European funding institutions as part of the *ex-ante* evaluation for the selection of the best proposals to be funded, and as a complementary tool of the peer-review assessment (European Science Foundation 2011). However, the use of scoring methodologies for monitoring and *ex-post* evaluation processing of funded projects is very uncommon.

Scoring approaches have been widely addressed since the 1950s in fields such as decision sciences, management sciences, or science policy (Moore and Baker 1969; Krawiec 1984; Rengarajan and Jagannathan 1997; Wang, Wang and Hu 2005). However, when the focus is put on monitoring and *ex-post* evaluation of individual research projects, the fact is that except for scoring processes carried out within the few studies using the Payback model, there is scant scientific literature dealing with this topic. By contrast, there is a noteworthy example of usage and implementation of scoring for these purposes within the field of cooperation: the results oriented monitoring (ROM) methodology (Hall and Clauss 2012) defined as a review and assessment tool applicable to project and programme level aimed at collecting structured data, capturing evidence, and supplying recommendations to improve and outline the quality and performance of Europe Aid's portfolio.

There are some cases of scoring implementation precisely associated with the Payback model developed by Buxton and Hanney (1996). Following this model, Hanney, Davies, and Buxton (1999) used a scoring approach to rate some items of a questionnaire aimed at assessing research impacts from a North Thames R&D portfolio. Likewise, Buxton et al. (2000) conducted a similar study where the basis for the development of a plan for regular monitoring was proposed. Wooding et al. (2005) developed a comparative analysis of research grants for arthritis through case studies, that were then evaluated by a qualitative assessment and a scoring process to rate the level of payback from each case study in each category. Similarly, Pollitt et al. (2011) used a rating panel integrated by researchers to score the impacts of case studies according to a scoring sheet and payback categories. Then, a scoring panel based on assessment of stakeholders was applied to identify successful case studies in producing various types of impact within the five payback categories in the field of mental health research (Wooding et al. 2013). In the Netherlands, Oortwijn et al. (2008) assessed the impact of 'Health Technology Assessment' for individual projects through dossier reviews and surveys whose summarized and structured findings were later assessed by experts using an iterative scoring of payback.

In the IOM assessment tool, we score projects against the four selected categories of impact, that is 1) advancing knowledge; 2) capacity building and research targeting; 3) policy and decision making; and 4) population health and health systems, plus the category on dissemination and knowledge transfer.

We equated all these categories (from here on referred to as dimensions) to scoring criteria. By following the scoring approach of Souder (1972) a set of dimensions delineated by distinct characteristics (or items) was then defined. In our case, the items selected were indicators of impact used in the coordinators' survey.

The different items of each dimension were finally rated using one of the following scale types:

- Yes/No scale where Yes = 1 and No = 0.
- Yes/No scale supplemented by discrete numbers representing values for each concrete item, so that if a YES answer is given, a corresponding value for that item, that is the number of times it occurs, has to be indicated.
- Likert type scale (Clason and Dormody 1984; Jamieson 2004) with values 'Not at all', 'May in the future', 'Yes, to some extent', and 'Yes, to great extent' and corresponding to a numerical scale covering values from 0 to 3.

The set of dimensions and the associated items used for implementing our scoring tool are listed in Annex 4.

Information extracted from the coordinators' questionnaire can be directly loaded onto the scoring matrix, since items and dimensions match with corresponding questions in the survey. Once information is loaded in the scoring matrix we tried as far as possible to find an objective criterion to discriminate and further classify projects into different groups according to impact scores obtained over the payback categories. A simple and realistic approach led us up to establish three main groups of projects based on their impact scores, namely, 'Low Impact', 'Good Impact', and 'High Impact' projects.

The next step was to fix boundaries among these three groups in order to classify projects across each category. In our opinion, a reasonable choice is to transform values of each item into percentages and subsequently calculate the cumulative percentages. In this way, we could obtain the four quartiles (Q) of the distribution in a similar way to the approach used by bibliometric tools such as SCImago Journal and Country Rank (SCImago 2007) or Journal Citation Reports (Thomson Reuters 2014) to rank journals by impact. Then, according to quartiles, three groups of projects were finally set up as follows:

- 25% of projects, concretely those with the lowest values, will be included in the Q4 of the distribution and classified as *Low Impact projects*.
- Then, a more numerous group including projects with intermediate values, specifically between 25% and 75% of the distribution (Q3 and Q2), will be aggregated in the category of *Good Impact projects*.
- Finally, a final group containing the best values and representing the Q1 of the distribution will be *High Impact projects*.

In an attempt to facilitate the assessment process, each group can be identified by means of colours, following the traffic lights code, as shown in Fig. 6.

This function can be implemented in the tool in order to be able to identify, at a glance, those projects achieving higher or lower impacts for each dimension. By using a spreadsheet or specific software tailored to this end, the

Low Impact projects	Good Impact projects	High Impact project
Q4	Q3 & Q2	Q1

Figure 6. Three groups of IOM methodology to classify projects after scoring.

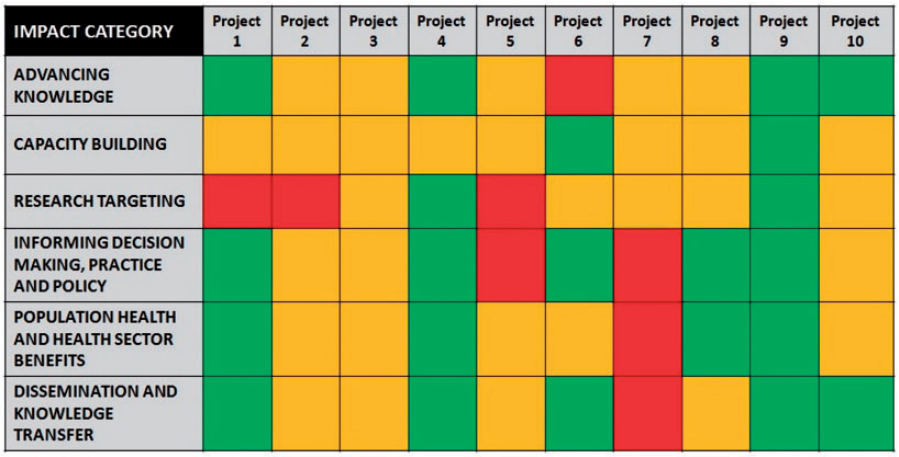

Figure 7. Example of the project scoring matrix.

aforementioned formulas and operations necessary to conduct the study could be implemented through conditional rules or directly using codes.

To ensure the scoring matrix's good performance, a significant set of projects (at least 20) responding the coordinators' survey would be desirable in order to enrich the comparison and the final classification of the projects over the three designed impact groups. Thus, the higher the set of projects under analysis, the more precise the final classification will be.

Using the IOM assessment tool, it will be possible to have a first idea in a quick and easy way of the type of impacts that a group of funded projects have had. It will provide a snapshot of the different types of impacts from the funded research, highlighting projects with a high level of impact for any or all of the categories and also those that, in comparison to the group, have had a low impact in some or all the categories. It is useful to see in which categories impact is mostly achieved and if certain types of projects achieve more impacts than others, and also to identify projects that could be recognized as *success stories*.

Figure 7 shows an example of how the scoring matrix would look for a group of projects (it is not based on real data).

The level of impact on each category, measured as low, good, and high, is specific to the moment the scoring takes place, and can be compared with future scores for the project, for example, with the data from the coordinators' survey 3 years after. This can be useful to monitor the impact of the projects. These measures give an idea of the impact for each category in comparison with other projects, and do not refer to the level of achievement of individual project objectives, and thus it should not be used to evaluate if the project has performed well or badly, as this should take into account the project's initial objectives, the type of project (research projects, coordination, and support action), and other variables.

Any further conclusion on what specific impact each project has had will require a more in depth evaluation, complementing the results of the scoring matrix with the project's final reports, the results framework, the end users' survey, face to face interviews, and case studies work to obtain more evidence about the type and quality of the project's impacts.

4. Discussion and conclusions

Among the most relevant conclusions extracted from the case studies work, we can remark that, in general, the information from the coordinators' survey matched closely with the findings derived from the case studies. In fact, results from case studies revealed a high concordance with the coordinators' survey on several facets, for instance, in gathering most of the findings from the projects, providing evidence of project performance, and revealing some types of impacts. Therefore, the use of questionnaires has proven to be helpful for identifying and assessing the benefits of health research. However, the use of case studies is also recommended to advance knowledge of which approaches are more likely to produce more impact. A more detailed analysis of those projects producing higher impacts can give clues for improving the design of future public health research programmes. Other valuable issues were better captured by case studies, for instance how to best identify impacts at

local level, the difficulty of understanding and reporting long-term impacts (social and economic), or the significance of high visibility, and further sustainability of the project in achieving impacts. Refinements have been made to the questionnaire to try to better deal with these types of issues.

It is important to bear in mind that the IOM methodology has been tested only using information from the 28 Public Health International Research Projects which filled out the coordinators' survey. Admittedly, in our test the methodology provided coherent results, but we believe that its performance should be tested against a larger and more representative data sample.

The main strengths of the IOM methodology are summarized below:

- The methodology can be used in parallel and complementing on-going FP7 project reporting and evaluation approaches already in use by the EC.
- The methodology has been developed bearing in mind the lack of resources in terms of time availability that project officers in the Health Unit of DG Research and Innovation have. Deployment of the methodology requires minimal time and resources. It was not feasible to consider using case studies or interviews to collect data from projects, so that is why the main data collection tool used is a short, self-administered online survey.
- A good repository of project results and impacts needs to be established when implementing the methodology. This is an important requirement for any M&E system to be useful, as data can be accessible any time and used for different purposes: for internal individual project monitoring and assessment, or even future programme evaluations.
- The methodology enables project officers to aggregate project data for analysis, and present projects' results and impacts in different ways: individual data, grouped by type of impact, by type of project, by theme, for the whole area, and even by countries.
- The methodology will enable DG Research and Innovation to report to international cooperation partner countries on specific results and impacts of projects in which partners from their countries have participated and which have focused on issues of importance for their health systems.
- The IOM methodology can easily be implemented in EC-funded research areas other than public health by adapting payback categories and assessment tools to the required areas.

We would like to specifically point out what we feel is a major value of the methodology. Having as a mandatory requirement the completion of the Coordinators' survey during the period in which the project is still active (or a few years after) is very valuable. First, this ensures that project data will be available and second, that the data will be of good quality, as the coordinator will be able to provide the information easily and will be willing to do so. This information will be readily available for programme interim and *ex-post* evaluations, overcoming in this way the difficulties of obtaining project data for programme evaluations when you launch a survey years after projects have finished.

Nevertheless, the IOM methodology also presents some limitations:

- A methodology to monitor the impact of health research projects, understanding monitoring as a follow-up during the project's life and 3 years after, will need to assume that it will not be able to provide complete evidence on the impacts achieved by the project. This is due to the fact that for most impact categories, effects of the research can only be visible over the medium-long term. Many authors have stated that it takes an average of 17 years to translate health research into practice (Morris, Wooding and Grant 2011). The peak for citations of publications is said to be between 2 and 4 years after the publication takes place (Camarinha-Matos and Afsarmanesh 2007) and an average of 8 years elapses between the publication of a paper and the publication of a clinical guidelines citing that paper (Grant et al. 2000).
- There is always some degree of subjectivity when researchers are asked to report about the impacts of their projects, especially for non-academic impacts, such as benefits for policy making, health, and for long-term impacts such as the social benefits of research. Responses are '*often statements of what they believe ought ideally to have happened rather than what they realistically expected*' (Hanney, Davies and Buxton 1999). Based on our experience and in previous work developed and cited above (Hanney, Davies and Buxton 1999), we could consider coordinators' surveys as a reliable tool enabling a valid approximation to the complex issue of research impact. Moreover, the IOM methodology proposes the use of other sources of information (the end users' survey and the results framework) as a means to both validating and complementing the data obtained using the coordinators' survey.
- The IOM methodology provides the tools to obtain a quick overview of how individual projects have performed in terms of achieving expected impacts, as well as how well they can be rated for each of the pre-established impact categories. Data gathered through the questionnaire and the developed scoring approach can help to perform this task, but officers in charge of the assessment of the projects will need to spend some specific time in order to have a more general understanding of the project's results and impacts. They will need to analyze the final reports as well as information about the type of project,

initial goals, budget, length, specific issues that could have arisen during the project, etc., because this information could be very important for a better interpretation of the results obtained from the survey.
- A full validation of the IOM model using projects was not possible in the context of the EVAL-HEALTH project. Implementing and further testing the IOM methodology with FP7 projects should provide valuable information to refine the different data collection tools, as well as the scoring matrix. In this regard, the proposed IOM methodology should not be considered to be a fixed set of guidelines and tools. On the contrary, it should be refined and modified throughout its use, since information retrieved from projects will facilitate a better understanding of the pathways to impacts and better use of the resources.

To conclude, in order to gain in effectiveness, and also as a means of making researchers aware of the need that the EC has to know the impacts of research projects, we suggest that project participants (and specially those acting as coordinators) should be aware from the very beginning (even during the launch of the future calls for proposals of the new Horizon 2020) about the type of monitoring tools (specially the coordinators' survey) that will be used by the EC. Impact assessment should be regarded by the researchers as a positive point, and not as another burden for project management. This requires that everyone is aware, from the very beginning, of the potential use of all the data and information that the EC will require of project coordinators. In step with this, linking monitoring to reporting and designing an appropriate data management system will facilitate and improve the use of the IOM methodology.

Supplementary data

Supplementary data is available at *REEVAL Journal* online.

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